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Direct Testimony and Schedules
Randy A. Capra

Before the Minnesota Public Utilities Commission
State of Minnesota

In the Matter of the Application of Northern States Power Company
for Authority to Increase Rates for Electric Service in Minnesota

Docket No. E002/GR-19-564
Exhibit___(RAC-1)

Energy Supply

November 1, 2019

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Schedules

I. INTRODUCTION

Q. PLEASE STATE YOUR NAME AND OCCUPATION.

A. My name is Randy A. Capra. I am the General Manager of Power Generation for Xcel Energy Services Inc. (XES), which is the service company affiliate of Northern States Power Company, a Minnesota corporation (NSPM or the Company) and an operating company of Xcel Energy Inc. (Xcel Energy).

Q. PLEASE SUMMARIZE YOUR QUALIFICATIONS AND EXPERIENCE.

A. I have worked for Xcel Energy since 1985, including assignments as an Instrument and Control Specialist, Plant Supervisor, Engineering Manager, Operations Manager, Plant Director and General Manager. In my current position as General Manager of Power Generation, Energy Supply NSP, I am responsible for all fossil and renewable operations throughout the NSP generation fleet. My statement of qualifications is attached as Exhibit___(RAC-1), Schedule 1.

Q. WHAT IS THE PURPOSE OF YOUR TESTIMONY IN THIS PROCEEDING?

A. I present and support Northern States Power Company's capital and Operations and Maintenance (O&M) budgets for the Energy Supply business unit for purposes of determining test year electric revenue requirements and final rates in this proceeding. I also present and support the Company's multi-year rate plan (MYRP) capital additions and O&M budgets related to the Energy Supply function. I also provide information with respect to the performance of our generation fleet and steps we are taking to continually improve performance and operate more efficiently.

Q. PLEASE PROVIDE AN OVERVIEW OF ENERGY SUPPLY'S PLANS FOR THE NEXT THREE YEARS.

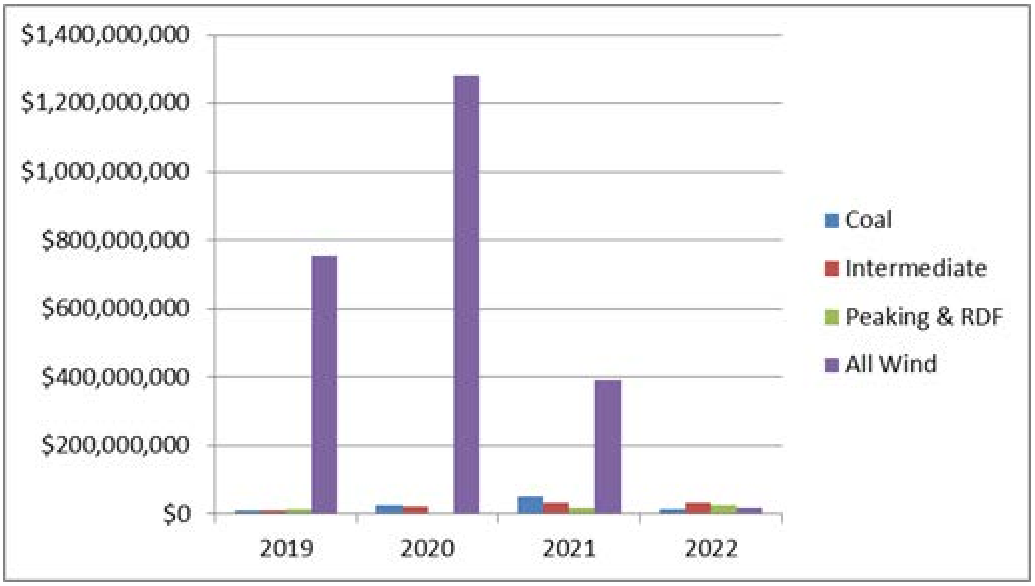
A. The Company's Energy Supply function will be at the forefront of the Company's implementation of its carbon reduction efforts and long-term carbon-free goals. Over the next three years we will begin to see the Company's shift to more Company-owned renewable energy generating facilities. Additionally, the next three-year period will continue our efforts to wind down coal operations, anticipating the retirement of Sherco Unit 2, in 2023.

As we move to a carbon-free future, the Company expects to make significant investments over the next several years. Specifically, the Commission has already approved our development and construction of the Blazing Star I, Foxtail and Lake Benton wind farms, which will be placed in service in 2019. In 2020, we anticipate placing in service the Commission-approved Blazing Star II, Freeborn, Crowned Ridge projects, and pending Commission approval, the Mower, Jeffers and Community Wind North wind repowering projects. These renewable investments will contribute to our ability to achieve the Company's and the State's policy goals over the long term.

In fact, almost 90 percent of Energy Supply's capital investments during this MYRP will be in advancing our carbon-free goals by adding material amounts of wind to our system. Figure 1 shows this dramatic investment.

Figure 1

Annual Capital Additions by Fuel Type

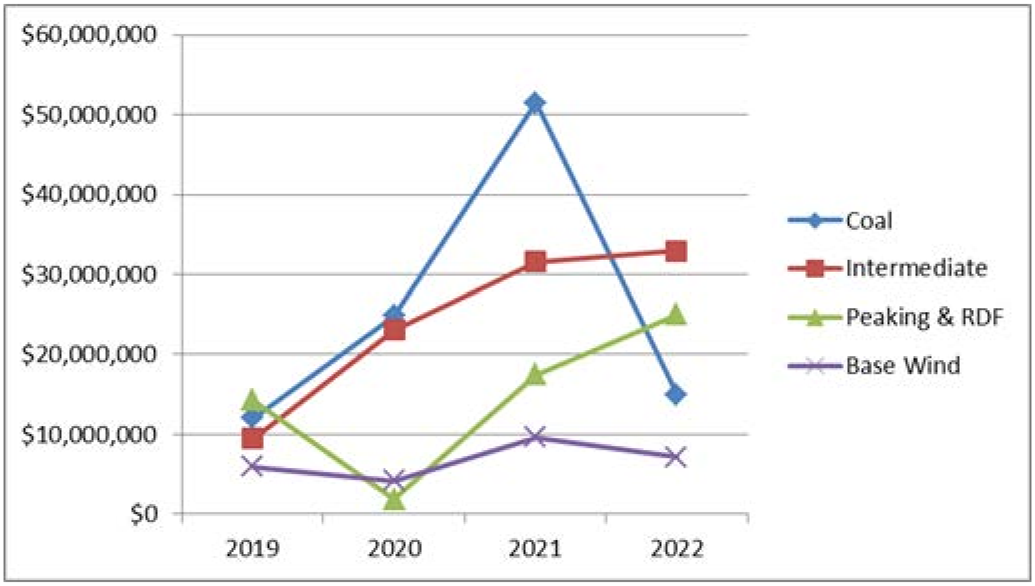


During this MYRP, our focus on shifting to a carbon-free future will also see us preparing to retire our coal fleet, beginning with the retirement of Sherco Unit 2 at the end of 2023. In light of this, our capital investments into our coal plants will begin to decline sharply during this MYRP, while capital investment in our other plants will begin to increase. Figure 2 shows how our coal capital spend is declining in relation to our other existing plants.

Figure 2

Annual Capital Additions by Fuel Type

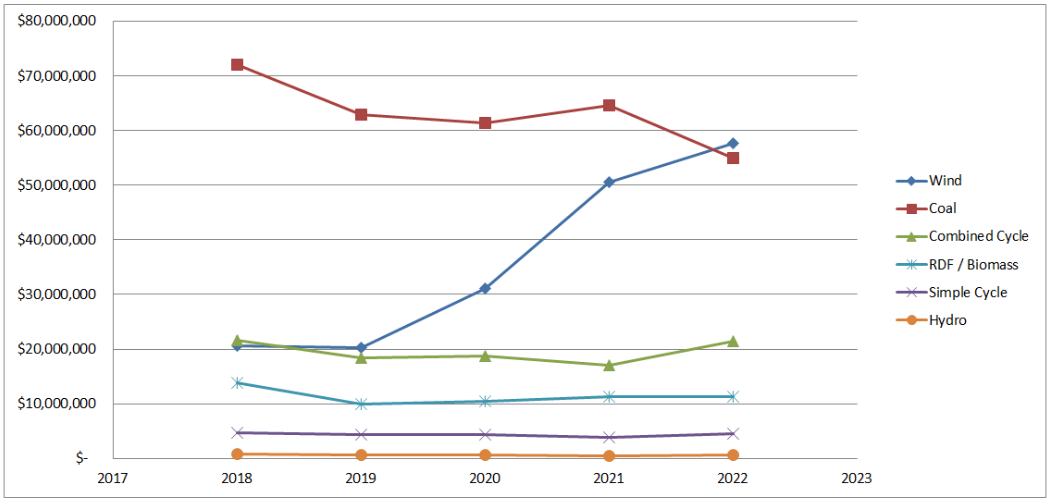
(Excluding Investment in New Wind Farms)



These investments will also necessitate a shift in our O&M spending into the future to accommodate these new investments and recognize the pending retirement of our coal fleet. In fact, over the course of this multi-year rate plan, the Company will see its O&M spending on coal-fired generation decline and its spending on wind generation increase, such that overall O&M on wind will eclipse that for our coal fleet. Figure 3 illustrates this. Many of these O&M impacts specifically related to our wind investments have been approved (or are pending approval) by the Commission.

Figure 3

O&M Costs by Fuel Type



Q. DOES THE SHIFT TO A MORE CARBON-FREE FUTURE IMPACT ENERGY SUPPLY'S CORE PRIORITIES?

A. No. The Company's Energy Supply function will remain responsible for maintaining the safe operation of the Company's non-nuclear generating fleet. We must continue to support our generation facilities through capital additions that are needed to keep our plants in good working order as well as operations and maintenance expense to ensure they are operated and maintained effectively. These costs are necessary to provide our customers with economical energy they can rely on. We also support new and existing resources necessary to meet demand and keep the Company well-positioned to comply with environmental regulations and the Company's and State's energy policy goals.

Over the next three years, Energy Supply will continue to focus on keeping our plants running safely and efficiently. In order to do that, each year we must make investments in Reliability/Performance Enhancement projects.

We must also undertake Environmental Improvement projects to control and reduce the emissions from our existing plants. These efforts toward reliability, performance enhancement, and environmental improvements form the bulk of our routine work to keep our generation plants running.

Q. HOW IS YOUR TESTIMONY ORGANIZED?

A. First, I provide an overview of the Energy Supply business area and the value it provides to customers. Next, I describe Energy Supply's capital budget planning and oversight. I also describe Energy Supply's capital investment program for 2020, 2021, and 2022, followed by a similar discussion for our O&M expenses. Lastly, I discuss the operating performance of our key assets and operating model initiatives.

For the capital discussion of my testimony, I note that dollar amounts are first presented on an NSPM basis followed by the State of Minnesota jurisdictional amount in parenthesis, unless otherwise noted. The O&M jurisdictional values in my testimony do not reflect the interchange offsets to Northern States Power Company-Wisconsin (NSPW); those values are shown in Exhibit___(RAC-1), Schedule 2.

Q. PLEASE SUMMARIZE THE COMPANY'S CAPITAL ADDITIONS DURING THE 2020 TEST YEAR AND 2021 AND 2022 PLAN YEARS.

A. Over the next three years we anticipate higher capital outlays in 2020-21 reflecting our investment in new wind generation, balanced by lower capital additions in 2022 to meet customer needs for reliable, safe, and cost-effective service.

To continue providing safe, reliable, environmentally-sound, and cost-effective electric service to our customers, we plan to place into service capital additions at our existing plants totaling approximately $56.0 million for NSPM in 2020 ($40.9). In addition, we have budgeted in 2020 for a total of $1.28 ($0.93) billion of new renewable capital additions for the completion of the Blazing Star II, Freeborn, and the Crowned Ridge wind projects as well as the purchase of the Mower, Jeffers and Community Wind North wind farms.[1] Consequently, our total capital additions for 2020 are expected to total $1.33 ($0.97) billion.

In addition to the major investments we are making in our system, in 2020 we also plan to place in service capital projects at our High Bridge Unit 7, Riverside Unit 9, and Sherco Unit 3 plants as part of our ongoing commitment to maintain reliability and performance of our assets and make environmental improvements that are valuable to our customers. Additionally, we are planning to implement other projects at our plants to ensure their long-term safe and reliable operation.

In 2021, we plan to place into service capital additions at our existing plants of approximately $112.4 ($82.1) million. The vast majority of these additions, $89.1 ($65.0) million, are Reliability/Performance Enhancement investments, which are needed to maintain our generation fleet in good working order. Significant individual efforts include projects at Sherco Unit 1, A. S. King Unit

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[1] The Company's proposed Railroad Island solar project was inadvertently included as a capital addition in the rate case. Please see the Direct Testimony of Company witness Mr. Benjamin Halama regarding the removal of this project from the interim rate revenue deficiency and a planned Rebuttal adjustment to also remove it from final rates.

1, Riverside Units 7 and 10, Red Wing, Blue Lake Units 7 and 8, and St. Anthony Falls.

In 2022 we plan to place into service capital additions at our existing plants of approximately $80.7 ($58.9) million. The vast majority of these additions, $66.3 ($48.4) million, are Reliability/Performance Enhancement investments. Significant individual efforts include projects at Black Dog Units 5 and 2, Angus Anson Unit 4, Sherco Unit 3, Inver Hills Unit 3 and Blue Lake Unit 7.

Our capital budgets also reflect our core priorities, in light of the impacts to our customers of the Company's recent past investments (for example, the 2016 addition of Courtenay wind farm and 2018 addition of Black Dog Unit 6 projects to our system) and pending future investments. Therefore, our budgets reflect the deferral of some Reliability/Performance Enhancement spending from 2019 and 2020 into 2021 and beyond. We have also looked for ways to better forecast or reduce costs, and are looking for cost avoidance or savings opportunities where possible. While we cannot defer needed projects indefinitely – and some needs cannot be deferred at all – we have taken these steps to balance customer cost impacts with needed work at our plants.

Q. PLEASE SUMMARIZE ENERGY SUPPLY'S O&M BUDGETS FOR THE 2020 TEST YEAR AND 2021 AND 2022 PLAN YEARS.

A. As I mentioned above, our O&M budgets are tracking the transformation of our generation fleet – which means the O&M spend associated with our coal generation is decreasing while the O&M spend associated with the maintenance of our growing wind fleet is increasing. Notably, these O&M

impacts have already been approved or are pending approval by the Commission for these material investments.

In support of our overall mission to maintain a safe and reliable generation fleet, we have budgeted $142.8 ($103.9) million for O&M expenses in 2020. The primary drivers of our 2020 O&M budget are additional costs for Blazing Star I, Foxtail, and Lake Benton wind farms which are being placed into service in 2019, new costs for Blazing Star II, Border Winds, Freeborn Wind, and Mower Wind which are being placed in service in 2020, and wage increases for our Energy Supply labor.

In 2021, we have budgeted $163.6 ($119.1) million for O&M expenses. The primary drivers of our 2021 O&M budget are additional costs for the wind farms being placed into service in 2020, new costs for the Dakota Range wind farm being placed into service in 2021, and wage increases for our Energy Supply labor.

In 2022, we have budgeted $166.5 ($121.3) million for O&M expenses. The primary drivers of our 2022 O&M budget are additional costs for the Dakota Range wind farm and wage increases for our Energy Supply labor, offset by reduced operating and maintenance expenses due to Sherco 2 retirement planned for 2023.

Q: HAS THE COMPANY UNDERTAKEN ANY EFFORTS TO MANAGE ITS O&M SPENDING?

A. Yes, we continue to undertake efforts to manage our O&M spending by using productivity and efficiency measures and other cost reduction strategies to help offset cost increases due to new assets, and maintain a reasonably small but predictable year-on-year O&M growth rate on an average basis. That said, our O&M budgets fluctuate somewhat in individual years, depending on which overhauls and other work may be needed at our generation plants.

Our proposed plant additions, capital investments, and O&M budget support our commitment to keeping our plants online and available for our customers. Our generating fleet has historically performed within industry norms. In addition, since 2011 we have been implementing our Energy Supply Operating Model to better centralize management of our fleet, implement additional best practices, improve our quality assurance and human performance practices, and seek cost efficiencies through better sourcing management. We are transitioning to the next phase of the Operating Model in 2019 to use the lessons learned through our previous efforts and focus on modernizing this work through Productivity Through Technology initiatives as well as other continuous improvement initiatives in an effort to control our overall O&M spending through more centralized and efficient plant management. Through these programs, we are seeking to continually improve our plant operations to cost-effectively achieve strong performance.

Q. HOW ARE THE COMPANY'S BUDGETS AFFECTED BY THE COMMISSION'S RECENT DECISION IN DOCKET NO. E002/PA-18-702 REGARDING THE PURCHASE OF THE MANKATO ENERGY CENTER?

A. The Company had been anticipating owning the Mankato Energy Center and budgeted for this. However, given the Commission's recent decision regarding the purchase of the facility, my testimony presents our budgets for the 2020 test year and 2021 and 2022 plan years without the planned costs for capital investment and operation and maintenance of the Mankato Energy Center. Company witness Mr. Benjamin C. Halama describes the budgetary impacts of the Company continuing to take service from the Mankato Energy Center under the existing power purchase agreements and how this is reflected in our cost of service.

Q. HOW IS THE REMAINDER OF YOUR DIRECT TESTIMONY ORGANIZED?

A. The remainder of my Direct Testimony is organized as follows:

Section II – Energy Supply Functions and Activities

Section III – Capital Budget

Section IV – O&M Budget

Section V – Operating Performance

Section VI – Conclusion

II. ENERGY SUPPLY FUNCTIONS AND ACTIVITIES

Q. PLEASE DESCRIBE ENERGY SUPPLY'S KEY ROLES AND RESPONSIBILITIES.

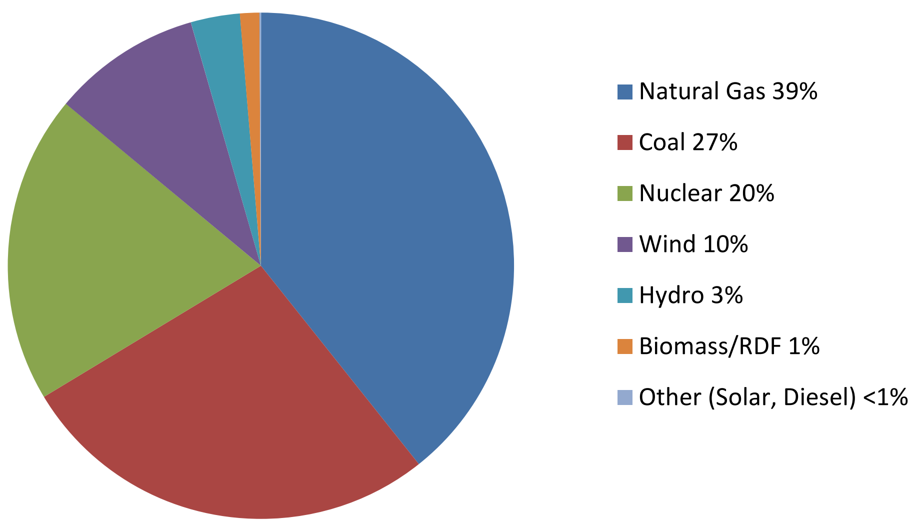
A. Energy Supply's primary responsibility is to operate and maintain the Company's non-nuclear generation facilities in a safe, reliable, cost-effective, and environmentally-sound manner. We are also responsible for managing major construction projects, overseeing environmental compliance, and supporting the coordination of generating unit dispatch with the Midcontinent Independent System Operator, Inc. (MISO).

Q. PLEASE DESCRIBE THE NSP GENERATION PORTFOLIO.

A. The NSP Electric System (serving NSPM and NSPW) serves over 1.6 million electric customers in Minnesota, North Dakota, South Dakota, Wisconsin, and Michigan. Together, NSP's generating plants have a net maximum capacity of almost 9,000 megawatts (MW). Our generating facilities use a variety of fuel sources including natural gas, coal, nuclear fuel, water (hydro), wind, biomass, refuse, solar, and oil. Figure 4 shows the NSPM fuel mix as a percent of July 2019 owned accredited capacity.

Figure 4

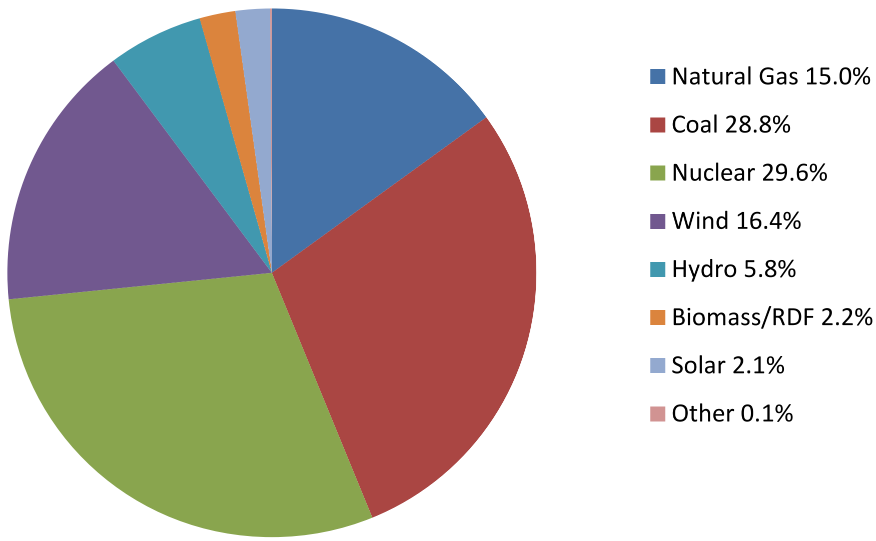
NSPM Fuel Mix by Accredited Capacity (MW) - July 2019



In addition to the owned accredited capacity view of our generation facilities, I provide another representative view of how we are meeting customer needs, the actual generation view of our electricity production. While the focus of my testimony is limited to the generation that is owned by the Company, we also serve customer needs with power purchased pursuant to long-term Power Purchase Agreements (PPAs). We recover our energy costs (and some associated capacity costs) associated with our purchased power resources through a combination of base rates and the Fuel Clause Adjustment Rider, which is annually reviewed by the Commission in other proceedings. Figure 5 shows the fuel mix as a percent of actual 2018 generation including PPAs.

Figure 5

NSPM Fuel Mix by Actual 2018 Owned Generation and PPAs (MWH)



Q. HOW HAS THE GENERATION PORTFOLIO EVOLVED OVER TIME?

A. Our generation portfolio has evolved as a result of state and federal energy policies and regulations and Company-driven efforts to improve efficiencies and environmental performance. Underlying all of that is customer preference, which continues to trend toward a preference for a generation mix that more heavily relies on renewable resources.

For example we have added material amounts of renewable energy to the NSP System from 2016-2018, including wind and solar resources. The 2019 bridge year, 2020 test year, and 2021-2022 plan years will also see significant investment in new wind and solar facilities. I discuss these further in my testimony.

Q. DO YOU EXPECT THE RESOURCE MIX TO CONTINUE TO EVOLVE OVER THE NEXT SEVERAL YEARS?

A. Yes. As shown in our current Resource Plan, we expect our resource mix to gradually shift away from coal resources and incorporate higher levels of renewable and natural gas resources. This is a response to several factors, including our commitment to carbon-free energy, the declining cost of renewable energy and natural gas, customer preference, and the age of some of our existing generation units. Our proposed framework for meeting future generation needs is further outlined in our 2020-2034 Upper Midwest Resource Plan submitted to the Commission July 1, 2019 in Docket No. E002/RP-19-368.

Q. HOW DOES ENERGY SUPPLY SUPPORT THE COMPANY'S GENERATION PORTFOLIO DESCRIBED ABOVE?

A. Energy Supply makes capital investments and incurs O&M costs to support existing generation plants, maintain and update generation facilities, and invest in new resources where appropriate. As a general matter, we must make investments each year to keep our plants running safely and efficiently to support our customers' needs and reduce future financial risk to our customers. However, large new generation resources tend to be the largest drivers of our capital budget, while overhauls of existing plants tend to drive O&M and contribute to capital maintenance programs and timing. I discuss our capital investments and O&M trends in more detail below.

III. CAPITAL BUDGET

A. Overview

Q. WHAT IS THE PURPOSE OF THIS SECTION OF YOUR TESTIMONY?

A. In this section I illustrate capital budget trends for Energy Supply, discuss how the Energy Supply business unit develops its annual capital budget, and explain how Energy Supply identifies, prioritizes, and manages capital projects within the confines of the capital budget.

Q. FOR 2016-2018, WHAT WERE ENERGY SUPPLY'S KEY STRATEGIC GOALS AND FOCUS AREAS THAT DROVE CAPITAL INVESTMENTS?

A. For 2016-2018, our capital addition levels were primarily driven by the completion of the Courtenay Wind Farm in 2016-2017, $297.3 ($216.8) million, and Black Dog Unit 6 in 2018, $87.3 ($64.5) million. We continued a steady execution of our investment plan with a focus on overall plant maintenance and support. We experienced some variability during this period due to the need for emergent work to mitigate outages, environmental regulation compliance, and other compliance requirements. In total, our 2016-2018 average annual capital additions were approximately $197.7 ($145.2) million. Our 2016-2018 average annual capital additions at existing facilities were approximately $73.8 ($54.5) million.

Q. AND HOW DID YOUR CAPITAL INVESTMENTS BREAK INTO CAPITAL BUDGET GROUPINGS THAT REFLECTED THOSE GOALS?

A. We divide our capital budget into the following three capital budget groupings, which describe the types of work Energy Supply undertakes:

- Renewable and New Generation,

- Reliability/Performance Enhancement,
- Environmental Improvement.

Q. FOR 2016-2018, CAN YOU PROVIDE A SUMMARY OF HOW YOUR INVESTMENTS FELL INTO THOSE CAPITAL BUDGET GROUPINGS?

A. Yes. Our capital grouping hierarchy was established during development of our new Enterprise Project Management (EPM) software system, Unifier, implemented in 2013. Table 1 below shows the breakdown of costs by each capital budget grouping for 2016-2018.

Table 1

2016–2018 Actual Capital Additions (With AFUDC)

Northern States Power Company - MN ($ Millions)			
	2016	**2017**	**2018**
Renewable and New Generation	$ 301.7	$ 2.6	$ 89.1
Reliability/Performance Enhancement	$ 41.4	$ 48.1	$ 84.6
Environmental Improvement	$ 12.7	$ 1.9	$ 10.9
Total:	**$355.8**	**$ 52.6**	**$ 184.6**

Q. PLEASE EXPLAIN WHY THE PERCENTAGES OF YOUR INVESTMENTS IN THESE GROUPINGS CHANGED OVER THESE THREE YEARS?

A. Energy Supply must balance the need to make investments to propel us into a carbon-free future, the needs of our existing plants to operate safely and reliably, available capital within the Company, and the overall impact of our capital spend pattern on customers. As I discuss further below, our investments in existing plants so that they continue to operate safely and reliable is generally steady and we can manage to the budget by prioritizing necessary projects. That said, our larger investments in new generating facilities can be less consistent in that we make significant capital additions when in-servicing new plants or replacing assets when they reach end of serviceable life. To account for these significant capital additions we often need to reallocate other work. Consequently, the Company's investments in capital budget groupings vary somewhat by year, and include some amount of work that was deferred from previous years.

Q. WHAT ARE THE COMPANY'S FORECASTED CAPITAL ADDITIONS FOR 2019?

A. In 2019, we are forecasting a total amount of capital additions of $788.9 ($572.5) million dollars. Reliability/Performance Enhancement and Environmental Improvement capital additions are $35.8 ($26.1) million. These include a series of Reliability/Performance Enhancement projects such as the combustion turbine major overhauls at Angus Anson Unit 3 and High Bridge Unit 8. We have also undertaken Environmental Improvement projects primarily for Black Dog related to stormwater management and chemical unloading. Our forecasted Renewable and New Generation capital additions of $753.1 ($546.4) million in 2019 are for Blazing Star I wind farm, Foxtail wind farm and Lake Benton wind farm.

Q. WHAT ARE THE COMPANY'S BUDGETED CAPITAL ADDITIONS FOR 2020?

A. In 2020, we are forecasting total capital additions of $1.33 ($0.97) billion dollars. Our forecasted Renewable and New Generation capital additions of $1.28 ($0.93) billion in 2020 are for the Crowned Ridge, Blazing Star II, Freeborn, Mower, Jeffers and Community Wind North wind farm projects. Reliability/Performance Enhancement and Environmental Improvement capital additions are $50.1 ($36.6) million. These include Reliability/Performance Enhancement projects for combustion turbine major overhauls at High Bridge Unit 7 and Riverside Unit 9 as well as projects completed during the planned Sherco Unit 3 overhaul. These projects are: replacement of the 37-1&2 high-pressure feedwater heaters, replacement of unit protection Programmable Logic Controllers (PLCs) and replacement of the 31&32 secondary air heater heat transfer baskets. We have also undertaken Environmental Improvement projects primarily for Sherco Units 1, 2 and 3 by replacing the bottom ash pond to comply with new Environment Protection Agency (EPA) Coal Combustion Residuals (CCR) requirements by the compliance date of October, 31 2020.

Q. WHAT ARE THE COMPANY'S BUDGETED CAPITAL ADDITIONS FOR 2021?

A. In 2021, we are budgeting a total amount of capital additions of $493.7 ($358.6) million dollars. Our forecasted Renewable and New Generation capital additions of $392.3 ($284.6) million in 2021 are mainly for the Dakota Range wind farm. Reliability/Performance Enhancement and Environmental Improvement capital additions are $101.4 ($74.0) million. These include Reliability/Performance Enhancement projects for combustion turbine major overhauls at Riverside Unit 10 as well as projects completed during the planned Allen S. King Plant overhaul. We have also undertaken Environmental Improvement projects primarily for construction of landfill cell 4 for Sherco Unit 3.

Q. WHAT ARE THE COMPANY'S BUDGETED CAPITAL ADDITIONS FOR 2022?

A. In 2022, we are budgeting at total amount of capital additions of $92.5 ($67.4) million dollars. Reliability/Performance Enhancement and Environmental Improvement capital additions are $73.5 ($53.6) million. These include Reliability/Performance Enhancement projects for Hot Gas Path replacements at Black Dog Unit 5 and Angus Anson Unit 4. We have also undertaken Environmental Improvement projects primarily for replacement of the Air Quality Control System (AQCS) fabric filter baghouse bag replacement at Sherco Unit 3. Our forecasted Renewable and New Generation capital additions of $18.9 ($13.7) million in 2022 is for our wind integration battery project, which I describe further, below.

Q. LOOKING AHEAD, WHAT ARE YOUR CAPITAL BUDGETS FOR 2020-2022 BY CAPITAL BUDGET GROUPING?

A. For the next year (2020), our capital spend will decrease with respect to base investments. The reduction in base capital was made to somewhat offset additional costs related to major capital Renewable and New Generation additions that are being placed in service in 2020. When major capital additions are planned, non-essential capital additions are deferred where possible to minimize the effect on customers while maintaining an acceptable risk profile. (Non-essential capital additions may include parking lot repairs, roof repairs, or vehicle replacements, for example.)

However, many Reliability/Performance Enhancement projects cannot be deferred indefinitely, as issues like aging building roofs and vehicles will have to be addressed eventually. As such, we anticipate base capital spending will increase beginning in 2021-2022. I discuss each of the key projects we anticipate for 2020 through 2022 later in my testimony.

Table 2 below illustrates that, overall, our 2020-2022 average capital additions break down into approximately $564.6 ($409.6) million for Renewable and

New Generation, $66.0 ($48.2) million for Reliability/Performance Enhancement and $9.0 ($6.5) million for Environmental Improvement.

Table 2

2020 – 2022 Forecasted Capital Additions (With AFUDC)

Northern States Power Company - MN ($ Millions)			
	2020	**2021**	**2022**
Renewable and New Generation	$ 1,282.5	$ 392.3	$ 18.9
Reliability/Performance Enhancement	$ 42.7	$ 89.1	$ 66.3
Environmental Improvement	$ 7.4	$ 12.3	$ 7.2
Total:	**$ 1,332.6**	**$493.7**	**$ 92.5**

Q. PLEASE EXPLAIN THE BUDGETED INVESTMENTS IN 2020 THROUGH 2022.

A. Virtually all of our Renewable and New Generation capital additions are associated with the Commission-approved wind farms that we are adding to our system, including Crowned Ridge, Blazing Star II, Freeborn, and Dakota Range, as well as the projects pending Commission approval such as Mower, Jeffers, and Community Wind North. When these wind farm projects were approved, efforts were made to delay or cancel non-essential capital projects that were budgeted in 2020 to 2021 or later. Approximately $50 million of projects were moved out of 2020 to minimize the effect on customers of the renewable additions. This effort reduced costs, but also means that we will need to address the deferred projects in the future.

Our 2021 planned Reliability/Performance Enhancement budget reflects our efforts to plan for projects that need to be completed in 2021, as well as projects that could have been completed earlier but were deferred. Examples of base capital projects that we would typically have completed earlier but which were deferred until 2021 include A.S. King superheater outlet pendant replacement and Sherco Unit 3 landfill cell 4 construction. These projects are discussed later in my testimony.

Our 2022 capital additions budget reflects the impact of the material investments we are making and a return to a more typical investment pattern with minimal new capacity additions or replacements of retiring assets.

Q. WHAT KEY PROJECTS WILL YOU BE INVESTING IN OVER THIS TIME PERIOD?

A. The investment in Renewable and New Generation projects, namely, the Crowned Ridge, Blazing Star II, Freeborn, Mower, Jeffers, Community Wind North and Dakota Range wind farms drives our overall capital investment strategy. In 2020, we anticipate placing the Crowned Ridge, Blazing Star II, Freeborn, Mower, Jeffers, Community Wind North in service (approximately $1.28 billion with AFUDC); in 2021 we anticipate placing the new Dakota Range wind farm in service (approximately $381.3 million with AFUDC); and in 2022 we anticipate placing a wind farm battery project in service (approximately $18.9 million with AFUDC). The remainder of our costs are largely driven by base investments required to keep our generation fleet operating safely and reliably producing electricity, and overhauls required to complete repairs.

Q. WHAT OTHER CAPITAL ADDITIONS DO YOU EXPECT TO DRIVE YOUR INVESTMENTS OVER THESE YEARS?

A. Our capital additions are largely dependent on individual unit overhaul cycles. Equipment and systems that comprise a generating unit have life expectancies and inspection/replacement cycles defined by their manufacturers. These cycles may be defined by different measurable criteria, *i.e.,* hours and starts. At intervals throughout the equipment life, inspections are performed to gauge if the actual degradation is following the calculated trend. When the equipment degradation trend approaches end of life, a replacement project is budgeted for the next available opportunity that does not affect availability. For most major equipment components, these repairs and inspections must take place during an overhaul when the unit is offline and equipment can be safely disassembled.

Depending on the type of generating unit, the costs will vary. Overhauls at coal generation plants are a mix of O&M costs and capital costs because it is often necessary to clean areas of the plants (an O&M cost) before undertaking the capital upgrades. Overhauls at Intermediate plants are largely capital costs, due to the replacement of combustion turbine parts. The turbine parts, as part of the inherent design of these plants, are exposed to extremely high temperatures and lots of thermal cycles, and therefore have shorter life expectancies and are more prone to thermal fatigue failure than those in our baseload fleet. Tables 3 and 4 below show Energy Supply's actual and planned plant additions for 2016 to 2022 and expenditures for 2016 to 2021.

Table 3

2016 – 2022 Capital Plant Additions (With AFUDC)

Northern States Power Company - MN ($ Millions)	2016	2017	2018	2019	2020	2021	2022
ES - Except Major	$ 38.5	$ 53.4	$ 129.5	$ 41.7	$ 56.0	$ 112.4	$ 80.7
MN Jurisdiction	$ 28.4	$ 39.3	$ 95.7	$ 30.4	$ 40.9	$ 82.1	$ 58.9
ES - Major Renewable	$ 312.4	$ -	$ -	$ 747.2	$ 1,276.5	$ 381.3	$ 11.8
MN Jurisdiction	$ 229.4	$ -	$ -	$ 542.1	$ 926.1	$ 276.6	$ 8.5
ES - Major Thermal	$ -	$ -	$ 108.3	$ -	$ -	$ -	$ -
MN Jurisdiction	$ -	$ -	$ 80.0	$ -	$ -	$ -	$ -
Total	**$350.9**	**$ 53.4**	**$ 237.8**	**$ 788.9**	**$ 1,332.5**	**$ 493.7**	**$ 92.5**
Total MN Jurisdiction	**$257.8**	**$ 39.3**	**$ 175.7**	**$ 572.5**	**$ 967.0**	**$ 358.7**	**$ 67.4**

Table 4

2016-2022 Capital Expenditures (Excludes AFUDC)

Northern States Power Company - MN ($ Millions)	2016	2017	2018	2019	2020	2021	2022
ES - Except Major	$ 69.5	$ 82.5	$ 89.4	$ 42.7	$ 70.7	$ 102.8	$ 84.6
MN Jurisdiction	$ 51.3	$ 60.8	$ 66.0	$ 31.2	$ 51.6	$ 75.0	$ 61.8
ES - Major Renewable	$ 192.6	$ 10.0	$ 309.6	$ 668.2	$ 1,078.1	$ 262.6	$ 3.6
MN Jurisdiction	$ 141.5	$ 7.2	$ 225.3	$ 484.8	$ 782.2	$ 190.5	$ 2.6
ES - Major Thermal	$ 28.7	$ 33.3	$ 7.7	$ 0.01	$ 2.4	$ 2.5	$ 66.5
MN Jurisdiction	$ 21.2	$ 24.5	$ 5.7	$ 0.08	$ 1.7	$ 1.8	$ 48.5
Total	**$290.8**	**$125.8**	**$ 406.7**	**$ 710.9**	**$ 1,151.2**	**$ 367.9**	**$ 154.7**
Total MN Jurisdiction	**$ 214.0**	**$ 92.5**	**$ 297.0**	**$ 516.1**	**$ 835.5**	**$ 267.3**	**$ 112.9**

Q. WHAT DO THESE TABLES ILLUSTRATE REGARDING CAPITAL EXPENDITURES VERSUS CAPITAL ADDITIONS?

A. These tables above illustrate that our overall capital expenditures in existing plants typically remain within a range of $80 to $110 million (2017, 2018, 2021 and 2022) but for the years in which we make major capital investments – as with Courtenay Wind 2016, Blazing Star I 2019, Foxtail 2019, Lake Benton 2019, Crowned Ridge 2020, Blazing Star II 2020, Freeborn 2020, Mower 2020, Jeffers 2020, and Community Wind North 2020.

Q. WHAT KINDS OF CHANGES COULD OCCUR THAT MAY LEAD TO A RE-PRIORITIZATION OF YOUR INVESTMENTS AND CHANGE THE PERCENTAGES THAT YOU INVEST IN EACH CAPITAL BUDGET GROUPING?

A. As discussed by Company witness Mr. Gregory J. Robinson, we must manage our business unit to our capital budget. The most important budget management tool is good project planning. However, despite good planning, unexpected events can, and do, occur. For example, if there is an unexpected failure of a large component at an existing plant, we must address it when it occurs. When that happens, we determine whether we can re-prioritize or defer budgeted projects.

Q. WHY IS THE ABILITY TO CHANGE THESE INVESTMENT PERCENTAGES IMPORTANT TO THE COMPANY AND YOUR CUSTOMERS?

A. Since capital funds are finite, when the need to implement unbudgeted capital emerges, we fund these needs by reprioritizing comparably less urgent capital projects in a way that preserves safety and reliability. For example in 2019-2020, Reliability/Performance Enhancement projects were deferred to make room for Environmental Improvement required to comply with regulations. By doing this, we are generally able to stay within our annual capital budget and continue to safely and reliably operate our plants.

Similarly, to the extent additional analysis of our capital projects indicates that we should delay one project in lieu of another project of similar scope, timing and cost, we perform these like-kind project replacements to more efficiently deploy our capital budgets and ensure we are meeting our generation plants' needs.

Q. IS IT NECESSARY FOR ENERGY SUPPLY TO ADJUST ON A REGULAR BASIS THE CAPITAL PROJECTS PLANNED TO BE WORKED ON?

A. Yes, for the reasons noted above. As a further example, Reliability/ Performance Enhancement capital projects on the intermediate plant turbines and generators are dictated by the number of hours, or starts, the machine experiences. If market conditions change as regional generation assets change, the frequency and duration of operation for these plants will also differ from historical trends and future modeling. This may cause the acceleration of projects like combustion turbine Combustion Inspections (CI), Hot Gas Path (HGP), or Combustion Turbine (CT) major overhaul work and steam turbine major overhauls.

Q. SHOULD CUSTOMERS BE CONCERNED THAT SPECIFIC CAPITAL PROJECT PLANS EVOLVE?

A. No. It is in our customers' interests for Energy Supply to apply the funding available to the highest-priority projects based on risk and urgency. We make adjustments to our capital investment plan during the course of a year to better serve our business's most pressing needs in a cost-effective way. When the need arises to accelerate a project, we assess the situation to make sure we are doing so for the right reasons and in a prudent way. Similarly, we assess potential project delays or cancellations to make sure we are still meeting business and customer needs in a reasonable way.

Q. EVEN IF YOUR INVESTMENT GROUPING PERCENTAGES CHANGE FROM THE CURRENT FORECAST, WILL ENERGY SUPPLY STILL MANAGE ITS OVERALL CAPITAL INVESTMENTS TO ITS OVERALL BUDGET?

A. Yes. Ultimately, we will invest as necessary to meet our overall goals of safe, reliable and environmentally sustainable power generation for our customers.

Q. SO WHAT DO YOU CONCLUDE ABOUT ENERGY SUPPLY'S 2020–2022 CAPITAL INVESTMENT FORECASTS?

A. I conclude that our capital forecasts represent an accurate and reasonable picture of our investments over these years. Therefore, these forecasts can be relied on to set just and reasonable rates for our customers.

B. Capital Budget Development

1. Key Investment Needs

Q. WHAT ARE THE BASIC CATEGORIES OF THE CAPITAL BUDGET?

A. At the highest level, the capital budget can be described as consisting of base capital and major capital. Base capital projects are considered a part of the normal plant operation cycle necessary to preserve and maintain operation of our plants. Major capital projects are large, unique projects that have special regulatory requirements and are initiated in support of strategic corporate goals for addition of generation capacity or significant extension of the operational life of a generation asset in support of the Resource Plan.

As noted above, we divide the capital budget into the following capital budget groupings: 1) Renewable and New Generation, 2) Reliability/Performance Enhancement, and 3) Environmental Improvement. In my testimony, I discuss the capital budget from both the capital budget grouping perspective and the individual plant or generation resource perspective for 2020 through 2022.

Q. PLEASE DESCRIBE THE FIRST CAPITAL BUDGET GROUPING, RENEWABLE AND NEW GENERATION PROJECTS.

A. Various circumstances such as changing system requirements, policy goals, or the opportunity for customer savings may necessitate the construction of new generation units or the decommissioning of old generating units. In this case, the Company is forecasting material investment in renewable generation that will further carbon-reduction goals. Additionally, the decommissioning and removal of the coal-fired units at our Black Dog plant facilitated the construction of a combustion turbine at the plant with Black Dog Unit 6.

Q. PLEASE DESCRIBE THE SECOND CAPITAL BUDGET GROUPING, RELIABILITY/ PERFORMANCE ENHANCEMENT PROJECTS.

A. Our generating stations are large, complex machines that require regular maintenance to ensure that they are operating reliably and efficiently consistent with their design. Many of our capital additions take the form of routine investments that may involve replacing worn or obsolete parts of our generating units. We also routinely make safety repairs and improvements at our plants to maintain a safe working environment for our employees and satisfy new codes and regulations. We consider these types of capital additions the baseline of our capital spend, and they make up the majority of our base capital budget.

We also undertake Reliability/Performance Enhancement projects that are intended to improve the functioning of existing plants. An example of a

Reliability/Performance Enhancement project is air heater heat transfer surface section replacements at Sherco. As heat transfer surfaces "baskets" fail, heat transfer decreases and the unit heat rate subsequently suffers, which in turn increases the amount of fuel required to create the same electrical output. By replacing these basket sections, the Company enhances performance with more efficient equipment, ultimately providing more efficient production to meet our customers' needs.

Q. PLEASE DESCRIBE THE THIRD CAPITAL BUDGET GROUPING, ENVIRONMENTAL IMPROVEMENT PROJECTS.

A. Our plants may require new systems and components to continue to operate reliably and consistently with new regulatory requirements. This type of capital addition can include replacing degraded environmental components or the addition of new environmental technology such as mercury sorbent injection and other emissions controls. Such capital projects are generally larger than routine maintenance projects and are planned over a longer period.

2. Reasonableness of Overall Budget

Q. PLEASE MAKE THE BUSINESS CASE FOR THE ENERGY SUPPLY CAPITAL PROGRAM.

A. Energy Supply's capital program during the 2019 bridge year, 2020 test year, and 2021 and 2022 plan years is built around the implementation of Commission-approved projects and those projects pending Commission approval to propel us into our carbon-free future. The remainder of our capital program supports one of the most fundamental activities of an electric utility: the safe and reliable generation of electricity.

89.3 percent of our capital program from 2019-2022 is implementing 1,520 MW of wind projects. These resources benefit customers through reduced fuel costs and have already been approved by the Commission. The remaining investments are necessary because operating electric generation resources is a complex and capital- intensive process. Generation resources need continual oversight, maintenance, and improvement even when completely new. As resources age, the needs of the plant change, often shifting to investments in maintaining the plant. We also make investments necessary to remain compliant with all environmental and legal mandates.

We recognize that funds are not unlimited and that it is critical to provide our customers with cost-effective electricity. As I discuss below, we manage our capital investments accordingly by timing investments where possible to keep costs reasonably level over time. I will also discuss processes we have employed to ensure the costs of any given project are reasonable. While we cannot control the timing of investments in every circumstance, we maintain a disciplined capital planning and investment process to support the provision of reliable and safe energy at cost-effective prices.

Q. PLEASE DESCRIBE THE PROCESS THE COMPANY USES TO DETERMINE ITS CAPITAL INVESTMENT PLAN FOR ENERGY SUPPLY.

A. The appropriate annual capital budget for Energy Supply is based on the relationship between corporate management of overall finances and the business needs Energy Supply identifies in order to maintain our power plants and address new generation needs. Mr. Robinson explains how the Company establishes overall business area capital spending guidelines and budgets based on financing availability, specific needs of business areas, and overall needs of the Company.

Within Energy Supply, we use a rigorous planning process to determine which projects to undertake and when. Our long-term (15-year) investment plan is detailed in our Resource Plan. We maintain a more detailed project investment plan for our mid-term (5 year) investment cycle. There are also projects that we must undertake in any given year simply to keep the plants running.

Multiple factors drive our capital requirements, including the in-service dates of new generation, safety, customer demand, environmental regulations, and unit operational condition. Each year, our plants submit proposed capital projects for the next year based on the requirements, needs, and goals of each plant and planned new generating stations to propel us into our carbon-free future. The proposed projects are evaluated and ranked according to their financial and operational merits, such as costs, benefits, and impact on Unplanned Outage Rate. Evaluated projects include those that may be completed in a single year, as well as those that will require multiple years to execute and complete. The result of this review process is a ranked list of potential projects for a given year, which is evaluated against the available capital budget for that year, planned new generation, as well as the planned unit outage schedule for the next several years and known regulatory factors, such as new environmental regulations.

Q. WHAT HAPPENS IF THE NUMBER OR TYPE OF PROJECTS ENERGY SUPPLY BELIEVES ARE IMPORTANT OUTPACES THE AVAILABLE FUNDING?

A. Often the desired initial budget exceeds the spending guidelines, which then requires review meetings with Company leaders to assess the requested budget and determine a different course of action. Because this happens throughout the Company, a higher or lower percentage of the Company's overall resources may be allocated to Energy Supply in any given year, depending on the priority of needs of the Company. To determine the urgency of the need for projects not specifically required for compliance, we often rely on performance data, engineering studies, and equipment age to identify the equipment that presents the greatest risk of failure.

Ultimately, the needs of our generation plants and Company goals with respect to new future generation resources are balanced against the overall funding available to arrive at an appropriate budget for the Energy Supply business area.

Q. IS THE OVERALL LEVEL OF ENERGY SUPPLY CAPITAL ADDITIONS REASONABLE AND NECESSARY IN EACH YEAR OF THIS MULTI-YEAR RATE PLAN?

A. Yes. In each year, while Energy Supply might desire greater funding to meet all of our needs, the Energy Supply capital additions included in this case are reasonable and necessary to maintain the reliability and safety of our generation resources, to implement Commission orders, and to ensure compliance with environmental and other mandates. Overall, our capital additions support investments that are necessary to provide electricity to meet our customers' energy needs.

3. Ongoing Capital Cost Controls

Q. PLEASE EXPLAIN THE PROCESS YOU FOLLOW TO MANAGE PROJECT IMPLEMENTATION.

A. Capital budgets are finalized at least one year prior to their execution. Part of the project development process includes the identification of key schedule dates and budgetary milestones. Once a capital project has been approved for execution, it is assigned to a Project Manager (PM), typically three to six months in advance of the first planned activity required to commence the project. The PM is responsible for working with the plant to review and more fully develop the schedule and monthly cash flow requirements for the assigned project. The PM will typically contact vendors and contractors to gather cost and schedule data for the anticipated scope of the project, and begin engineering and purchasing activities. If the PM identifies specific information related to changes in cost or the schedule, he or she advises management and recommends options for consideration. Management then responds as appropriate.

Q. PLEASE EXPLAIN THE PROCESS YOU FOLLOW TO MANAGE PROJECT PROCUREMENT COSTS.

A. Part of the responsibilities of the PMs is to work with our Supply Chain function to procure the goods and services we require to meet Energy Supply's mission through competitive supply contracts. Our policies require that all purchases of goods or services greater than $50,000 must be competitively bid. There is an allowance on rare occasions for sole source procurement, but justification for such actions is limited, and we require approval of such sole source contracts at the Director level. The use of competitively-bid Master Services Agreements (MSAs) and other competitively-bid contracts helps to ensure that we receive the best value from our suppliers, which benefits our customers.

Q. WHAT DOES ENERGY SUPPLY DO TO ADAPT TO CHANGING CONDITIONS?

A. As described earlier, when the need to implement unbudgeted projects arises, we try to find ways to fund these needs by deferring comparable but less urgent capital projects. If there are instances where we have an unexpected need to undertake a large project that we cannot offset but which would benefit our customers, a capital budget target adjustment may be requested and reviewed by our Financial Counsel and Board of Directors prior to approval to move forward.

In short, with rare exceptions that must be managed within overall Company limitations, Energy Supply is required to manage to our allotted budget in each year, and we do.

4. Major Capital Projects

Q. WHAT IS THE PURPOSE OF THIS SECTION OF YOUR TESTIMONY?

A. This section of my testimony discusses the major planned investments Energy Supply anticipates in 2020 through 2022.

Q. HOW DID ENERGY SUPPLY IDENTIFY THE PROJECTS THAT FALL WITHIN THIS CATEGORY OF INVESTMENTS?

A. In general, we consider a project to be major if it is a unique project that will require a greater than normal quantity of Energy Supply resources to complete. Most often, major capital projects for Energy Supply involve investments in new generation assets. These could be replacements at existing sites where older equipment is being retired, new equipment is replacing the capacity/energy, or new build sites for capacity/energy additions.

Q. WHAT MAJOR CAPITAL PROJECTS DOES ENERGY SUPPLY ANTICIPATE COMPLETING OVER THE PERIOD OF THIS MULTI-YEAR RATE PLAN?

A. We anticipate undertaking eight major capital projects. Seven of the projects occur in 2020 and 2021, and each of those projects has already been approved, or is pending approval, by the Commission. Specifically, in 2020, we plan to in-service Crowned Ridge, Blazing Star II, Freeborn, Mower, Jeffers, and Community Wind North. In 2021, we plan to in-service the Dakota Range wind farm. In 2022, we plan to in-service an energy storage battery at one of our wind farms We discuss each major capital addition in greater detail below.

C. 2020 Capital Additions

Q. PLEASE DESCRIBE THE CAPITAL ADDITIONS THE COMPANY IS PROPOSING TO MAKE IN 2020?

A. We project capital plant additions of approximately $1.33 ($0.94) billion for 2020. The majority of the 2020 capital additions relate to completion of the Crowned Ridge, Blazing Star II, Freeborn, Mower, Jeffers, and Community Wind North major capital projects, approximately $1.27 ($0.92) billion including AFUDC. These wind investments, the largest of which have already been approved by the Commission, are a central piece of our continued movement toward a carbon-free future. Other significant capital plant additions include:

- Combustion Turbine Major overhaul on High Bridge Unit 7,
- Combustion Turbine Major overhaul on Riverside Unit 9,
- Bottom Ash Pond 2 at Sherco,
- Combustion Turbine Compressor upgrade on Riverside Unit 9.

Further, we are seeking to make approximately $20.0 ($14.6) million in capital additions related to smaller projects (under approximately $1 million) at our various other plants. Exhibit___(RAC-1), Schedule 3 provides a list of all capital projects that we are seeking to include in rate base for 2020, their capital addition costs, and their in-service dates. Exhibit___(RAC-1), Schedule 4 provides a description of each project and information regarding why each project is needed. I discuss all of our major capital projects and most of our larger capital projects (generally defined as requiring more than $1 million of plant-in-service) in further detail below. I discuss these investments for each year by plant type starting with our coal units, then our combined cycle units, then our peaking units.

1. Baseload Plants

Q. ARE THERE ANY CAPITAL PROJECTS PLANNED FOR THE SHERCO PLANT IN 2020?

A. Yes. We are planning approximately $24.5 ($17.9) million in plant additions in 2020 for projects at Sherco Units 1, 2 and 3 to coincide with the planned overhaul at Unit 3 in 2020. These projects primarily relate to maintaining the reliability, efficiency and environmental compliance of these units. Included in Schedules 3 and 4 is a description of each individual project, its costs, in-service date, and the need for the project. The schedules also identify and describe each of the capital additions at Sherco that we plan to include in rate base for the 2020 test year.

Q. PLEASE DISCUSS THE SIGNIFICANT 2020 CAPITAL PROJECTS AT SHERCO.

A. We are planning four significant capital project additions at our Sherco plant for 2020:

- Bottom Ash Pond 2,
- 37-1&2 high pressure feedwater heaters Unit 3,
- Unit protection PLC Unit 3,
- 31&32 air heater heat transfer surfaces.

We have budgeted $6.2 ($4.5) million to replace the Sherco Bottom Ash Pond 1 with Bottom Ash Pond 2. This Environmental Improvement project is required by the Environmental Protection Agency (EPA) Coal Combustion Residuals (CCR) rules. Clay-lined ponds no longer meet the requirements of the CCR rules. This project replaces Pond 1, which has a clay liner, with a new pond which will have a Geosynthetic Clay Liner (GCL)/High Density Polyethylene (HDPE). The project is scheduled to be completed before October 31, 2020, the date by which we must cease use of Pond 1.

We have also budgeted $2.2 ($1.6) million in 2020 capital additions to replace 37-1&2 high pressure feedwater heaters on Sherco Unit 3. The high- pressure feedwater heaters use extraction steam to pre-heat water prior to being transferred to the boiler. The heaters are original equipment from 1987, and tube failures have been increasing in frequency. When a tube leak occurs, the unit must be taken offline for a forced outage to complete repairs, so we expect this capital project to reduce the time and cost associated with those ongoing repairs.

We have also budgeted $2.0 ($1.5) million in 2020 capital additions to replace the unit protection Programmable Logic Controller (PLC) on Sherco Unit 3. This project will replace the existing Unit Protection 31 and 32 PLCs and their associated Inputs and Outputs (IO). The U3 Unit Protection PLC system uses two large fully redundant processors with distributed IO to protect the U3 boiler, turbine and generator. The present ladder diagram based logic operates on obsolete mid 1980s Square D Symax PLCs. The purpose of this project is to replace the obsolete Square D PLC hardware with new PLC equipment. This project will modernize existing hardware while allowing it to still interface with the old design of the plant.

We have also budgeted $1.5 ($1.1) million in 2020 capital additions to replace 31&32 secondary air heater heat transfer surfaces on Sherco Unit 3. This project is to replace all three layers of air heater transfer surface "baskets" in both Unit 3 secondary air heaters as well as the cold end grating. The basket layers include the hot end layer, intermediate layer and the cold end layer. To replace the baskets, the circumferential seals must first be removed in order to remove the baskets. During this operation, inspections will be made on the radial seals, circumferential seals or bypass seals, and the rotor post seals. If it is determined at that time to replace the seals, they will be procured and replaced. Heating-element baskets are replaced when the degradation and wear from years of use starts to impact the efficiency of heat transfer. When that degradation occurs, we start to see pressure drop through the system, because the hot end basket material is breaking apart and migrating down to the other layers. If these baskets are not replaced, the material breaking off will lay on the layers below and create a domino effect of breaking off. Failure to make this capital addition could result in additional plant outages.

Q. WHY IS THE COMPANY PROCEEDING WITH THESE PROJECTS WHILE THE FUTURE OPERATION OF SHERCO UNITS 2, 1 AND 3 IS LIMITED DUE TO THEIR RESPECTIVE RETIREMENT DATES OF 2023, 2026 AND 2030?

A. These investments are needed to preserve the reliable operation of these units in the near term, and to help ensure safe, reliable and environmentally-compliant operations for our customers today. Thus, it is important that these units are well-maintained until such time as they are removed from service. That said, we are managing spending in recognition of the retirement dates. For instance, Sherco Unit 2, which is scheduled to retire at the end of 2023, has only $3.0 ($2.2) million of capital additions over the remaining investment years of 2020-22. This represents a material reduction in the capital spend that is usually necessary to keep a coal unit in good working order.

2. Intermediate Plants

Q. IS THE COMPANY MAKING ANY CAPITAL ADDITIONS AT ITS INTERMEDIATE FACILITIES IN 2020?

A. Yes. We are planning plant additions of approximately $23.1 ($16.9) million at our intermediate facilities in 2020. These projects are mainly related to maintaining reliability and environmental performance. These project additions are scheduled during the overhauls on High Bridge Unit 7 and Riverside Unit 9. Schedules 3 and 4 provide additional information on these capital additions.

Q. PLEASE DISCUSS THE SIGNIFICANT CAPITAL PROJECT AT THE HIGH BRIDGE PLANT.

A. We have budgeted $10.2 ($7.4) million in 2020 capital additions to complete a major Combustion Turbine (CT) overhaul on High Bridge Unit 7. A major overhaul occurs when a Hot Gas Path (HGP) inspection and repairs coincide with the need for a Combustion Inspection (CI) and also includes a compressor inspection, rotor inspection and inspection of the auxiliaries. CT major overhauls are performed at intervals of starts (*i.e.*, how many start/ stop cycles the turbine has engaged) or hours of operation defined by the Original Equipment Manufacturer (OEM). During a major overhaul, all combustion parts are replaced, all turbine blades and vanes are replaced. The rotor is also pulled out of the CT, disassembled and restacked. Significant inspections are also completed at this time to assess the health of the asset and look for signs of long-term issues initiating.

I note that delaying this major inspection beyond the OEM-recommended maintenance interval would involve material risk. As these components age, they may undergo thermal mechanical fatigue, cracking, abnormal wear, foreign object damage, cooling hole damage or plugging, or other issues inherent with the high temperature operating conditions they experience. These issues could result in unit trips, extended forced outages, and possibly major equipment damage. Consequently, to keep High Bridge in good working order we are undertaking the OEM-recommended work on the OEM's recommended schedule. Our budgeted amounts are based on the Master Services Agreement we have in place for all HGP and CI projects, which cover our material supply and construction services for these types of projects.

Q. PLEASE DISCUSS THE SIGNIFICANT CAPITAL PROJECTS AT THE RIVERSIDE PLANT.

A. We are planning two significant capital project additions at our Riverside plant for 2020:

- Major CT overhaul on Riverside Unit 9, and
- CT compressor overhaul on Riverside Unit 9.

We have budgeted $6.4 ($4.7) million in 2020 capital additions to perform the Riverside Unit 9 major CT overhaul. This CT overhaul is similar to the one we are performing at High Bridge that I discussed above.

We have also budgeted $2.6 ($1.9) million in 2020 capital additions to replace parts of the Riverside Unit 9 CT compressor. Five rows of rotating vanes (S-0 through S-4) and the fixed exhaust guide vanes will be replaced as part of our parts exchange Master Material Agreement (MMA) with PSM. These parts have neared the end of their useful life and need to be replaced. The work will be completed at the same time as the Unit 9 major CT overhaul to minimize costs.

3. Peaking and Refuse Derived Fuel Plants

Q. IS THE COMPANY PLANNING ON ANY CAPITAL ADDITIONS TO ITS PEAKING AND REFUSE DERIVED FUEL PLANTS IN 2020?

A. Yes. We are planning $1.9 ($1.4) million in 2020 plant additions at our peaking and refuse derived fuel plants. Schedules 3 and 4 provide details on these projects.

4. Renewable Facilities

Q. IS THE COMPANY PLACING ANY NEW PLANTS INTO SERVICE IN 2020?

A. Yes. We will be placing six wind farm projects in service in 2020. Costs associated with these projects are currently included in the Renewable Energy Standard (RES) Rider. We are forecasting costs at completion of approximately $1.27 billion.

We have budgeted $329.8 ($239.2) million in 2020 capital additions for the completion of the Crowned Ridge wind farm. This is a 200 MW wind farm being constructed near Watertown, SD. The wind farm will consist of 73 GE 2.3-116 90HH and 15 GE 2.1 -116 80HH wind turbine generators, a collection system, operations and maintenance building, access roads, collector substation, and a transmission interconnection line. The Commission approved this project in Docket No. E002/M-16-777.

We have budgeted $336.3 ($244.0) million in 2020 capital additions for the completion of Blazing Star II wind farm. This is a 200 MW wind farm being constructed in Lincoln County, MN. The wind farm includes 100 V110 and V116 Vestas Turbines at 2.0 MWs each, a collector system, operations and maintenance building, access roads, collector substation, and approximately 10 miles of transmission line. The Commission approved this project in Docket No. E002/M-16-777.

We have budgeted $298.6 ($216.6) million in 2020 capital additions for the completion of the Freeborn wind farm. This is a 150-200 MW wind farm being constructed in Freeborn County, MN. The wind farm includes 75- 100 V110 and V116 Vestas Turbines at 2.0 MWs each, a collector system, operations and maintenance building, access roads, collector substation, and transmission line. The Commission approved this project in Docket No. E002/M-16-777.

We have budgeted $168.2 ($122.0) million in 2020 capital additions for the completion of the Mower wind farm. This is a repower project located near Grand Meadows, MN. The project consists of replacing blades, hubs and drive trains on 43 existing Siemens 2.3MW wind turbines. Our proposal to acquire the facility, or alternatively to amend our purchased power agreement with the owner, is currently before the Commission in Docket No. E002/PA-19-553.

We have budgeted $71.9 ($52.2) million in 2020 capital additions for the completion of the Jeffers wind farm. This is a 44 MW wind farm being repowered in Cottonwood County, MN. The project will install 20 Vestas Turbines (V110 2.2) at 2.2 MWs each. These will replace the existing Clipper wind turbines. Our proposal to acquire the facility, or alternatively to amend our purchased power agreement with the owner, is currently before the Commission in Docket No. E002/PA-18-777.

We have budgeted $66.2 ($48.0) million in 2020 capital additions for the completion of the Community Wind North wind farm. This is a 26.4 MW wind farm being repowered in Buffalo Ridge, MN. The installation includes 12 Vestas Turbines (V110 2.2) at 2.2 MWs each. These will replace the Clipper wind turbines. Our proposal to acquire the facilities, or alternatively to amend our purchased power agreements with the owner, is currently before the Commission in Docket No. E002/PA-18-777.

Q. ARE THERE ANY CAPITAL PROJECTS PLANNED FOR THE COMPANY'S EXISTING WIND FARMS IN 2020?

A. Yes. We are forecasting approximately $4.1 ($3.0) million in plant additions in 2020 for our existing wind facilities that consist mainly of gearbox, generator and transformer replacement projects. Schedules 3 and 4 provide additional information.

Q. PLEASE DISCUSS THESE GEARBOX, GENERATOR AND TRANSFORMER REPLACEMENT PROJECTS.

A. Gearbox, generator and transformer failures have been occurring throughout the wind industry, and we consequently have a need to replace this equipment as failures occur. This can be seen in our projected additions at Grand Meadows, Nobles, Pleasant Valley, Border Winds and Courtenay--our older wind facilities that are no longer under warranty.

We have installed vibration-monitoring equipment to help detect potential gearbox failures and limit the amount of damage, thereby increasing the core exchange value of the gearbox or in some cases allowing us to complete repairs as an O&M expense.

Q. PLEASE DISCUSS THE SIGNIFICANT CAPITAL PROJECT AT THE NOBLES WIND FARM.

A. We have budgeted $1.1 ($0.81) million in 2020 capital additions to perform gearbox replacements.

D. 2021 Capital Additions

Q. WHAT CAPITAL PLANT ADDITIONS IS THE COMPANY PROPOSING TO PLACE IN SERVICE IN 2021?

A. For 2021, we are requesting to include in rates the costs associated with approximately $493.7 ($358.7) million of plant additions. The majority of the 2021 capital additions are related to completion of the Dakota Range wind farm major capital project, approximately $380.9 ($276.3) million including AFUDC. Other significant capital plant additions include:

- Auxiliary boiler replacements at Sherco;
- Boiler superheater outlet pendant replacements at Allen S. King; and
- Combustion Turbine Major overhaul on Riverside Unit 10.

Further, we are seeking to make approximately $36.6 ($26.7) million in capital additions related to smaller projects (under approximately $1 million) at our various other plants. Schedule 3 provides a list of all capital projects that we are seeking to include in rate base for 2021, their capital addition costs, and their estimated in-service dates. Schedule 4 provides a project description and information regarding why the project is needed. I discuss all of our major capital projects and most of our larger capital projects (above approximately $1 million) in further detail below in my discussion regarding each generating plant.

1. Baseload Plants

Q. ARE ANY CAPITAL PROJECTS PLANNED FOR THE SHERCO PLANT IN 2021?

A. Yes. We are planning approximately $31.5 ($23.0) million in plant additions in 2021 for projects at Sherco Units 1, 2 and 3. In 2021, there is a scheduled overhaul for Sherco Unit 1 consistent with its regular three-year overhaul schedule. These projects primarily relate to maintaining environmental compliance, reliability and efficiency of these units. Included in Schedules 3 and 4 is a description of each individual project, its costs, in-service date, and the need for the project. The schedules also identify and describe each of the capital additions at Sherco that we plan to include in rate base for the 2021 test year.

Q. PLEASE DISCUSS THE SIGNIFICANT 2021 CAPITAL PROJECTS AT SHERCO.

A. We are planning four significant capital projects for Sherco in 2021. These include:

- Auxiliary boiler replacements;
- Landfill cell 4 on Unit 3;
- Stormwater management pond; and
- 11&12 air heater heat transfer surfaces on Sherco Unit 1.

We have budgeted $11.3 ($8.3) million in 2021 capital additions to replace the two auxiliary boilers at the Sherco plant. This project is to install new Auxiliary Boilers (ABs) to provide a reliable source of steam supply for unit cold startup for the existing power plant and building heating. The existing ABs are in poor condition. #1 AB was removed from service and permanently decommissioned a number of years ago due to control issues and tube leaks. The boiler Authorized Inspector (AI) has removed this AB from operation. The #2 AB is serviceable and runs for a few hours each year to help ensure it will operate if needed; however, it has been unreliable and requires extensive efforts each time to start. #2 AB is over 40 years old and parts are not readily available to fix the unit. #2 AB is not sized adequately to start Unit 3. The original #1&2 AB's were built with Units 1 and 2 and sized accordingly.

Consequently, we must replace the AB's with larger capacity boilers to ensure reliable operation of Sherco Units 1 and 3 through the end of their useful lives in 2026 and 2030.

A reliable source of steam for startup and building heating becomes increasingly important in the future, since there will be times where no coal unit will be operating to supply heat or startup steam to any other unit. Steam supply from the new AB's will decrease our dependence on Units 1 and 2 for blackstart requirements in preparation of the retirement of these units. This provides more flexibility related to any economic outages or for seasonal operation in the event that Units 1 and 2 are economically dispatched by MISO (instead of their current must-run status).

We have also budgeted $3.4 ($2.5) million in 2021 capital additions to build ash landfill cell 4 for Sherco Unit 3. This project is to construct a 24-acre, GCL/HDPE composite lined, cell located South of Cell 3. The project includes an additional sump pump station, extension of fence and permitting (renewal for cell 4 and inclusion of cell 5). The new cell is necessary for the continued disposal of Air Quality Control System (AQCS) ash from Sherco Unit 3. Without this additional cell, we would need to find an offsite location to dispose of ash generated from operations and pay to have it shipped to and disposed of at that location, which is a more expensive and less optimal solution.

We have also budgeted $3.3 ($2.4) million in 2021 capital additions to build a stormwater management pond for the Sherco plant. This project is to install systems to collect and divert storm water away from the Recycle Basin and

Scrubber Pond. Reducing water flow into the Recycle Basin will reduce the volume of water transferred to the Scrubber Solids Pond. Water that has contacted ash can never be removed from the station site per EPA Effluent Limitation Guideline (ELG) rules. Any remaining ash contact water would need to be evaporated to close the scrubber solids ponds shortly after the final coal unit retires. This project will reduce the amount and cost of water treatment that will be needed at end-of-life of Sherco Units 1, 2 and 3.

We have also budgeted $2.3 ($1.7) million in 2021 capital additions to replace Sherco Unit 1 11&12 air heater heat transfer surfaces. This project is very similar to the 31&32 secondary air heater heat transfer surfaces on Sherco Unit 3 discussed as part of the 2020 additions.

Q. ARE THERE ANY CAPITAL PROJECTS PLANNED FOR THE ALLEN S. KING PLANT IN 2021?

A. Yes. We are planning total capital plant additions of approximately $19.9 ($14.6) in 2021. In 2021 there is a scheduled overhaul for the Allen S. King plant consistent with its regular three-year overhaul schedule. These projects primarily relate to maintaining environmental compliance, reliability and efficiency of these units. Schedules 3 and 4 identify all of our capital plant additions at the Allen S. King plant.

Q. PLEASE DISCUSS THE SIGNIFICANT 2021 CAPITAL PROJECTS AT THE ALLEN S. KING PLANT.

A. We are planning seven significant capital projects for the Allen S. King plant in 2021. These include:

- Boiler superheater outlet pendant replacements;

- Boiler cyclone burner refractory replacements;
- Selective Catalytic Reduction (SCR) catalyst layer replacement;
- Distributed Control System (DCS) upgrade;
- 11 Reserve State Auxiliary (RSA) transformer replacement;
- 480V plant switchgear bus 3&4 replacement; and
- Generator stator rewedge.

We have budgeted $9.3 ($6.8) million in 2021 capital additions to replace the boiler secondary superheater outlet pendants. This project is to replace the Secondary Superheater outlet section (SSH) of the boiler. There are 70 outlet (rear) pendant sections across the width of the furnace. This section of the boiler is at end-of-life due to the confluence of three primary failure mechanisms: Outer Diameter (OD) wall loss from erosion/corrosion, Inner Diameter (ID) oxide growth and creep damage (long-term overheating). This section of the boiler is original equipment installed in 1968 and has impressively served our customers for over 50 years. Inspections have verified that the metallurgy of the tubes has been compromised and multiple tube leaks have occurred in the section the last several years with increasing frequency. Making this addition will help to reduce plant outages.

We have budgeted $2.5 ($1.8) million in 2021 capital additions to replace the cyclone burner refractory. This project will replace the cyclone refractory in all 12 cyclones due to loss of refractory from erosion in an abrasive environment. The project scope includes the replacement of the entire refractory inside the cyclones and the re-entrant throat. The approximate square footage of this work is 6,524 square feet. The stud density is 351 studs per square foot, so we must now install approximately 2,300,000 studs to act as anchors to hold the refractory in place. The cyclones are key components of the plant, and this project will help ensure they continue to operate efficiently and effectively, thereby helping to reduce plant outages.

We have budgeted $2.4 ($1.8) million in 2021 capital additions to replace one row of the Allen S. King Unit 1 Selective Catalytic Reduction (SCR) catalyst. Specifically, we plan to replace the middle layer (143 modules) of the SCR with a new catalyst during the 2017 spring outage. Each catalyst module has dimensions of 64" x 75" x 38" and weighs 2,900 pounds each. The scope of the project includes the procurement and installation of new catalyst, removal and proper disposal of the existing catalyst, and ammonia injection tuning after installation. The expected life of the catalyst is six years for any particular layer. Our catalyst management plan requires replacement of one of the three layers every other year and has been completed several times at this plant. This particular layer was first installed in April 2014.

Three layers are required to be in operation to maintain emissions within permit limits. If a layer is allowed to fall under desired chemical activity levels, the unit must derate. By undertaking this project, we can continue to operate the Allen S. King plant at full capacity while maintaining compliance requirements. Failure to do so would require us to derate the unit so that emissions fall within required tolerances.

We have budgeted $1.8 ($1.3) million in 2021 capital additions to upgrade the Distributed Control System (DCS) that is used to operate the plant equipment. This scope will provide new hardware and software to support plant DCS. The Allen S. King DCS is an Emerson Ovation product, and this project is part of our Ovation Evergreen Master Service Agreement (MSA). The goal of this MSA is to allow us to continue to keep pace with advancements in technology by replacing obsoleting technology. This customer support module provides a way to keep our Ovation system continuously up to date. The Evergreen program allows us to avoid a costly total system retrofit required when the components are too old to be salvaged. The Ovation Evergreen program plans for replacing the affected items, including networks, workstations, controllers and system software with the latest releases, and incorporating new IO and security features.

We have budgeted $1.5 ($1.1) million in 2021 capital additions to replace the 11 RSA transformer. 11 RSA is near end-of-life. The RSA transformer is used to bring power into the plant when it is not able to provide its own auxiliary load to power large fans and pumps. 11 RSA is 1975 vintage transformer that was purchased used and installed at the Allen S. King plant in 1984. The rating of the transformer is unique in our fleet, 16 MVA (115kV/6.9kV), and there are no spares if there is a failure. Without 11 RSA, we cannot start up the unit for operation, and cannot safely shut down the unit.

We have budgeted $1.1 ($0.84) million in 2021 capital additions to replace the 480V plant switchgear bus 3&4. The switchgears are 1968 vintage and at the end of their useful life. The replacement includes replacing the disconnects, dry transformers (not oil filled), main breakers, tie breaker and feeder breakers, along with protective relaying. Due to the age of the switchgear and lack of replacement and spare parts, there are challenges to keeping the switchgear operational, which has resulted in breakers not opening as needed.

We have budgeted $1.1 ($0.85) million in 2021 capital additions to replace wedges in the generator stator. Wedge tightness testing performed in 2014 showed that 50 percent of the wedges are loose and we can no longer defer this work. Loose wedging can case the stator bars to move in the slot, which can lead to groundwall insulation damage and an eventual fault. Reliable operation requires that this work be done now, since the last wedge work was performed in 1984.

Q. WHY IS THE COMPANY PROCEEDING WITH THESE PROJECTS WHILE THE FUTURE OPERATION OF ALLEN S. KING UNIT 1 IS POTENTIALLY LIMITED DUE TO THE COMPANY'S PROPOSED RETIREMENT DATE OF 2028?

A. These investments are needed to preserve the reliable operation of the unit in the near term, and ensure safe and environmentally compliant operations for our Customers. Thus, it is important that these units are well maintained until such time as they are removed from service.

2. *Intermediate Plants*

Q. IS THE COMPANY MAKING ANY CAPITAL ADDITIONS AT ITS INTERMEDIATE FACILITIES IN 2021?

A. Yes. We are planning plant additions of approximately $31.6 ($23.0) million at our Intermediate plants. These projects are mainly related to maintaining reliability and environmental performance. These projects additions are scheduled during the overhaul at Riverside. Schedules 3 and 4 provide additional information on these capital additions.

Q. PLEASE DISCUSS THE SIGNIFICANT CAPITAL PROJECTS AT THE RIVERSIDE PLANT.

A. We are planning seven significant capital project additions at our Riverside plant for 2021:

- Major CT overhaul on Unit 10;
- Generator Step-Up (GSU) transformer on Unit 7;
- CT compressor overhaul on Unit 10;
- Steam turbine L-1 blades on Unit 7;
- Plant DCS upgrade;
- CT controls upgrade Unit 9; and
- CT controls upgrade Unit 10.

We have budgeted $6.7 ($4.9) million in 2021 capital additions to perform the Riverside Unit 10 major CT overhaul. This work is being performed per the OEM-recommended overhaul schedule based on equivalent operating hours. During a major overhaul, all combustion parts are replaced, all turbine blades and vanes are replaced. The rotor is also pulled out of the CT, disassembled and restacked. Significant inspections are also completed at this time to assess the health of the asset and look for signs of long-term issues initiating. These overhauls are necessary to perform as recommended to help ensure continued safe and reliable operation of the CT.

We have also budgeted $2.7 ($2.0) million in 2021 capital additions to replace the Unit 7 GSU transformer and 115kV disconnect. This equipment was originally installed in 1985 and is nearing the end of its useful life. The life expectancy of this type of equipment is typically 30-40 years, and this unit has shown issues with dissolved gas analysis transformer oil inspections. The 115kV disconnect should be replaced at the same time due to contact corrosion.

We have also budgeted $2.8 ($2.0) million in 2021 capital additions to replace parts of the Riverside Unit 10 CT compressor to improve reliability while the unit is in overhaul. Five rows of rotating vanes (S-0 through S-4) and the fixed exhaust guide vanes will be replaced as part of our parts exchange Master Material Agreement (MMA) with PSM. The work will be completed at the same time as the Unit 10 major CT overhaul to minimize costs.

We have budgeted $2.5 ($1.8) million in 2021 capital additions to replace the Unit 7 steam turbine L-1 blades. This project is to replace the L-1 blading on both ends of the Unit 7 steam turbine Low Pressure (LP) rotor. The L-1 blading is original to the unit and reached the end of its design life of 30 years in 2017. There is also a service bulletin from the OEM, Siemens, related to a known defect with the existing blading design that has caused failures on other units during operation. The service bulletin recommends replacing the existing blading with redesigned blading to reduce operational risk and improve reliability. In addition to the erosion damage that occurs on the leading edge of the blading, the blading material has a finite life and normal operating conditions slowly degrade the material over time. This degradation makes the blading more susceptible to cracking, which has the potential to lead to a catastrophic turbine failure. The blading should be replaced to minimize operational risk to the unit and plant personnel.

We have budgeted $1.7 ($1.2) million in 2021 capital additions to upgrade the DCS that is used to operate the plant equipment. This project is part of our Emerson Ovation Evergreen program. This is similar to the project in 2021 at Allen S. King, and all of our plants with Emerson Ovation are part of the Evergreen program as part of our efforts to standardize or reduction of costs and risks.

We have budgeted $1.5 ($1.1) million in 2021 capital additions to upgrade the Unit 9 CT control system by replacing the hardware and software. This current version of the Mark VI controls is operating on the Windows XP operating system, for which Microsoft is no longer issuing licenses. Without a timely upgrade, with the present hardware capable of running the now outdated Windows XP, the higher the risk of failure and potential long-term outage becomes. The CT control system hardware needs to be refreshed periodically to help ensure the system does not fall behind the obsolescence curve as it has now done. The existing system was installed in 2009. Project scope includes updating servers, Human Machine Interfaces (HMI's), switches, obsolete control cards as well as converting software to Emerson Ovation. This will facilitate and simplify control of the units by having the integrated Balance Of Plant (BOP) and CT controls.

We have budgeted $1.5 ($1.1) million in 2021 capital additions to upgrade the Unit 10 CT control system. This project is the same scope as the previous project for Unit 9

3. Peaking and Refuse Derived Fuel Plants

Q. IS THE COMPANY PLANNING ANY CAPITAL ADDITIONS TO ITS PEAKING AND REFUSE DERIVED FUEL PLANTS IN 2021?

A. Yes. We are planning $17.4 ($12.7) million in 2021 plant additions at our peaking and refuse derived fuel plants. These projects are mainly related to maintaining reliability and environmental performance. These project additions are scheduled during the overhauls on Red Wing and Blue Lake overhauls. Schedules 3 and 4 provide details on these projects.

Q. PLEASE DISCUSS THE SIGNIFICANT CAPITAL PROJECTS AT THE RED WING PLANT.

A. We are planning two significant capital project additions at our Red Wing plant for 2021:

- Ash landfill cell 5; and
- Generator rewind on Unit 1.

We have budgeted $2.0 ($1.5) million in 2021 capital additions to construct ash landfill cell 5. This project is for the construction of the South central cell which will provide Refuse Derived Fuel (RDF) ash disposal capacity thru 2035.

We have budgeted $1.9 ($1.4) million in 2021 capital additions to rewind the Unit 1 generator. This project will replace the original 1948 General Electric generator stator windings. Activities associated with this project will include winding removal; stator frame and core cleaning and inspection; inspect, clean, and tighten associated clamping hardware; new winding installation; and applicable testing. The 2007 Turbine Generator Major Overhaul Inspection and 2010 Life Extension Study both recommend a generator rewind based on age and condition of the generator. The current stator winding is 65 years old while median life expectancy is 40 years. The reports indicate a generator rewind is required for operation through 2027.

Q. PLEASE DISCUSS THE SIGNIFICANT CAPITAL PROJECTS AT THE BLUE LAKE PLANT.

A. We are planning three significant capital project additions at our Blue Lake plant for 2021:

- CT control system on Unit 7;
- CT control system on Unit 8; and
- Exhaust silencer on Unit 1.

We have budgeted $1.7 ($1.2) million in 2021 capital additions to replace the Unit 7 CT control system. This project is to replace the current Speedtronic Mark V CT control system hardware and software. GE Drives and Controls, Inc. ceased normal production of the Speedtronic Mark V turbine control system on March 31, 2004. As with many products, and particularly with electronics, the Mark V has exceeded its supportable life as parts and components become unavailable and technology resources become scarce. This makes it increasingly difficult to guarantee timely availability/reparability of parts for an extended period of time. Undertaking this project now will provide us with the ability to more reliably control the CT into the future.

We have budgeted $1.7 ($1.2) million in 2021 capital additions to replace the Unit 8 CT control system. This project is the same scope as the previous project for Unit 7.

We have budgeted $1.5 ($1.1) million in 2021 capital additions to replace the Unit 8 exhaust silencer on the exhaust stack which is made up of internal baffles or panels. The stainless steel panels are melting and breaking up consistent with normal wear and tear. The internal stack panels are used to reduce the exhaust decibels coming out the stack of the CT. Keeping noise levels down is a necessary condition of our operating permits and consequently we must perform this project to remain in compliance.

4. *Renewable Facilities*

Q. IS THE COMPANY PLACING ANY NEW PLANTS INTO SERVICE IN 2021?

A. Yes. We will be placing one wind farm project in service in 2021. We have budgeted $380.9 ($276.3) million in 2021 capital additions for the completion of the Dakota Range wind farm. This project is to construct a 300 MW wind farm in Grant and Codington Counties, South Dakota. The wind farm includes 72 V136 Vestas Turbines rated at 4.2 MWs each, a collector system, O&M building, access roads, and collector substation.

Q. ARE THERE ANY CAPITAL PROJECTS PLANNED FOR THE COMPANY'S OTHER WIND FARMS IN 2021?

A. Yes. We are forecasting approximately $9.6 ($7.0) million in 2021 plant additions for our existing wind facilities that consist mainly of gearbox replacement and environmental performance projects. Schedules 3 and 4 provide additional information.

Q. PLEASE DISCUSS THE SIGNIFICANT CAPITAL PROJECTS AT THE WIND FARMS.

A. We are planning three significant capital project additions at our wind farms for 2021:

- Gearbox replacements at Nobles;
- Gearbox replacements at Grand Meadows; and
- Gearbox replacements at Courtenay.

We have budgeted $1.6 ($1.1) million in 2021 capital additions to replace gearboxes at Nobles. I have previously discussed the need for gearbox replacements at wind farms in the 2020 additions section.

We have budgeted $1.0 ($0.76) million in 2021 capital additions to replace gearboxes at Grand Meadows. I have previously discussed the need for gearbox replacements at wind farms in the 2020 additions section.

We have budgeted $1.0 ($0.76) million in 2021 capital additions to replace gearboxes at Courtenay. I have previously discussed the need for gearbox replacements at wind farms in the 2020 additions section.

E. 2022 Capital Additions

Q. WHAT CAPITAL PLANT ADDITIONS IS THE COMPANY PROPOSING TO PLACE IN SERVICE IN 2022?

A. For 2022, we are requesting to place in rates the costs associated with approximately $92.5 ($67.4) million of plant additions. Significant capital plant additions include:

- Wind integration battery;

- Hot Gas Path (HGP) Black Dog Unit 5;
- Hot Gas Path (HGP) Angus Anson Unit 5; and
- Baghouse fabric filter bags Sherco Unit 3.

Further, we are seeking to make approximately $36.7 ($26.8) million in 2022 capital additions related to smaller projects (under approximately $1 million) at our various other plants. Schedule 3 provides a list of all capital projects that we are seeking to include in rate base for 2022, their capital addition costs, and their estimated in-service dates. Schedule 4 provides a project description and information regarding why the project is needed. I discuss all of our major capital projects and most of our larger capital projects (above approximately $1 million) in further detail below in my discussion regarding each generating plant.

1. Baseload Plants

Q. ARE ANY CAPITAL PROJECTS PLANNED FOR THE SHERCO PLANT IN 2022?

A. Yes. We are planning approximately $12.0 ($8.8) million in plant additions in 2022 for projects at Sherco Units 1, 2 and 3. These projects primarily relate to maintaining environmental compliance, reliability and efficiency of these units. In 2022, there is a scheduled overhaul for Sherco Unit 2 consistent with its regular three-year overhaul schedule. With Sherco Unit 2 retirement at the end of 2023, we have materially limited the overhaul scope and planned additions addressing only the turbine control valves and coal mill projects that are critical to keep the unit operating through its remaining life. Included in Schedules 3 and 4 is a description of each individual project, its costs, in-service date, and the need for the project.

Q. PLEASE DISCUSS THE SIGNIFICANT 2022 CAPITAL PROJECT AT SHERCO.

A. We have budgeted $4.5 ($3.3) million in 2022 capital additions to replace the baghouse fabric filter bags on Unit 3. These bags are the filtration media that remove particulates from the flue gas as part of our AQCS system. The baghouse is made up of 48 compartments with 378 fabric filter bags that are each approximately one-foot diameter and over 34 feet long. The current set of bags was installed starting in 2009 and typical life is seven to nine years. Bag compartment failures have begun, and this replacement project was started in 2019. The work is completed with the unit online by isolating the compartment where work is taking place, and the project has anticipated three-year duration. This replacement work is required to comply with our air permit.

Q. ARE ANY CAPITAL PROJECTS PLANNED FOR THE ALLEN S. KING PLANT IN 2022?

A. Yes. We are planning total capital plant additions of approximately $2.9 ($2.1) in 2022. In 2022 there is no scheduled major overhaul for the Allen S. King Plant, and there are no significant (*i.e.,* over $1 million) capital additions. Schedules 3 and 4 identify all of our capital plant additions at the Allen S. King plant.

2. Intermediate Plants

Q. ARE ANY CAPITAL PROJECTS PLANNED FOR THE COMPANY'S INTERMEDIATE PLANT IN 2022?

A. Yes. We are planning capital additions of approximately $32.9 ($24.0) million at our Intermediate plants. These projects are mainly related to maintaining reliability and environmental performance. These projects additions are scheduled during the overhauls on Black Dog Unit 5/2. Schedules 3 and 4 provide additional information on these capital additions.

Q. PLEASE DISCUSS THE SIGNIFICANT 2022 CAPITAL PROJECTS AT BLACK DOG.

A. We are planning six significant capital project additions at Black Dog for 2022:

- CT Major overhaul Unit 5;
- Water treatment system;
- Plant entrance road erosion wall;
- Steam turbine L-0 blades Unit 2;
- Steam turbine turning gear Unit 2; and
- Plant DCS upgrade Unit 5.

We have budgeted \$8.8 (\$6.4) million in 2022 capital additions to purchase parts and perform HGP Inspection. The combustion turbine major overhaul is being performed per the OEM-recommended equivalent operating hours. During a major overhaul, all combustion parts are replaced, all turbine blades and vanes are replaced. The rotor is also pulled out of the CT disassembled and restacked. Significant inspections are also completed at this time to assess the health of the asset and look for signs of long-term issues initiating.

We have budgeted \$2.9 (\$2.1) million in 2022 capital additions to replace the demineralizer with a Reverse Osmosis (RO) system. The existing system has had significant maintenance issues and is not incorporated into plant DCS. The new system will be able to meet Electric Power Research Institute (EPRI) guidelines for Heat Recovery Steam Generator (HRSG) makeup water quality with conductivity < 0.100 microsiemens and silica < 10 ppb.

We have budgeted $2.7 ($2.0) million in 2022 capital additions to install an erosion wall to protect plant equipment from flooding of the Minnesota River.

We have budgeted $2.1 ($1.5) million in 2022 capital additions to replace the Unit 2 steam turbine L-0 blades. The current L-0 blades were installed in 1987 and will have 35+ years of operation during the next steam turbine major overhaul. These blades typically have a life expectancy of between 20-40 years, or 160,000 - 320,000 equivalent operating hours, depending on operating conditions. This unit is more susceptible to water droplet erosion because of the lower main steam temperature than design, especially during winter months. Cycling duty will also decrease life expectancy by increasing fatigue and thermal stresses on the turbine, possibly necessitating replacement earlier in the life expectancy range. Recent inspections on these blades have shown evidence of more rapid moisture erosion than would be expected with this operating history. Failure of these blades would result in a significant unplanned outage to repair or replace.

We have budgeted $1.8 ($1.3) million in 2022 capital additions to replace the Unit 2 steam turbine turning gear. This project includes complete replacement of the 1950's vintage turning gear assembly for Unit 2 Steam Turbine/Generator. This includes removal of the existing turning gear assembly and motor and replacement with a better design more suitable for cycling operation.

We have budgeted $1.2 ($0.89) million in 2022 capital additions to perform Emerson Ovation Evergreen DCS upgrades. This project is part of our Emerson Ovation Evergreen program. This is similar to the project in 2021 at

Allen S. King, and all of our plants with Emerson Ovation are part of the Evergreen program as part of our efforts to standardize or reduction of costs and risks.

Q. PLEASE DISCUSS THE SIGNIFICANT 2022 CAPITAL PROJECT AT RIVERSIDE.

A. We have budgeted $2.4 ($1.7) million in 2022 capital additions to replace the water treatment system. The existing system's serviceability has decreased to the point of requiring replacement. The scope of this project is to install one new RO water treatment system within the existing building and reusing ancillary systems from the existing RO system. This water is used for generating steam in the Heat Recovery Steam Generators (HRSG).

3. Peaking and Refuse Derived Fuel Plants

Q. ARE ANY CAPITAL PROJECTS PLANNED FOR THE PEAKING AND REFUSE DERIVED FUEL PLANTS IN 2022?

A. Yes. We are planning $25.0 ($18.3) million in 2022 plant additions at our peaking and refuse derived fuel plants. These projects are mainly related to maintaining reliability and environmental performance. These project additions are scheduled during the overhauls on Angus Anson, Inver Hills Blue Lake, Red Wing and Wilmarth overhauls. Schedules 3 and 4 provide details on these projects.

Q. PLEASE DISCUSS THE SIGNIFICANT CAPITAL PROJECTS AT THE ANGUS ANSON PLANT.

A. We are planning two significant capital project additions at our Angus Anson plant for 2022:

- HGP on Unit 4; and

- CT controls on Unit 4.

We have budgeted $5.2 ($3.8) million in 2022 capital additions to perform a HGP on Unit 4. The project includes replacement of the following standard hot gas path parts per the PSM parts contract; transitions, liners, liner end caps, fuel nozzle assemblies, stage 1 buckets/nozzles/shroud blocks, stage 2 buckets/shroud blocks. The project also includes replacing the R0 (1st stage) compressor blades to mitigate a design issue with the OEM blades. The exhaust frame flex seals will be replaced with a set of Inconnel seals. The HGP inspection is required at 24,000 operating hours or 900 starts per the OEM and the PSM parts contract.

We have budgeted $1.4 ($1.0) million in 2022 capital additions to replace the CT control system on Unit 4. This project scope is similar to the CT controls replacement projects described in the 2021 additions for Blue Lake Units 7 and 8.

Q. PLEASE DISCUSS THE SIGNIFICANT CAPITAL PROJECT AT THE INVER HILLS PLANT.

A. We have budgeted $2.3 ($1.7) million in 2022 capital additions to replace the CT control system on Unit 3. This project scope is similar to the CT controls replacement projects described in the 2021 additions for Blue Lake Units 7 and 8. Additionally this project includes integrated balance of plant controls with a modern control system including new microprocessors, HMIs, monitors, historian, EMS-SCADA interface, network switches, dual redundant network, data links, and other relevant networking systems. The new controls will include overspeed integration similar to a similar project at our Wheaton plant. The project also includes modifying the fuel oil controls with position feedback. This project includes upgrading the vibration monitoring with Bently Nevada equipment.

Q. PLEASE DISCUSS THE SIGNIFICANT CAPITAL PROJECTS AT THE BLUE LAKE PLANT.

A. We are planning two significant capital project additions at our Blue Lake plant for 2022:

- GSU transformer Capital Emergency Spare Part (CESP); and
- Exhaust silencer on Unit 4.

We have budgeted $1.9 ($1.4) million in 2022 capital additions to purchase a CESP GSU transformer which is a spare, portable transformer that we must keep in stock should a transformer fail at one of our plants. The GSU transformer will be designed for suitable use at Angus Anson 4, Black Dog 5, Blue Lake 7 and 8, High Bridge 7 and 8, Riverside 9 and 10, so that we may have the flexibility to utilize this equipment at different plants as needs arise. Scope is to include GSU, accessories, and preparation of layup location. CESP parts are purchased when critical components are identified with long lead times that could render an asset inoperable. We need to keep a spare transformer, since it would take an inordinate amount of time to replace a transformer if we had to order it when it was needed. Our previous CESP GSU transformer of this size was mobilized and installed at Angus Anson Unit 4 when that transformer failed in 2016, and therefore it is necessary we acquire an additional CESP GSU transformer to service our fleet.

We have budgeted $1.5 ($1.1) million in 2022 capital additions to replace the Unit 7 exhaust silencer. This project scope is the same as the 2021 additions project for Blue Lake Unit 8.

4. Renewable Facilities

Q. IS THE COMPANY PLACING ANY NEW PLANTS INTO SERVICE IN 2022?

A. Yes. We will be placing a pilot energy storage "battery" project in service in 2022. This project is expected to be completed at one of our wind farms that has a Network Resource Interconnection Service (NRIS) Interconnection Agreement. We are still developing the total parameters and location of the project. We have budgeted $18.9 ($13.7) million in 2022 capital additions for the completion of this project. This small pilot battery project is intended to demonstrate the effectiveness of increasing capacity accreditation from the wind farm and to help ensure that renewable generation is not curtailed when there is more capacity than demand. The battery is expected to be designed to be charged by the wind energy, and to supply energy to the grid through the existing interconnection agreement when wind generation has decreased or stopped due to lower wind speeds.

Q. ARE THERE ANY OTHER IMPACTS TO THE 2022 CAPITAL ADDITIONS BUDGET YOU WISH TO NOTE?

A. Yes. We are forecasting approximately $7.2 ($5.2) million in 2022 plant additions for a credit associated with the in-servicing of the Dakota Range wind farm in 2021. This is a South Dakota economic development credit.

Q. ARE ANY CAPITAL PROJECTS PLANNED FOR THE COMPANY'S WIND FACILITIES IN 2022?

A. Yes. We are forecasting approximately $7.1 ($5.2) million in 2022 plant additions for our existing wind facilities that consist mainly of gearbox, generator and transformer replacement projects. Schedules 3 and 4 provide additional information.

Q. PLEASE DISCUSS THE SIGNIFICANT CAPITAL PROJECTS AT THE WIND FARMS.

A. We are planning one significant capital project addition at our wind farms for 2022:

- Gearbox replacements at Nobles.

We have budgeted $2.0 ($1.4) million in 2022 capital additions to replace gearboxes at Nobles. I have previously discussed the need for gearbox replacements at wind farms in the 2020 additions section.

IV. O&M BUDGET

A. O&M Overview

Q. WHAT IS INCLUDED IN THE ENERGY SUPPLY O&M BUDGET?

A. The Energy Supply O&M budget is necessary for the operation and maintenance of our fleet. For example, significant labor is required to operate and maintain our generating plants on a day-to-day basis, including operating power plant equipment from control rooms, performing checks on equipment operating parameters, cleaning and inspecting our equipment, and performing routine maintenance such as repairing pumps and valves. We also regularly use chemicals such as lime, activated carbon, and ammonia to reduce emissions at the plants. In addition to existing assets, O&M costs have been included in the budget for new assets which are being added to the portfolio.

Q. DO YOU HAVE ANY INITIAL COMMENTS REGARDING THE O&M FORECAST FOR THE 2020 TEST YEAR AND 2021 AND 2022 PLAN YEARS?

A. Yes. Our O&M spending during this MYRP is reflective of the shift that is occurring in our generation fleet – away from coal generation and toward lower carbon resources. Our baseline historical O&M spending from 2016 to 2018 averages to approximately $150 million per year. Over the course of this MYRP, our O&M budgets vary to reflect the addition of new wind and the impending retirement of coal units. While our O&M spending ultimately levels out around historical levels, the spend shows up in different buckets – namely, less spend in steam production and more spend dedicated to our growing renewable fleet.

Q. HOW ARE THE COMPANY'S LONG-TERM O&M COSTS TRENDING AS YOU TRANSITION TO RENEWABLES?

A. As I outlined above, as we transition our fleet towards a carbon-free future, our O&M costs are also changing accordingly. The annual costs associated with operating and maintaining our coal units have been decreasing due to their lower capacity factors (due to increased wind penetration) and reduced overhaul and project investments as several units approach retirement. Conversely, the annual costs associated with operating and maintaining our renewable fleet have been increasing, mostly from new wind generation being added to our portfolio. The impact of this shift to less carbon-intensive generation sources has shifted our overall O&M priorities so that our O&M spending on wind will eclipse our spending on coal-fired generation by the end of this MYRP. The costs associated with our Combined Cycle, Simple

Cycle, RDF, and Hydro units have been relatively flat, with some variation between years due mostly to unit overhaul schedules.

There is some variation between years due to the timing of new assets going into service and other units attriting towards retirement, but overall our average budget for years 2020 – 2022 is approximately 4.6 percent more than our average spend for years 2016 – 2018. I discuss these historic and forecasted trends further, below.

I note that some of our O&M costs will be recovered through the Renewable Energy Standard Rider during the pendency of this case. I discuss these costs here as they are integral to Energy Supply's budget regardless of how they are recovered. Mr. Halama discusses the Company's rider roll-in proposal and how it affects this rate case.

Q. WHAT IS THE COMPANY'S O&M BUDGET FOR 2020, 2021 AND 2022?

A. We have budgeted $142.8 ($103.9) million in O&M costs for 2020, which is approximately 5.3 percent less than our three-year average cost from 2016 – 2018 of $150.8 ($111.3) million. This includes the O&M costs for Blazing Star I Wind, Foxtail Wind, and Lake Benton Wind, which are scheduled to go into service in 2019. This also includes costs for Blazing Star II, Community Wind North, Crowned Ridge Wind, Freeborn Wind, Jeffers Wind, and Mower Wind which have abbreviated costs in 2020 due to partial-year operation after being placed into service. These new additions will be offset mostly by reduced spending on chemicals and reduced maintenance at our fossil plants.

We have budgeted $163.6 million ($119.1) in O&M costs for 2021, which is an increase of approximately 14.6 percent compared to 2020. The increase in 2021 is mostly due to a full year of operation for Blazing Star II, Community Wind North, Crowned Ridge Wind, Freeborn Wind, Jeffers Wind, and Mower Wind. This also includes abbreviated costs for Dakota Range Wind due to partial year operation after being placed into service in 2021. There are also increased costs from Allen S. King 1 being in a major overhaul year.

We have budgeted $166.5 million ($121.3) in O&M costs for 2022, which is an increase of approximately 1.8 percent compared to 2021. The increase in 2022 is primarily due to a full year of operation for Dakota Range Wind, offset by about $5 million less in overhaul work scope since Sherco 2 is not budgeted for a major unit overhaul due to scheduled retirement.

A detailed overview of our O&M budget by plant and year, including the impact of the RES Rider on the new wind generation going into service, can be found in Schedule 2.

Q. CAN YOU PROVIDE MORE INFORMATION REGARDING HOW THE COMPANY'S CHANGING FLEET AFFECTS THE O&M BUDGET?

A. Asset additions and managing toward asset retirements materially impacts our budgeting. As we install or purchase new assets, we need to budget O&M costs to effectively operate, maintain, and manage these resources. The addition of new assets into our portfolio also affects the operating profiles of our existing assets. Many of our existing assets have O&M costs which are variable based on their operating profiles, such as chemical costs, so any significant change to their operating profiles has a direct impact on their costs and thus needs to be accounted for in our O&M budget.

In addition to new assets affecting our O&M budget, there is also an effect from assets which are scheduled for retirement. As a particular unit approaches retirement, typically less Overhaul and Project maintenance is performed due to diminishing returns on investment, which decreases the O&M budget for that unit. The retirement of existing assets also affects the operating profiles of our other dispatchable assets. For example, when Black Dog 3 and 4 retired in 2015, Black Dog 5/2 had a marked increase in capacity factor partly due to the loss of generating capacity from Black Dog 3 and 4, which increased the variable O&M costs for that unit.

Q. WHAT IS THE IMPACT OF NEW ASSETS ON THE 2020, 2021 AND 2022 O&M BUDGETS?

A. We are forecasting 2020 O&M costs for the Blazing Star I wind farm of approximately $4.9 million, for the Foxtail wind farm approximately $3.3 million, and for the Lake Benton wind farm approximately $1.6 million. Also in 2020, the Company is planning to complete Crowned Ridge, Blazing Star II, Freeborn, Mower, Jeffers and Community Wind North wind farm projects and begin incurring O&M expenses from those assets. Collectively, these new wind farms total approximately $12.7 million in 2020 O&M costs.

In addition to the O&M costs in 2020 shown above, these new assets will continue to have an impact going forward as they become part of our base budget and we shift priorities to accommodate these units by reducing costs at other facilities. We are also budgeting approximately $0.5 million in 2021 for the Dakota Range wind farm which is scheduled to go into service late in the year. Collectively, these new wind farms total approximately $31.8 million in 2021 O&M costs.

Similarly in 2022, we are budgeting O&M costs for these new assets at approximately $38.7 million. The increase from 2021 is due to a full year of operation for all the new wind farms, with Dakota Range having been placed into service in late 2021.

Q. WHAT IS THE IMPACT OF RETIRED ASSETS ON THE 2020, 2021 AND 2022 O&M BUDGETS?

A. The base O&M costs at Black Dog have been decreasing steadily since the coal units were retired in 2015 due to employee attrition and decreased equipment maintenance. The 2020 O&M budget at Black Dog is $6.1 million, which is approximately 37.8 percent less than 2015 actuals and 15.3 percent less than the three-year historical average of $7.2 million.

The closure of the Fibrominn plant in 2018 as approved by the Commission in Docket No. E002/M-17-530 removes that plant from the 2020 O&M budget saving approximately $2.9 million in O&M costs compared to 2018.

The scheduled retirement of Sherco 2 in 2023 has a significant impact to the budget, particularly in 2022, as the Company is not planning to perform a major unit overhaul as would normally be scheduled. Compared to the 2016 – 2018 historical average of $45.4 million, the O&M budget at Sherco in 2022 is only $33.5 million, which is a decrease of $11.9 million or 26.3 percent. In addition to the decreased costs from avoiding the major unit overhaul, there are reductions in base labor and base maintenance costs as the unit approaches retirement and less work is performed.

Q. HOW DOES THE 2019 FORECAST COMPARE WITH 2018 ACTUAL COSTS?

A. We are forecasting $133.3 million in O&M costs for 2019, which is approximately $22.4 million or 14.4 percent lower than our 2018 actual costs. The 2019 forecast is significantly less than our 2018 actuals for several reasons. First, we are forecasting a decrease of $4.8 million at Allen S. King and a similar decrease of $4.8 million at High Bridge due to no major overhauls planned at those facilities in 2019. We are also forecasting a decrease of $4.4 million at Sherco due to less project and overhaul spending. There is also a decrease of $3.2 million associated with the retirement of the Fibrominn plant.

In addition to these changes with our fossil plants, we are also forecasting cost savings for our existing wind fleet due to negotiated pricing from extending their service agreements to 10-year terms. We are forecasting a decrease of $0.7 million at Border Winds, a decrease of $0.8 million at Courtenay, a decrease of $0.4 million at Grand Meadows, and a decrease of $0.6 million at Pleasant Valley. While these changes account for most of the reduction in 2019, there are also other smaller reductions at most of our other generating facilities. These reductions help with our transition to renewable energy as we plan to in-service Blazing Star I, Foxtail, and Lake Benton wind farm in 2019 and start incurring O&M costs for these assets.

Q. HOW DOES THE 2020 BUDGET COMPARE WITH 2018 ACTUAL COSTS?

A. The 2020 O&M budget is $142.8 million, which is a decrease of 8.3 percent when compared to 2018 actuals of $155.7 million. This is due mostly to a decrease of approximately $4.9 million at Allen S. King due to no major overhaul, a decrease of approximately $5.7 million at Sherco due to reduced overhaul and project spending, a decrease of $3.6 million at High Bridge from reduced overhaul spending, and smaller reductions at our other generating plants. These reductions are offset somewhat by additional costs for new renewable assets including an increase of $4.9 million for Blazing Star I, an increase of $3.3 million for Foxtail, an increase of $1.6 million for Lake Benton, and an increase of $1.1 million for Crowned Ridge.

Q. HOW DOES THE 2020 BUDGET COMPARE WITH THE 2019 FORECAST?

A. Our 2020 Energy Supply O&M budget is approximately $9.5 million or 7.1 percent higher than our 2019 forecasted expenses. As discussed above, our 2019 forecast is significantly lower than our 2016 – 2018 historical spend in anticipation of our new renewable generation going into service in 2019. Since these units are going into service in late 2019, only part of the new unit costs are being realized in the fiscal year 2019 due to timing. For example, Blazing Star I is forecasted for only $0.4 million in 2019 due to a December 2019 in-service date, whereas the 2020 budget for the full year is $4.9 million. This trend is typical for the other new units going into service in 2019, which explains why the 2019 forecast is lower than both the 2016 – 2018 historical spend and 2020 – 2022 budget.

Q. HOW DOES THE 2021 BUDGET COMPARE WITH THE 2020 BUDGET?

A. We have budgeted $163.6 million in O&M costs for 2021, which is an increase of approximately 14.6 percent compared to 2020. The increase in 2021 is mostly due to a full year of operation for Blazing Star II, Community Wind North, Crowned Ridge Wind, Freeborn Wind, Jeffers Wind, and Mower Wind. This also includes abbreviated costs for Dakota Range Wind due to partial-year operation after being placed into service in 2021. There are also increased costs from Allen S. King 1 being in a major overhaul year.

Q. HOW DOES THE 2022 BUDGET COMPARE WITH THE 2021 BUDGET?

A. We have budgeted $166.5 million in O&M costs for 2022, which is an increase of approximately 1.8 percent compared to 2021. The increase in 2022 is primarily due to a full year of operation for Dakota Range Wind and additional costs at Black Dog due to a major overhaul, offset by about $5 million less in overhaul work scope since Sherco 2 is not budgeted for a major unit overhaul due to scheduled retirement.

B. O&M Budget Detail

Q. WHAT IS INCLUDED IN THIS SECTION OF TESTIMONY?

A. In this section I will describe the variances in budgeted costs by each category of the Energy Supply O&M budget. Similar to past practice, I will use a three-year historical average of actuals (2016-2018) to make some comparisons.

Q. WHAT ARE THE BASIC CATEGORIES OF THE O&M BUDGET?

A. We prepare our budgets in accordance with the overall competencies that the Energy Supply function must implement. Our O&M budget can be analyzed by the following categories: 1) internal labor, 2) contract labor, 3) materials, 4) commodities, and 5) other. Table 5 provides our historic cost trends by category including our forecast for 2019 and budget for the 2020 test year and 2021 and 2022 plan years.

Table 5

Historic and Current NSPM Energy Supply O&M Budget

By Category

Northern States Power Company - MN ($ Millions)	2016 Actual	2017 Actual	2018 Actual	2016-18 Average	2019 Forecast	2020 Budget	2021 Budget	2022 Budget
Internal Labor	$ 72.1	$ 68.4	$ 74.5	$ 71.7	$ 65.6	$ 63.9	$ 63.0	$ 62.5
Contract Labor	$ 36.8	$ 38.8	$ 37.1	$ 37.5	$ 30.0	$ 37.7	$ 53.8	$ 54.9
Materials	$ 24.1	$ 17.8	$ 18.2	$ 20.0	$ 18.2	$ 21.3	$ 21.5	$ 22.5
Commodities	$ 8.6	$ 8.6	$ 6.9	$ 8.0	$ 8.0	$ 6.7	$ 6.5	$ 6.7
Other	$ 10.7	$ 10.9	$ 19.0	$ 13.5	$ 11.5	$ 13.2	$ 18.8	$ 20.0
Total	$ 152.3	$ 144.4	$ 155.7	$ 150.8	$ 133.3	$ 142.8	$ 163.6	$ 166.5

Q. WHAT ARE THE MAIN DRIVERS OF THESE CATEGORIES?

A. There are several factors which influence the O&M budget categories shown in Table 5, the most significant being overhauls and projects, which vary between years depending on equipment condition.

Q. WHAT IS AN OVERHAUL?

A. The process of generating electricity involves a complex series of consecutive steps, each step carried out in a different part of the station. In order to ensure that this process runs smoothly, efficiently, and safely, regular maintenance of a generating station is necessary.

Each of our coal units requires regular overhauls every one to three years depending on their design. Our natural gas unit overhauls are dependent upon the number of hours that they have operated and the number of times they have been started. During an overhaul, we perform detailed equipment inspections and perform preventive and corrective maintenance work activities to prepare the unit to meet our reliability goals. We also perform similar work which we classify as projects if it does not require the unit to be offline.

Q. HOW DO OVERHAULS AFFECT THE O&M BUDGET CATEGORIES?

A. Our planned Overhauls influence our O&M costs in two differing ways. First, our planned Overhauls increase our Internal Labor, Contract Labor, and Material costs. Internal Labor costs increase due to overtime and additional labor costs associated with extended working hours to return the unit to service in a timely manner. Contract Labor costs increase due to additional contractors and vendors providing equipment inspections, repairs, and testing during the overhaul. Material costs also increase due to additional materials used during the overhaul for equipment repairs. Conversely, our Chemical costs decrease during overhauls since our operating equipment is out of service and no chemicals are required.

Q. HOW DOES THE COMPANY PLAN AND SCHEDULE OVERHAULS?

A. In general, overhauls are planned and budgeted based on forecasted operating profiles and equipment condition to ensure long-term reliability and prevent operational issues and forced outages. Planned overhauls are managed so that costs are relatively constant each year. This overhaul management strategy minimizes variation in annual overhaul costs. For example, in 2020, Sherco 3 is scheduled for a major overhaul while the Allen S. King plant does not have a scheduled overhaul. As a result of our overhaul and project planning and prioritization process, we manage annual O&M spending on these items while also maintaining safe and reliable operations.

The Sherco units are on a 3 year major overhaul schedule, with the exception of Sherco 2 which was overhauled in 2019 and is not scheduled for a major overhaul in 2022 due to retirement in 2023.

Allen S. King 1 has extended their overhaul frequency in recent years to help reduce O&M costs while still striving to meet our reliability goals. The current overhaul schedule for Allen S. King 1 alternates between major and minor overhauls every 18 months.

The gas turbine overhauls at Black Dog, High Bridge, and Riverside are scheduled based on either equivalent starts or equivalent fired hours depending on how they are dispatched. The combined cycle plants are currently scheduled for overhauls based on an equivalent fired-hours basis due to their recent operating profiles. These plants also perform steam turbine overhauls approximately every eight to ten years depending on operation and equipment conditions. Steam turbine and gas turbine overhaul schedules are aligned when possible to minimize total overhaul durations. Our gas turbine overhauls at Angus Anson, Blue Lake, and Inver Hills are scheduled on an equivalent starts basis since they are typically used for peak demand and therefore have lower hours per start.

Red Wing and Wilmarth perform boiler overhaul work each year to ensure reliability over a 12-month cycle, and schedule turbine overhaul work every six to eight years depending on equipment condition.

Q. HOW ARE OVERHAULS SCHEDULED WITHIN A GIVEN BUDGET YEAR?

A. Our overhauls are scheduled in a collaborative effort to be least impactful to overall operations when a plant is in planned outage while ensuring Company and contractor resources are available to perform the work. Typically our major overhauls are performed in the spring season when demand is lower to ensure reliable generation in the summer peak demand period, and to a lesser extent some minor overhauls are performed in the fall season to prepare for the winter demand.

Q. IN ADDITION TO THE O&M CATEGORIES ABOVE, ARE THERE OTHER WAYS TO ANALYZE ENERGY SUPPLY'S O&M COSTS?

A. Yes. Our budgeting process begins at the plant level. Therefore, another way to analyze our O&M costs is by plant. I have provided Schedule 2 which presents O&M costs by plant from 2016 through 2022.

1. Internal Labor

Q. WHAT DOES THE INTERNAL LABOR COMPONENT OF THE ENERGY SUPPLY BUDGET CAPTURE?

A. Our Internal Labor budget component captures the costs of our Xcel Energy labor force that runs our plants and supports Energy Supply activities. Our Internal Labor budget also includes planned overtime and special time to ensure we have personnel available to operate our plants at all hours of the day. Our Internal Labor has historically been the largest component of our O&M budget, and this remains true as we transition to a carbon-free future.

Q. HOW DOES XCEL ENERGY DETERMINE WHICH OPERATIONS OF THE ENERGY SUPPLY FUNCTION WILL BE UNDERTAKEN BY INTERNAL LABOR?

A. We believe it best to maintain internal resources for the day-in, day-out work and support functions at our plants. Operating and maintaining our fleet is a core competency of the Company. Using internal labor to do so allows us to build up an internal knowledge base and expertise to meet these core needs. Key roles that we believe should be filled with internal labor resources include plant operators, maintenance personnel, electricians, environmental service workers, engineers, instrument and control technicians, and chemists familiar with our fleet.

Further, we utilize a part-time "Special Construction" workforce comprised of personnel who are dispatched to different plants to address projects throughout our fleet. This ensures we have personnel at the ready to meet immediate needs. They essentially account for our "bench strength" to mitigate costs and maintain access to critical resources, such as boilermakers.

Q. HOW HAVE YOUR INTERNAL LABOR COSTS BEEN TRENDING?

A. As shown in Table 5, our historical Internal Labor costs have averaged approximately $71.7 million annually with some variance between years due to overhauls and projects. We are forecasting a small but steady decrease in Internal Labor costs as several units approach retirement and less maintenance is performed at their end of life.

Q. WHAT IS THE COMPANY DOING TO CONTROL INTERNAL LABOR COSTS?

A. Our most significant means of controlling our Internal Labor costs is ensuring that we have the appropriate number of properly trained and qualified internal resources to perform the routine operation and maintenance of our operating units. As mentioned previously, we utilize our Special Construction workforce and Contractors to perform irregular or specialty work during projects and overhauls which helps us control our Internal Labor costs.

Q. WHAT IS THE IMPACT OF THE COMPANY'S CHANGING GENERATION PORTFOLIO ON YOUR INTERNAL LABOR?

A. Generally, as our fossil units are retired, there is a corresponding reduction in our number of full-time employees, as no labor is required to operate or maintain a retired asset. The Company typically manages these transitions through attrition from employee retirements or transfers leading up to unit retirement to minimize the impact of surplus labor thereafter. To help with these transitions, we have also utilized travelers from other plants, our Special Construction workforce, and contractors to help maintain operation and maintenance as the unit nears retirement, and we have attritted part of our regular workforce.

Conversely, as our new renewable units are added to the portfolio, there is a corresponding increase in our number of full-time employees as additional labor is required to manage these assets.

Q. WHAT IS THE IMPACT TO YOUR NUMBER OF FULL-TIME EMPLOYEES DUE TO UNIT RETIREMENTS?

A. In preparation for Sherco 2 retirement in 2023, we are forecasting approximately 6 percent annual reduction through attrition from 2020 – 2022.

Q. WHAT IS THE IMPACT TO YOUR NUMBER OF FULL-TIME EMPLOYEES DUE TO UNIT ADDITIONS?

A. We are forecasting an additional eight full-time employees to support Lake Benton, Blazing Star, Foxtail, Freeborn, Crowned Ridge, and Dakota Range wind farms.

Q. HOW DOES YOUR 2020 INTERNAL LABOR BUDGET COMPARE TO YOUR 2016 - 2018 ACTUALS?

A. Our 2020 Internal Labor budget is $63.9 million, which is approximately 10.8 percent lower than our 2016 - 2018 average costs. This decrease is mostly due to employee attrition at our fossil generating stations offset some by annual wage increases and additional headcount to support our new renewable units.

Q. HOW DOES YOUR 2020 INTERNAL LABOR BUDGET COMPARE TO YOUR 2019 FORECAST?

A. Our 2020 Internal Labor budget is approximately 2.6 percent lower than our 2019 forecast. This decrease is mostly due to employee attrition at our fossil generating stations offset some by annual wage increases and additional headcount to support our new renewable units.

Q. HOW DOES YOUR 2021 INTERNAL LABOR BUDGET COMPARE TO YOUR 2020 BUDGET?

A. Our 2021 Internal Labor budget is approximately $63.0 million, which is 1.4 percent less than our 2020 budget. This is due to employee attrition at our fossil generating stations offset some by annual wage increases and additional headcount to support our new renewable units.

Q. HOW DOES YOUR 2022 INTERNAL LABOR BUDGET COMPARE TO YOUR 2021 BUDGET?

A. Our 2022 Internal Labor budget is approximately $62.5 million, which is 0.8 percent less than our 2021 budget. This is due to employee attrition at our fossil generating stations offset some by annual wage increases and additional headcount to support our new renewable units.

2. Contract Labor

Q. WHAT DOES THE CONTRACT LABOR COMPONENT OF THE ENERGY SUPPLY BUDGET CAPTURE?

A. The Contract Labor component of our budget captures the costs of outside contractors, experts, and other third-party assistance that augment our core operations and maintenance competencies. Examples include crews hired to help with overhaul work, as well as experts from our equipment manufacturers to provide expertise on plant engineering and construction.

Q. HOW DOES THE COMPANY DETERMINE WHICH OPERATIONS OF THE ENERGY SUPPLY FUNCTION WILL BE UNDERTAKEN BY CONTRACT LABOR?

A. We look to outside vendors to provide specialized expertise that is not cost-effective for us to maintain for our core operations. Such expertise may be necessary for specialized and non-regularly occurring work such as repairs and overhauls. Examples of such functions include specialty engineers, turbine services, construction contractors and specialty trades. Further, we use contract labor to supplement our workforce as needed to accommodate major projects such as overhauls and O&M projects.

Q. HOW HAVE THE CONTRACT LABOR COSTS BEEN TRENDING?

A. As shown in Table 5, our historical Contract Labor costs have been fairly consistent at approximately $37.5 million annually. As we transition to renewable generation, we are initially forecasting a decrease in Contract Labor costs due to reduced overhaul and project spending at our fossil plants, followed by a significant increase in Contract Labor costs associated with our new wind resources coming into service and associated maintenance service agreements. I explain these trends in more detail below.

Q. WHAT IS THE COMPANY DOING TO CONTROL CONTRACT LABOR COSTS?

A. We use the Master Service Agreement program, which I describe below, to help ensure we obtain qualified and cost-effective contract labor. We also carry out significant contract oversight protocols, which include validating hours charged to a project and compliance to contract terms and conditions, as described in our Quality Assurance Policy provided in Exhibit___(RAC-1), Schedule 5.

Q. HOW DOES YOUR 2020 CONTRACT LABOR BUDGET COMPARE TO YOUR 2016 - 2018 ACTUALS?

A. Our 2020 Contract Labor budget is $37.7 million, which is an increase of approximately $0.2 million or 0.5 percent compared to our 2016 - 2018 average costs. In this comparison, the decrease in Contract Labor costs associated with reduced projects and overhauls is offset by the increase in Contract Labor costs associated with our new wind farms.

Q. HOW DOES YOUR 2020 CONTRACT LABOR BUDGET COMPARE TO YOUR 2019 FORECAST?

A. Our 2020 Contract Labor budget is $37.7 million, which is an increase of approximately $7.7 million or 25.8 percent compared to our 2019 forecast. This is mostly due to additional Contract Labor costs in 2020 due to a full year of service agreements for our new wind farms which are being placed into service in late 2019. The increase in Contract Labor costs at Blazing Star I is $3.0 million, at Foxtail $1.9 million, and at Lake Benton $0.8 million. There is also an increase of $0.8 million at Red Wing and $0.6 million at High Bridge due to increased project and overhaul spending.

Q. HOW DOES YOUR 2021 CONTRACT LABOR BUDGET COMPARE TO YOUR 2020 BUDGET?

A. Our 2021 Contract Labor budget is $53.8 million, which is an increase of $16.0 million or 42.6 percent compared to our 2020 budget. This significant increase is from additional Contract Labor costs in 2021 due to a full year of service agreements for our new wind farms which are being placed into service in late 2020. The increase in Contract Labor costs at Freeborn is $3.1 million, at Blazing Star II approximately $3.0 million, at Mower approximately $2.1 million, at Crowned Ridge approximately $2.0 million, at Jeffers approximately $0.8 million, and at Community Wind North approximately $0.6 million. We are also budgeting an increase of $3.1 million at Sherco and an increase of $0.9 million at Red Wing for increased Contract Labor costs associated with overhauls and projects that year.

Q. HOW DOES YOUR 2022 CONTRACT LABOR BUDGET COMPARE TO YOUR 2021 BUDGET?

A. Our 2022 Contract Labor budget is approximately $54.9 million, which is an increase of $1.1 million or 2.0 percent compared to our 2021 budget. This is due mostly to an increase in Contract Labor costs of $3.4 million at the Dakota Range wind farm, which is being placed into service in late 2021. There is also an increase in Contract Labor costs of $3.7 million at Black Dog for planned overhaul spending, which is being more than offset by a decrease of $4.4 million for Sherco 2, which is not planned for major overhaul due to scheduled retirement in 2023.

3. Materials

Q. WHAT DOES THE MATERIALS COMPONENT OF THE ENERGY SUPPLY BUDGET CAPTURE?

A. The Materials budget component captures all non-chemical material costs we incur to operate and maintain our plants. This includes items such as piping, pumps, valves, filters, building materials, and other miscellaneous materials used to operate and maintain our units.

Q. HOW HAVE MATERIAL COSTS BEEN TRENDING?

A. Our Material costs have averaged approximately $20.0 million annually with some variance between years due to overhauls and projects. Our material costs tend to fluctuate within a confined band depending on the scope of overhauls and projects. Certain projects and overhauls may include replacement of equipment components, which requires significant materials, whereas others may be focused on equipment cleaning or inspections and not require materials. Our material costs also tend to increase when major equipment comes out of warranty and any replacement parts need to be purchased by the Company instead of being provided by the manufacturer.

Q. WHAT HAS THE COMPANY BEEN DOING TO CONTROL MATERIAL COSTS?

A. As part of the Master Service Agreement program, we have implemented supply agreements with several preferred vendors to obtain bulk discounts and better service. Significant measures to leverage our purchasing volumes have also been implemented to reduce spend in the MRO (maintenance, repair, and operations) supplies category. The MRO supplies category includes general industrial supplies; fasteners; hand and power tools; pipe, valves and fittings; power transmission (clutch and gearbox); and safety materials. While these are generally less expensive items, we utilize a high volume of these materials.

Our basic sourcing strategy in this category is to lower the costs by leveraging volume purchasing at negotiated prices. Combining all of our sourcing with a few national suppliers has resulted in a nearly 7 percent cost reduction while also driving operational costs down. These savings are due to a combination of both negotiated pricing discounts and yearly cash rebate checks we receive from these suppliers.

The Company is also able to reduce costs with two measures: 1) by implementing consolidated statement billing to reduce administrative overhead, and 2) using consignment and dedicated inventory materials that allow the Company to reduce inventory and inventory holding costs. For example, during facility outages the Company uses consignment trailers from our suppliers to reduce lead-time, returns of unused materials, and overstock materials resulting in more efficient outage material control.

Another example of an MRO supplies category cost-saving strategy includes using a vending machine program to monitor and limit the consumption of supplies at plants. We use vending machines to provide consumables to our plant workers as a way to make these items available but also to track them. For example, if an employee requires rubber gloves to perform some operation, they can retrieve them from a vending machine and appropriately allocate the costs of those gloves to an appropriate work order. By doing this, we can disperse the availability of these items in many different locations while being able to track their use without additional personnel. Some plant supplies can be accessed via a standard-size vending machine and locker device. Currently the vending machines and locker units are being used for safety items (personal protective equipment) and general industrial items (lubricants, batteries, tools).

Q. HOW DOES YOUR 2020 MATERIALS BUDGET COMPARE TO YOUR 2016 - 2018 ACTUALS?

A. Our 2020 Materials budget is $21.3 million, which is an increase of approximately $1.3 million or 6.4 percent compared to our 2016 - 2018 average costs. This is primarily due to additional material costs as manufacturer warranties expire at both Courtenay wind farm and Black Dog 6 and additional Material costs for our new renewable units going into service.

Q. HOW DOES YOUR 2020 MATERIALS BUDGET COMPARE TO YOUR 2019 FORECAST?

A. Our 2020 Materials budget is $21.3 million which is an increase of approximately $3.1 million or 17.2 percent compared to our 2019 forecast. This is due mostly to additional Material costs for our new wind resources and variances within project and overhaul spending.

Q. HOW DOES YOUR 2021 MATERIALS BUDGET COMPARE TO YOUR 2020 BUDGET?

A. Our 2021 Materials budget is $21.5 million, which is an increase of $0.2 million or 1.1 percent compared to our 2020 budget. There is an increase of $0.5 million at Crowned Ridge, an increase of $0.2 million at Lake Benton, and smaller increases at our other new wind farms. This increase in Material spending for our renewables is offset by reduced Material costs at our fossil plants in 2021.

Q. HOW DOES YOUR 2022 MATERIALS BUDGET COMPARE TO YOUR 2021 BUDGET?

A. Our 2022 Materials budget is approximately $22.5 million which is an increase of $0.9 million or 4.3 percent compared to our 2021 budget. We are budgeting our Material costs to increase $1.4 million at Crowned Ridge, $0.5 million at Lake Benton, $0.2 million at Mower, and smaller increases at our other new wind farms. Similar to 2021, the increase in Material spending for our renewables in 2022 is offset by reduced Material costs at our fossil plants.

4. Chemicals

Q. WHAT IS INCLUDED IN YOUR CHEMICALS BUDGET?

A. This cost category consists primarily of chemicals used in the generation process and for the control of emissions. Chemicals for which we incur the most costs include sulfuric acid, lime, ammonia, and mercury sorbent. Exhibit___(RAC-1), Schedule 6 and Exhibit___(RAC-1), Schedule 7 provide the quantity and prices we have historically paid for our main chemicals, the amounts and prices we used to calculate our 2020, 2021 and 2022 budgets, and a summary of chemical costs by plant (actual percentage owned by the Company) including usage amount, price, and total cost for 2016 – 2018 actuals, 2019 forecast, and 2020 test year.

Q. CAN YOU PROVIDE ADDITIONAL INFORMATION REGARDING THE MAIN CHEMICALS THE COMPANY USES?

A. Yes. The main chemicals we utilize at our plants are discussed below.

Sulfuric Acid. The vast majority of sulfuric acid is used for water treatment to control scale formation in cooling waters. The material is received and handled in liquid form. It is then metered into the cooling tower waters where it controls scale by maintaining the pH within certain limits. Minor amounts are also used in demineralizers and process water for pH control.

Mercury Absorbents. Activated carbon is the industry standard for mercury removal from flue gases, and is used at Sherco and Allen S. King to remove mercury from the flue gas. Activated carbon is received in semi-tanker trucks, where it is loaded into large silos in a powder form. From these storage silos, it is metered into the boiler flue gas where mercury is absorbed into the active carbon. This activated carbon now containing mercury is ultimately caught in the Air Quality Control System and then conveyed to a secure landfill for safe storage.

Lime. Lime is used at the Allen S. King, Sherco Unit 3, Red Wing, and Wilmarth plants to remove sulfur dioxide from the flue gas. The use of lime at these plants is governed by the design of the flue gas desulfurization system and regulatory removal limits. The material is received and stored in a solid pebble form. To be used in an air quality control system, it is usually slaked with water and stored a short time before being used as lime slurry. This lime slurry is then metered into the Air Quality Control System, where it reacts with sulfur dioxide to produce calcium sulfate. This calcium sulfate is then collected by this same Air Quality Control System and conveyed to a secure landfill for safe storage.

Ammonia. The vast majority of ammonia used is at the Allen S. King plant for use in a Selective Catalytic Reduction (SCR) system. In addition to the Allen S. King plant, the Riverside, High Bridge, and Black Dog plants also use ammonia in SCR systems but to a lesser degree. An SCR system reduces the nitrogen oxides in boiler flue gas. The ammonia is received and handled in a liquid form, then vaporized and applied just ahead of a large catalyst inside the boiler flue gas ductwork. Here nitrogen oxides react with the ammonia to form nitrogen and water. Allen S. King, Riverside, and High Bridge use 19 percent aqueous ammonia, whereas Black Dog uses 29 percent aqueous ammonia.

Significantly smaller amounts of ammonia are also used at these and other plants for boiler water treatments. In this application, it is used directly to raise the pH of the boiler water to specific limits to reduce corrosion of the boiler steel.

Other. "Other" chemicals include chemicals with lower usage rates that may be specific to a generating site or are used in ancillary systems. Examples of these chemicals include: Bromine, Polisher Resin, Corrosion Inhibitors, Scale Inhibitors, Ethylene, Hydrogen, CO2, Nitrogen, Phosphate, Sodium Chloride, and Urea.

a. Base Chemical Trends

Q. HOW DO YOUR HISTORICAL CHEMICAL ACTUALS COMPARE TO THEIR BUDGETED AMOUNTS?

A. Our chemical costs have historically been under budget. This is due to a variety of reasons. The most significant impact on our historical costs has been operational improvements made at our coal plants over the past few years which have considerably reduced our chemical consumption rates (*i.e.*, the amount of chemicals consumed per MWh generated) compared to their original budgets. For example, at our Allen S. King plant our ammonia consumption rate has decreased by approximately 33 percent since 2016 due to installation of triasing secondary air dampers. Similarly, at our Sherco plant, we have decreased our forecasted mercury sorbent consumption rate by approximately 40 percent as we have gained more experience in using mercury sorbent and installed additional equipment to monitor and optimize its use. Our lime consumption rates have also decreased at most of our coal and RDF plants from operational improvements.

In addition to our improved chemical consumption rates, our chemical cost control measures have been more effective than originally anticipated which has also accounted for some of the underrun. While our generating capacity factors also affect our chemical consumption, and the capacity factors for our coal plants have generally been decreasing, we have been reasonably accurately forecasting capacity factors into our chemical budgets.

Q. HAS ENERGY SUPPLY ADJUSTED ITS CHEMICALS BUDGETING PROCESS IN LIGHT OF ITS OPERATIONAL EXPERIENCES?

A. Yes. As we have improved the efficiency of our chemical consumption, we have adjusted the 2020 test year budget and 2021 and 2022 plan year budgets to recognize more optimized chemical consumption rates.

Q. DOES THE COMPANY EXPECT CHEMICAL CONSUMPTION RATES TO CONTINUE DECREASING SIGNIFICANTLY?

A. While we have made significant improvements over the past few years to optimize our chemical consumption, and we continue to analyze our consumption rates and ways to improve, we believe that we are approaching the limits of our current technology and we are forecasting the consumption rates to stabilize accordingly.

Q. WHAT ARE THE SHORT-TERM TRENDS FOR BASE CHEMICALS?

A. Our chemical costs have generally been declining since 2017 due to operational efficiency improvements I mentioned earlier, most notably improvements at Allen S. King 1 which has reduced ammonia consumption and improvements at Sherco 1 and 2 which has reduced Mercury Sorbent consumption. There are some fluctuations between years due to overhaul schedules and the impact of market cost changes on our supply contracts. While our chemical contracts protect us from short-term commodity pricing volatility, they are tied to a market index such that chemical prices tend to increase steadily over the life of the contract.

We have budgeted $6.7 million in 2020 for Chemicals, which is approximately $1.3 million less than both our 2016 – 2018 average costs and 2019 forecast. This is due mostly to a $0.4 million reduction in the mercury sorbent budget at Sherco and a $0.7 million reduction in the ammonia budget at the Allen S. King plant. These reductions recognize the forecasted capacity factors at the plants as well as our recognition of the decreased consumption rates we have historically been experiencing.

Our 2016 to 2022 O&M costs for each type of chemical are set forth in Table 6 below.

Table 6

Historic and Current NSPM Energy Supply O&M Costs

By Chemical

Northern States Power Company - MN ($ Millions)	2016 Actual	2017 Actual	2018 Actual	2016-18 Average	2019 Forecast	2020 Budget	2021 Budget	2022 Budget
Lime	$ 3.4	$ 2.8	$ 2.9	$ 3.0	$ 3.0	$ 2.9	$ 2.9	$ 3.1
Mercury Sorbent	$ 1.8	$ 2.2	$ 1.0	$ 1.7	$ 1.1	$ 0.8	$ 0.7	$ 0.7
Ammonia	$ 2.2	$ 2.2	$ 1.9	$ 2.1	$ 1.9	$ 1.2	$ 1.2	$ 1.2
Sulfuric Acid	$ 0.5	$ 0.6	$ 0.8	$ 0.7	$ 0.8	$ 0.7	$ 0.7	$ 0.7
Other	$ 0.6	$ 0.7	$ 0.4	$ 0.6	$ 1.2	$ 1.1	$ 1.0	$ 1.0
Total	$ 8.6	$ 8.6	$ 6.9	$ 8.0	$ 8.0	$ 6.7	$ 6.5	$ 6.7

Q. CAN YOU ALSO DESCRIBE THE SHORT-TERM TRENDS FOR BASE CHEMICALS BY CHEMICAL TYPE?

A. Yes. I will describe the short-term trends for each chemical in turn.

Lime. The majority of our lime consumption is due to Sherco 3 sulfur dioxide emissions control equipment. In June 2017, the Sherco EPA Reasonably Attributable Visibility Impairment (RAVI) settlement went into effect, which resulted in more stringent sulfur dioxide emissions limits and therefore increased lime consumption. The Company then transitioned to a different blend of coal in 2019, which allowed for lime consumption rates to return back to their historical average. In addition to these changes, lime consumption also varies with unit capacity. For this reason, Sherco 3 lime consumption actually decreased in 2017 due to the Sherco 3 major overhaul. Lime consumption for Allen S. King, Red Wing, and Wilmarth has been relatively stable, with small variations between years due to planned overhauls and differences in unit generation profiles.

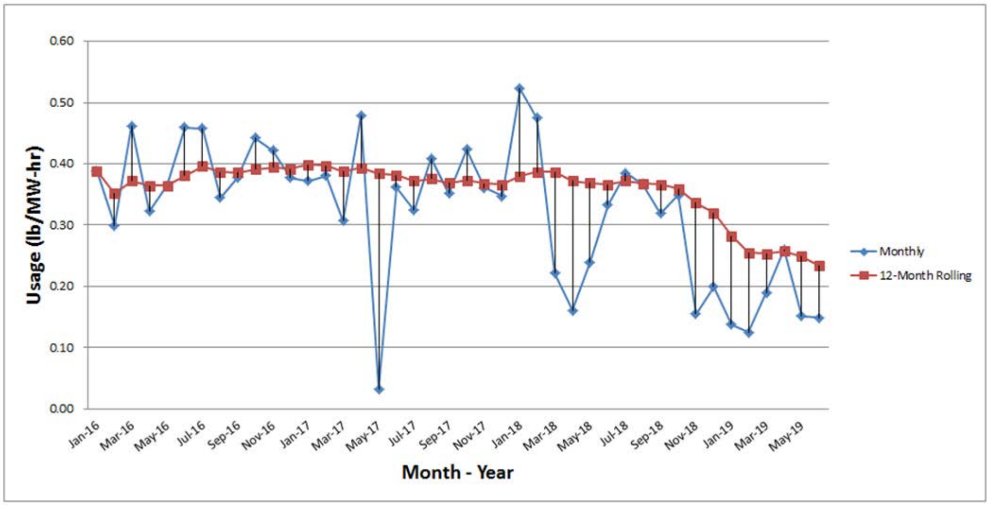
Mercury Sorbent. The mercury sorbent costs increased in 2015 after the new Sherco Units 1 and 2 activated carbon injection system went into service. The mercury sorbent costs were higher in 2017 since Units 1 and 2 did not have a planned overhaul that year, which resulted in increased capacity factor and therefore increased chemical use. This was offset somewhat by renegotiated pricing for mercury sorbent effective July 2017 which reduced unit costs.

In early 2018 the Company made significant improvements to the Continuous Emissions Monitoring System (CEMS), which allowed for real-time monitoring of mercury emissions compared to the previous methods which required sample analysis and only provided delayed results. The new CEMS equipment allowed for tuning adjustments and operational changes in real time, which significantly reduced carbon injection rates and improved efficiency while maintaining emissions compliance. This improvement can be seen in both the overall carbon usage and costs beginning with 2018 actuals and going forward in the 2019 forecast and 2020–2022 budget. A trend of the mercury sorbent usage for Sherco 1 and 2 can be seen in Figure 6 below.

Figure 6

Mercury Sorbent Consumption Rate

Sherco 1 and 2



Ammonia. Ammonia usage rates have been decreasing over the past few years for several reasons. The most significant improvement was installation of new triasing (three sections) secondary air dampers placed into service at the Allen S. King plant in spring 2016. A new SCR catalyst was also installed at Black Dog in fall 2016 which reduced the ammonia usage rate for Black Dog 5. Other tuning adjustments and operational improvements have been performed over the years which have also reduced ammonia usage. A trend of the ammonia usage for King 1 and Black Dog 5 can be seen in Figure 7 and Figure 8 below.

Figure 7

Ammonia Consumption Rate

Allen S. King

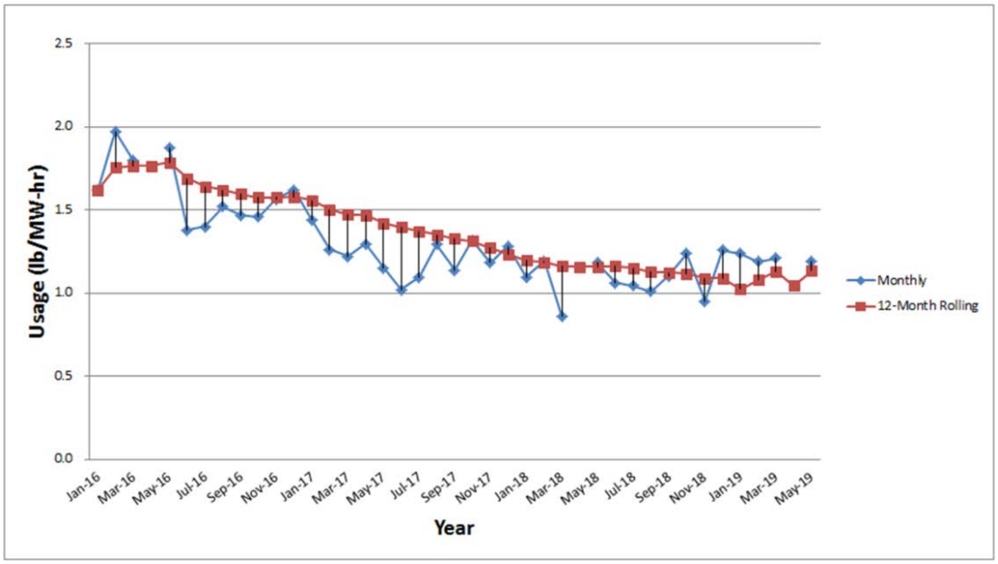
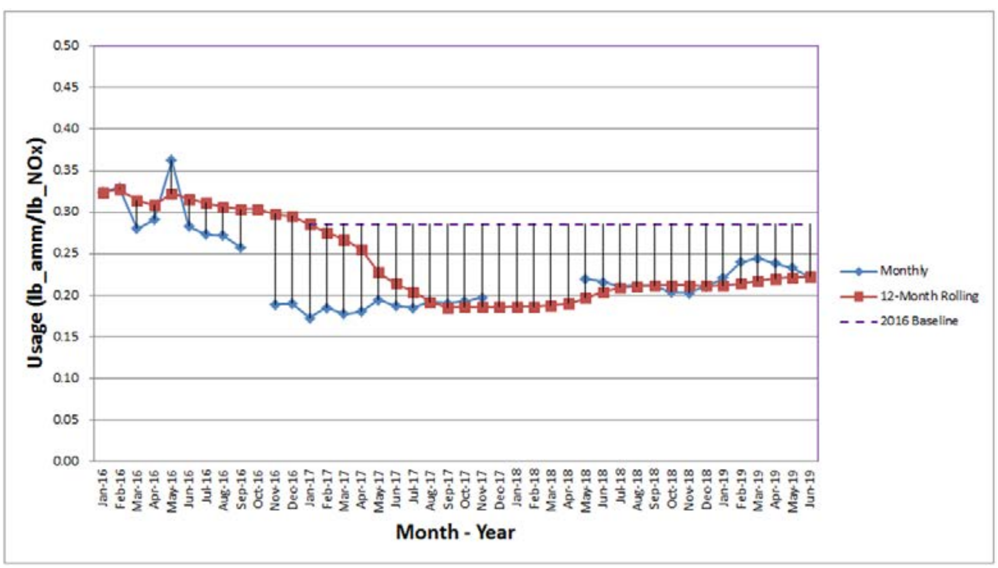


Figure 8

Ammonia Consumption Rate

Black Dog 5



Sulfuric Acid. Sulfuric Acid usage rates also remain steady overall. Fluctuations within a year are, as with ammonia, due to overhaul schedules and the impact of market cost changes on our supply contracts.

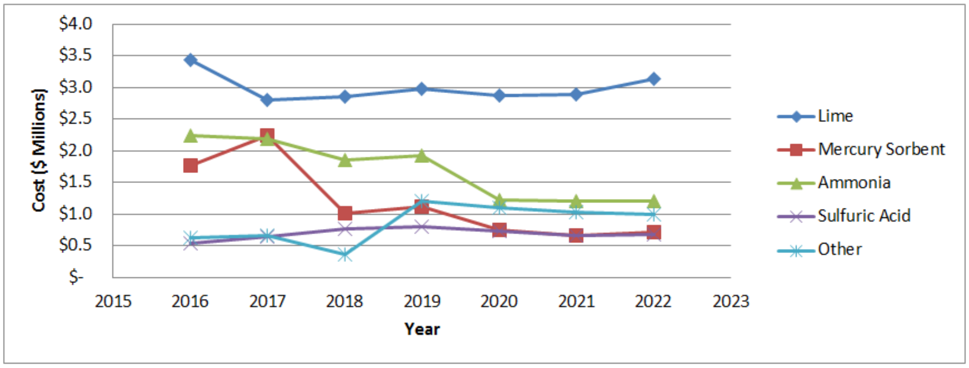
Other. We are forecasting an increase to our Other chemical costs beginning in 2019 for adding scale inhibitor chemicals to Sherco 1 and 2 scrubber modules. The other chemicals in this category have remained steady with mid-year fluctuations due to overhaul schedules and the impact of market cost changes on our supply contracts.

Q. WHAT ARE THE LONG-TERM TRENDS FOR BASE CHEMICALS?

A. The long-term costs of our major chemicals can be seen in Figure 9 below. Overall, most of our chemical costs have been flat or decreasing, with the exception of mercury sorbent costs increasing significantly for Sherco 1 and 2 beginning in 2015 with the new carbon injection system for mercury emissions control. Through a combination of new emissions monitoring technology, improved operating efficiencies and negotiated pricing, we have been able to significantly reduce the costs of Mercury Sorbent beginning in 2018. We are forecasting chemical costs to stabilize going forward at approximately $6.5 million annually with continued improvements and efficiencies with our emissions control equipment.

Figure 9

Historic and Current NSPM Energy Supply O&M Chemical Costs



Q. CAN YOU PROVIDE MORE DETAIL REGARDING THE TRENDS DEPICTED IN FIGURE 9?

A. Yes. Historic data contains unique events that can make year-to-year trend analyses misleading. As described, chemical usage levels and costs are greatly affected by equipment planned overhauls, unplanned outages, and capacity factors. For example, our use of Mercury Sorbent increases in 2017 since Sherco 1 and 2 did not have a major overhaul that year so their capacity factor was higher than other years. Exhibit___(RAC-1), Schedule 8 shows the 2019-2022 overhaul schedules.

I also note that Figure 9 identifies material usage and cost reductions we have been able to achieve after gaining experience with newer emissions control chemicals at our plants. With greater experience we are able to fine-tune the usage of these chemicals and optimize combustion equipment that effects emissions generation. As an example, our experience with SCR technology and the new triasing secondary air dampers at our Allen S. King plant has enabled us to fine-tune reductions in ammonia usage, which is evident in the trends.

b. Base Chemical Budgeting

Q. GIVEN THESE TRENDS AND CONSIDERATIONS, HOW DOES THE COMPANY BUDGET FOR BASE CHEMICALS?

A. Our budgeting methodology develops a historic plant average for chemical consumption (*i.e.,* the amount of chemicals used at a given plant in a given year). By calculating average consumption, we normalize the budget for the impact of operating profile variation over time. Next, we multiply plant averages by our predicted cost of a unit of a particular chemical. For the past nine years, we have gained market intelligence from a third-party firm, Power Advocates (PA), to obtain projected market price data. We then estimate forward pricing by factoring this data into our long-term chemical contracts' pricing formulas. We then make adjustments for significant planned outages and known adjustments to anticipated chemical usage rates.

There are exceptions to this approach. In particular, because we are continually optimizing our usage rate of mercury sorbent as we gain more experience with mercury removal technologies, we use the previous year's data instead of a three-year historic average for mercury sorbent. I discuss this chemical in more detail below.

We believe our methodologies are consistent with feedback we have received from our regulators and should result in more accurate budgeting. However, because our actual consumption of chemicals is based on the variables I described and is directly correlated to plant run times, unforeseen events can impact our actual costs when compared to our budgeted costs.

Q. WHAT ARE THE KEY VARIABLES THAT CAN AFFECT THE COMPANY'S BUDGETING PROCESS?

A. Our actual chemical costs are mainly affected by three variables: (1) plant dispatch; (2) operating efficiencies; and (3) commodity costs including the cost of transportation. While it is difficult to perfectly predict these three variables, we have continued to refine our budgeting processes to reasonably predict chemical usage and costs.

Q. PLEASE DESCRIBE HOW PLANT OPERATING PROFILES AFFECT CHEMICAL CONSUMPTION AND WHAT THE COMPANY HAS DONE TO ACCOUNT FOR THIS FACTOR.

A. Our actual consumption of chemicals at a particular plant is directly correlated to the amount the plant is running. If a particular plant is run more than we predict during any particular period of time, we will consume more chemicals. And if it runs less than we predict, it will consume less chemicals. Therefore, plant dispatch is a main driver of our chemical costs. However, our budgeting methodology for chemicals captures past actual usage to inform our budgeting, rather than relying on predictions of future changes in plant operating profiles. Further, improvements in reliability lead to greater accuracy in predicting usage.

Q. PLEASE DESCRIBE HOW OPERATING EFFICIENCIES AFFECT CHEMICAL CONSUMPTION AND WHAT THE COMPANY HAS DONE TO ACCOUNT FOR THIS FACTOR.

A. As we obtain more experience using chemicals for environmental remediation, we are able to fine-tune our chemical operations to best suit the operating needs of the plant. This means that although we expected to use a certain amount of chemicals at a particular plant, through operating efficiencies we were able to utilize a lesser amount of chemicals. These operating efficiencies inform subsequent years' budgeting. It is for this reason we have modified our straight consumption average budgeting methodology to account for increased experience with certain emissions chemicals.

As an example, in 2016 we budgeted Sherco 1 and 2 mercury sorbent at a consumption rate of 206 lb/hr consistent with the manufacturer's guidelines. Through operating experience and equipment improvements we have been able to reduce our consumption rates over time, and we are now budgeting Sherco 1 and 2 mercury sorbent at a consumption rate of 125 lb/hr, which represents a 40 percent reduction. Similarly at Allen S. King, we have been able to reduce our budgeted ammonia consumption rate from 2.3 tons/hr in 2016 down to 1.55 tons/hr in 2020, which represents a 33 percent reduction. There have been similar improvements at these and other sites for our other major chemicals.

Q. THERE WAS SIGNIFICANT INTEREST IN MERCURY SORBENT BUDGETING IN THE COMPANY'S LAST RATE CASE. PLEASE DESCRIBE HOW THE COMPANY'S MERCURY SORBENT PLANNING HAS EVOLVED AND IMPROVED.

A. We based our original absorbent budgets on Original Equipment Manufacturer (OEM) absorbent usage rate guidelines from ADA Carbon Solutions based on the system installed on Sherco Unit 3. After reviewing material supply proposal bids, Alstom was chosen as the equipment supplier, in part because of its decreased annual sorbent usage. We decreased absorbent usage rates in the budget based on OEM guidelines. After system installation and commissioning was complete, we analyzed our mercury removal rates and realized Alstom's guidelines were also too conservative. We again decreased sorbent usage rates for budgeting purposes to match a level that allows us to conservatively meet our mercury emissions requirements. To be more accurate in our forecasting of sorbent usage going forward, we use the previous year's data instead of a three-year historic average. We are also continuing to optimize the mercury reduction system and the systems that contribute to removal efficiency by testing how each system affects the other throughout the load range of plant operations. As mentioned previously, through continuous improvement of our operations and this iterative budgeting approach, we have been able to significantly reduce the impact of mercury sorbent in our O&M budget.

Q. PLEASE DESCRIBE HOW COMMODITY COSTS AFFECT YOUR CHEMICAL COSTS AND WHAT THE COMPANY HAS DONE TO ACCOUNT FOR THIS FACTOR.

A. The base ingredients for the chemicals we use are commodities traded on world markets and subject to market volatility similar to metals or petroleum. The base pricing for all consumers of chemicals includes the base commodity costs plus an adder from the provider for manufacturing costs and a profit margin. Consequently, we, like every other large consumer of chemicals, are subject to market fluctuations.

An example is the current indexed pricing model for ammonia, which is subject to market volatility and changes monthly. As the market for ammonia is driven by the world agriculture markets, any significant events affecting markets for fertilizer could have long-term impacts to our chemical pricing. As I explain below, however, we have negotiated long-term chemical contracts to help us ensure supply and achieve cost savings despite commodity cost fluctuations.

Q. HOW ACCURATE HAVE YOUR CHEMICAL PRICE FORECASTS BEEN?

A. Generally, our pricing forecasts have been reliable due to our negotiated rates in our chemical Master Service Agreements. A comparison of our budgeted chemical price forecasts and actual chemical costs can be found in Schedule 7.

c. Base Chemical Cost Controls

Q. IS THE COMPANY DOING ANYTHING TO CONTAIN ITS CHEMICAL COSTS?

A. Yes. We continue to optimize our usage of chemicals at our plants; however, this fine-tuning can only provide limited cost reduction in any given year. Consequently, our efforts to mitigate our chemical costs are also focused on obtaining favorable pricing from our suppliers.

As part of overall fleet-wide cost mitigation measures, which I discuss further below, we have undertaken extensive chemical cost mitigation steps. By competitively bidding and negotiating long-term agreements with negotiated mark-ups above base commodity index pricing, we can leverage our volume purchases to ensure supply and remove pricing-risk premiums that are inherent in long-term fixed contracts. These contracts allow us to mitigate the impact of supply constraints pricing when markets tighten. However, due to the inherent nature of index pricing, volatility remains a risk. Figures 10, 11 and 12 illustrate the favorable contract pricing obtained relative to established markets.

Figure 10

NSPM Quick Lime vs. Power Advocates

"Should Cost"

[PROTECTED DATA BEGINS

PROTECTED DATA ENDS]

Figure 11

NSPM Ammonia vs. Spot Market vs. Power Advocates

"Should Cost"

[PROTECTED DATA BEGINS

PROTECTED DATA ENDS]

Figure 12

NSPM Activated Carbon vs. Spot Market vs. Power Advocates "Should Cost"

[PROTECTED DATA BEGINS

PROTECTED DATA ENDS]

Q. CAN YOU PROVIDE A MORE DETAILED DISCUSSION OF THE SPECIFIC EFFORTS THE COMPANY IS UNDERTAKING TO PROCURE CHEMICALS AT REASONABLE PRICES?

A. Yes. I will discuss our effort with respect to each type of chemical:

Activated Carbon. Our contract for activated carbon was competitively bid and awarded to ADA Carbon Solutions. Our strategy for activated carbon in the near future is to build a strong relationship with our supplier to ensure sufficient supply and reasonable pricing. Pricing is based on the producers' price index for industrial chemicals less fuel, but also has capped yearly increases. Additional savings discounts and escalation caps were also negotiated for this contract. Our contract should allow for more consistent budget forecasts as well as anticipated below market, but indexed to market, pricing.

Lime. We underwent another competitive bidding process for lime in 2017, and as a result entered into an agreement that offered anticipated price protections through December 2021 based on available market intelligence. This contract has been renegotiated and updated pricing forecasts can be found in Schedule 7.

Anhydrous and Aqueous Ammonia. We accepted bids for ammonia in 2019 and Airgas Specialty Products was once again the successful bidder. Airgas offered competitive prices, and importantly, Airgas is just a few miles away from our Allen S. King plant – the largest ammonia consumer in the NSP fleet – which minimizes shipping costs.

As I mentioned, ammonia prices are now subject to a volatile market. The Company's ammonia supplier agreement with Airgas Specialty is now based on the Tampa Ammonia Index. The agreement utilizes a new formula based on this index and negotiated pricing to procure ammonia at significantly lower costs than the spot market.

Sulfuric Acid. The Company's current sulfuric acid supply agreement with Brenntag was extended to 2020. In an effort to apply downward cost pressure for this commodity, we are looking for other supply opportunities to leverage the Brenntag relationship.

Q. IN ADDITION TO COSTS, ARE THERE OTHER CONSIDERATIONS WHICH ARE EVALUATED WHEN SELECTING A CHEMICAL SUPPLIER?

A. Yes. In addition to cost control, it is also important to ensure that the supplier can meet the demands of each plant to ensure continuity of supply. This is important since the demand varies throughout the year and most of our major chemicals are required to operate our units; therefore, a shortage of chemicals due to supplier issues would result in unit derates or outages. When selecting a supplier, they are evaluated on their capability to ensure continuity of supply, including infrastructure of chemical production and storage, quantity of supply trucks available for dispatching, and other factors.

Q. IN ADDITION TO COST CONTROL, DOES THE COMPANY ENSURE THAT EMISSIONS CONTROL EQUIPMENT IS OPTIMIZED AND OPERATING EFFICIENTLY?

A. Yes. The Company has considerable control measures and checks in place to ensure our emissions control equipment is operating effectively. Plant operations and instrument technicians monitor performance and operating parameters in real time from the control room and CEMS equipment. There are alarms built into our control systems to alert operations to critical equipment issues to take timely action to resolve. Our emissions control equipment is also inspected routinely during operation and also during outages when the equipment is available for internal inspection. Our CEMS equipment is also calibrated and checked regularly to ensure it is operating correctly, and third-party testing contractors are utilized to verify accuracy of the CEMS equipment as required.

Furthermore, the Operations staff at our coal plants, combined cycle plants, and RDF plants work together with our Environmental Services and Performance Optimization departments to review short-term and long-term emissions and chemical usage trends to identify issues, perform system adjustments and tuning, and share best practices and improvement ideas. The lessons learned from these meetings are shared across our fleet.

Q. HOW DOES YOUR 2020 CHEMICALS BUDGET COMPARE TO YOUR 2016 - 2018 ACTUALS?

A. Our 2020 Chemicals budget is $6.7 million, which is a decrease of approximately $0.7 million or 16.8 percent compared to our 2016 - 2018 average costs. This is mostly due to a decrease in mercury sorbent costs of approximately $1.1 million and a decrease in ammonia costs of approximately $0.9 million, offset by an increase in Other chemical costs of approximately $0.6 million. Consistent with the discussion above, the decrease in mercury sorbent costs was due to improved performance of the Sherco 1 and 2 carbon injection system. The decrease in ammonia costs was due mostly to improvements at the Allen S. King plant related to triasing secondary air dampers, the new SCR catalyst at Black Dog 5, and other small improvements. The increase in Other chemical costs is due to the addition of scale inhibitor for Sherco 1 and 2 scrubber modules.

Q. HOW DOES YOUR 2021 CHEMICALS BUDGET COMPARE TO YOUR 2020 BUDGET?

A. Our 2021 Chemicals budget is $6.5 million, which is a decrease of approximately $0.2 million or 3.1 percent compared to our 2020 budget. This slight variance is due to overhaul schedules and forecasted capacity factors.

Q. HOW DOES YOUR 2022 CHEMICALS BUDGET COMPARE TO YOUR 2021 BUDGET?

A. Our 2022 Chemicals budget is $6.7 million which is an increase of approximately $0.3 million or 4.3 percent compared to our 2021 budget. This slight variance is due to overhaul schedules and forecasted capacity factors. Sherco 2 is not scheduled for a major overhaul in 2022 which increases the capacity factor and chemical costs for the unit.

5. Other

Q. WHAT DOES THE OTHER COMPONENT OF THE ENERGY SUPPLY O&M BUDGET CAPTURE?

A. The Other budget component (approximately 9.2 percent of the 2020 test year budget) captures all other costs we incur to operate and maintain our plants. This includes wind farm land easements, transportation fleet costs, utility costs for the plants such as gas, electric and sewer bills, fees including environmental fees, and other miscellaneous costs.

Q. HOW HAVE THE COSTS OF THE OTHER CATEGORY BEEN TRENDING?

A. Our costs in the Other category tend to fluctuate between years and have averaged around $13.5 million. We are expecting our Other category costs to increase as we add new wind farms into our portfolio and take on land easements and other costs associated with these assets.

Q. HOW DOES YOUR 2020 OTHER BUDGET COMPARE TO YOUR 2016 - 2018 ACTUALS?

A. Our 2020 Other budget is $13.2 million, which is a decrease of approximately $0.4 million or 2.6 percent compared to our 2016 - 2018 average costs.

Q. HOW DOES YOUR 2020 OTHER BUDGET COMPARE TO YOUR 2019 FORECAST?

A. Our 2020 Other budget is $13.2 million, which is an increase of approximately $1.7 million or 14.8 percent compared to our 2019 forecast. The main driver of this change is land easement costs at the newly in-serviced wind farms at Blazing Star I of $1.3 million, at Foxtail $0.5 million, and Lake Benton $0.3 million.

Q. HOW DOES YOUR 2021 OTHER BUDGET COMPARE TO YOUR 2020 BUDGET?

A. Our 2021 Other budget is $18.8 million, which is an increase of approximately $5.7 million or 42.8 percent compared to our 2020 budget. The main driver of this change is an increase in land easement costs at the newly in-serviced wind farms at Freeborn of $2.0 million, at Blazing Star II $1.0 million, at Crowned Ridge $0.9 million, at Mower $0.5 million, at Community Wind North $0.1 million, and at Jeffers $0.1 million.

Q. HOW DOES YOUR 2022 OTHER BUDGET COMPARE TO YOUR 2021 BUDGET?

A. Our 2022 Other budget is $20.0 million, which is an increase of approximately $1.2 million or 6.1 percent compared to our 2021 budget. The main driver of this change is an increase in land easement costs at the newly in-serviced wind farm at Dakota Range of $1.8 million. This increase is offset by a $0.3 million decrease in environmental permits and fees at Sherco and other miscellaneous cost reductions.

V. OPERATING PERFORMANCE

Q. PLEASE DISCUSS THE PURPOSE OF THIS SECTION OF YOUR TESTIMONY.

A. This section provides information related to our fleet performance. While we believe that our fleet generally performs well, there is always room for improvement, and we continue to seek ways to do so. Our focus is on operational excellence and providing our customers with reliable and safe energy at a reasonable cost.

Q. WHY DO POWER PLANT OUTAGES OCCUR AT ALL?

A. Power plants consist of multiple complex chemical, thermal, mechanical and electrical systems working together to convert the energy content of fuel to thermal energy, to mechanical energy, and ultimately to electricity. These complex systems are under significant chemical, thermal and mechanical stresses. This causes the equipment to occasionally succumb to these stresses and fail, which can result in an unplanned outage.

Planned outages are necessary to maintain and replace equipment to mitigate failures, which result in unplanned outages. An appropriate analogy is with an automobile, which if driven new off the dealership lot and operated in a continuous 24-hour, seven-day manner without stopping for periodic planned maintenance (*i.e.* lube oil changes, belt replacement, etc.) will ultimately succumb to mechanical failure resulting in costly repairs, and the car will be unavailable for an extended period.

Q. HAVE YOU QUANTIFIED THE RELATIONSHIP BETWEEN PLANNED OVERHAULS AND RELIABILITY?

A. Yes. The reliability of a particular unit typically follows what is referred to as a bathtub curve. Immediately following an outage, reliability is not at its maximum but begins to bend down (to the bottom of the bathtub) as new equipment installed in the outage is broken in and contaminants introduced into plant systems during the outage are removed. The second region at the bottom of the bathtub is the long period of highly reliable performance following the initial break in period. The third region presents the deterioration of reliability performance as equipment failures begin to occur over time prior to the next planned outage.

Q. HAS THE COMPANY IMPLEMENTED ANY STRATEGIES TO INCREASE PLANT PERFORMANCE?

A. Yes. Since 2011 we have implemented our Operating Model to develop and execute on strategies to improve plant performance. As I discuss further below, our success with the Operating Model has prompted us to implement Version 2.0 of the Operating Model beginning in 2019.

A. Past Performance and Outages

Q. HOW HAVE YOUR GENERATION UNITS PERFORMED DURING THE TENURE OF THE EXISTING MYRP?

A. We are performing well compared to our industry peers. Benchmarking indicates that overhaul performance at our major plants is generally on par with industry norms. Of course, we consistently strive to improve performance.

For supplemental information related to plant performance, please refer to: Exhibit___(RAC-1), Schedule 9, which provides the following data by plant:

1) generation capacity; 2) type of fuel; 3) kWh produced by month for 2016, 2017, 2018, and 2019 through September; 4) and the test year rate base amount for each plant; and Exhibit___(RAC-1), Schedule 10, which provides 1) plant outages for 2016, 2017, 2018, and 2019 through July and the duration of the outage periods; 2) the reason the plant was in an outage; and 3) the plan to alleviate the reoccurrence of similar outages.

Q. DOES THE COMPANY UTILIZE ANY METRICS TO MEASURE PLANT PERFORMANCE?

A. Yes. The Company standardized on utilizing Equivalent Availability Factor (EAF) as the main performance metric beginning in 2016 to develop consistency between units and provide an overall summary of unit performance considering both planned and unplanned events.

EAF measures a plant's availability at its maximum rating expressed as a percentage of all the available hours in a year. EAF is comprised of three sub-metrics to give the entire availability profile of the unit. The Equivalent Unplanned Outage Factor (EUOF) is used to calculate the availability impact of forced outages and derates, the Equivalent Planned Outage Factor (EPOF) is used to calculate the availability impact of planned outages, and Equivalent Seasonal Derate Hours (ESEDH) are used to calculate the availability impact of ambient temperature for our gas units. In other words, if a plant is unavailable for any reason, a planned outage for an overhaul or other work or an unplanned outage, this planned outage affects its EAF performance. Therefore, by utilizing the EAF metric for all our generating units, the Company emphasizes the importance of both preventing forced outages and also optimizing planned outage schedules.

These metrics are tracked across the industry by the North American Electric Reliability Corporation (NERC), which allows us to benchmark our performance against our industry peers.

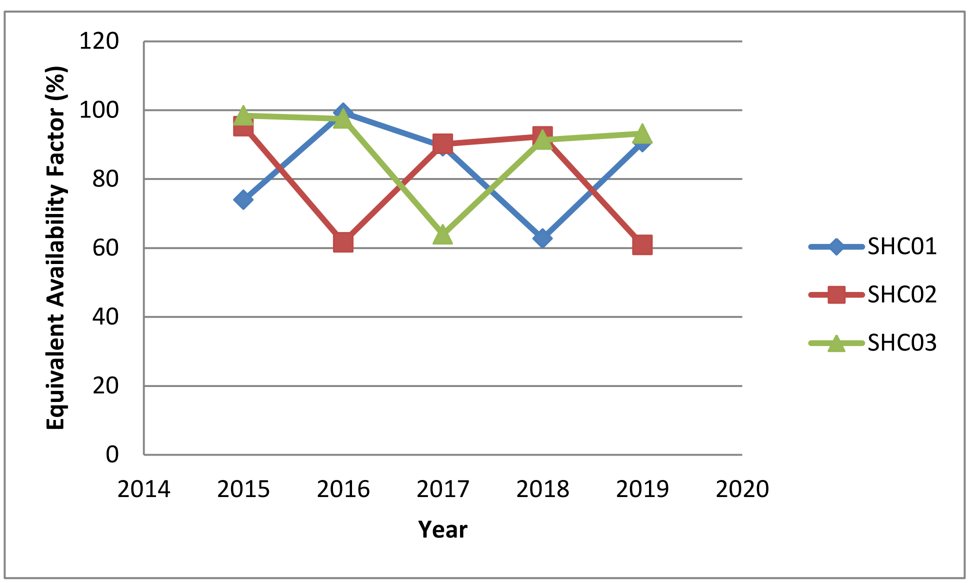
Q. HOW HAS THE SHERCO PLANT PERFORMED BASED ON THE EAF METRIC?

A. Our Sherco plant is comprised of three coal-fired generating units. The historical EAF for each unit can be seen in Figure 13 below. In general, the trend shows how significantly planned overhauls influence the EAF calculation. For example, Sherco 1 EAF is approximately 68 percent during planned overhaul years (2015 and 2018), whereas Sherco 1 EAF is approximately 93 percent for non-overhaul years. This relationship can also be seen with Sherco 2 and Sherco 3 as well.

Figure 13

Historic and Current Equivalent Availability Factor (EAF)

Sherco Plant



For 2018, Sherco 1 EAF was 62.8 percent due mostly to an extended planned overhaul which was fourth quartile when compared to industry peers. Sherco 2 did not have any planned overhauls and finished with an EAF of 92.3 percent, which was first quartile. Sherco 3 also did not have any planned overhauls in 2018 and finished with an EAF of 91.4 percent, which was also first quartile.

Similarly through July 2019, Sherco 2 EAF is at 60.9 percent due to an extended spring overhaul, which is fourth quartile, whereas Sherco 1 and Sherco 3 EAF is at 90.62 percent and 93.2 percent, respectively, both of which are first quartile. Overall the plant is forecasting EAF to be at 86.5 percent at year end, which is above the plant goal of 82.7 percent.

Q. WHAT DO YOU CONCLUDE BASED ON THESE METRICS?

A. I conclude that the Sherco Station has been operating well, being available consistent with top performance in the industry, while recognizing the need for overhauls and impact those overhauls have on the EAF metric.

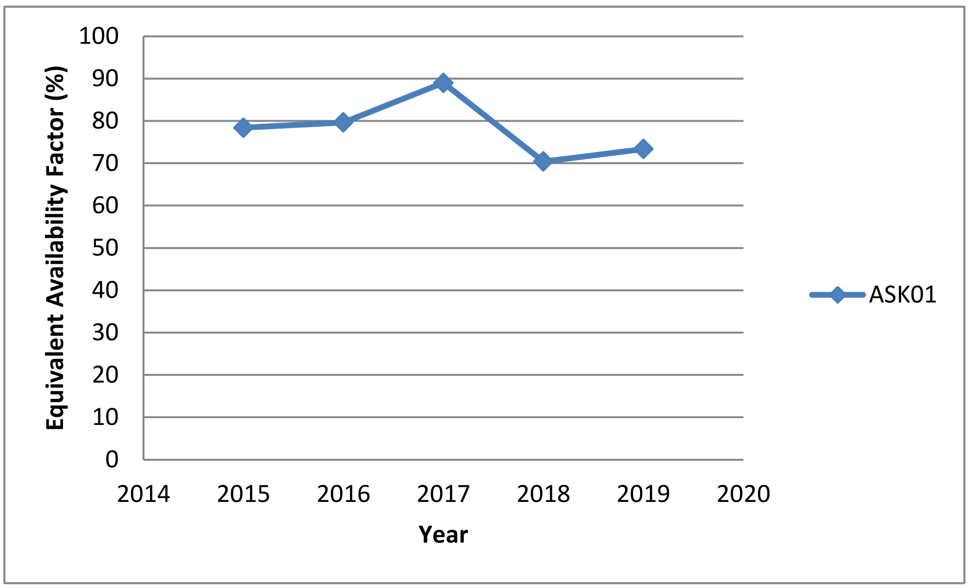
Q. HOW HAS THE ALLEN S. KING PLANT PERFORMED BASED ON THE EAF METRIC?

A. Our Allen S. King plant has a single coal-fired generating unit. The historical EAF can be seen in Figure 14 below. For 2018, Allen S. King 1 EAF was 70.4 percent, which was fourth quartile when compared to industry peers. Similarly through July 2019, Allen S. King 1 EAF is at 73.4 percent due to a forced outage in the spring due to steam turbine generator vibrations, which is also fourth quartile. Overall, the plant is forecasting EAF to be at 81.6 percent at year end which is somewhat, but not significantly, below the plant goal of 84.1 percent.

Figure 14

Historic and Current Equivalent Availability Factor (EAF)

King Plant



Q. WHAT DO YOU CONCLUDE WITH RESPECT TO THESE METRICS?

A. I conclude that the Allen S. King plant is generally performing well; however, there is room for improvement.

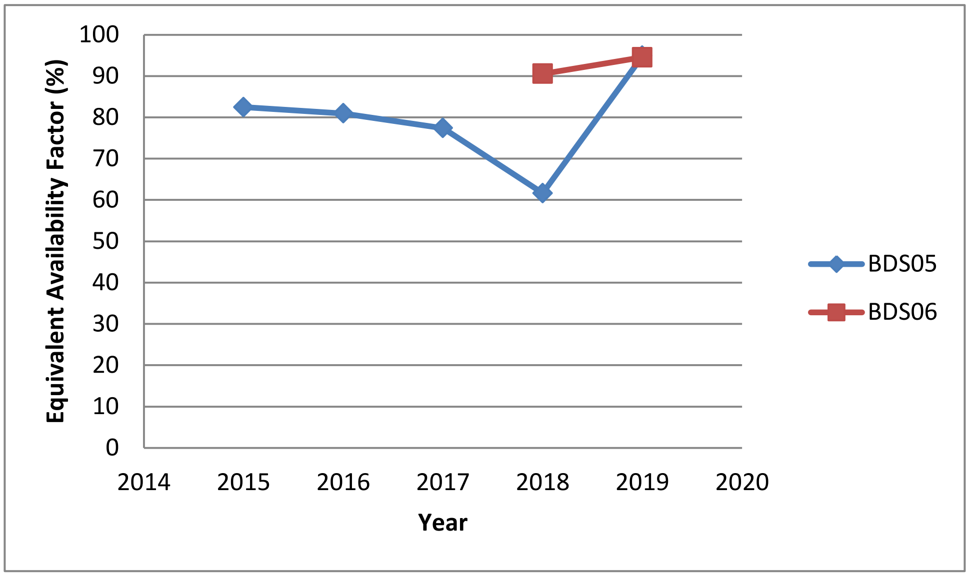
Q. HOW HAS THE BLACK DOG PLANT PERFORMED BASED ON THE EAF METRIC?

A. Black Dog is comprised of a repowered Unit 2 steam turbine in combined cycle with Unit 5 gas turbine, and a simple cycle gas turbine Unit 6 which went commercial in spring 2018. The historical EAF for these units can be seen in Figure 15 below.

Figure 15

Historic and Current Equivalent Availability Factor (EAF)

Black Dog Plant



For 2018, Black Dog 5/2 EAF was 61.6 percent due to an outage extension resulting from gas turbine damage identified during an inspection, which was fourth quartile. Black Dog 6 EAF was 90.6 percent following unit commissioning, which was second quartile.

Through July 2019, Black Dog 5/2 EAF is 94.9 percent and Black Dog 6 EAF is 94.5 percent, both of which are first quartile. Overall the plant is forecasting EAF to be at 93.5 percent at year end, which is above the plant goal of 90.7 percent.

Q. WHAT DO YOU CONCLUDE BASED ON THESE METRICS?

A. I conclude that the Black Dog plant is operating well since the overhaul of Unit 5 combustion turbine in 2018, and Unit 6 has operated well since it went commercial.

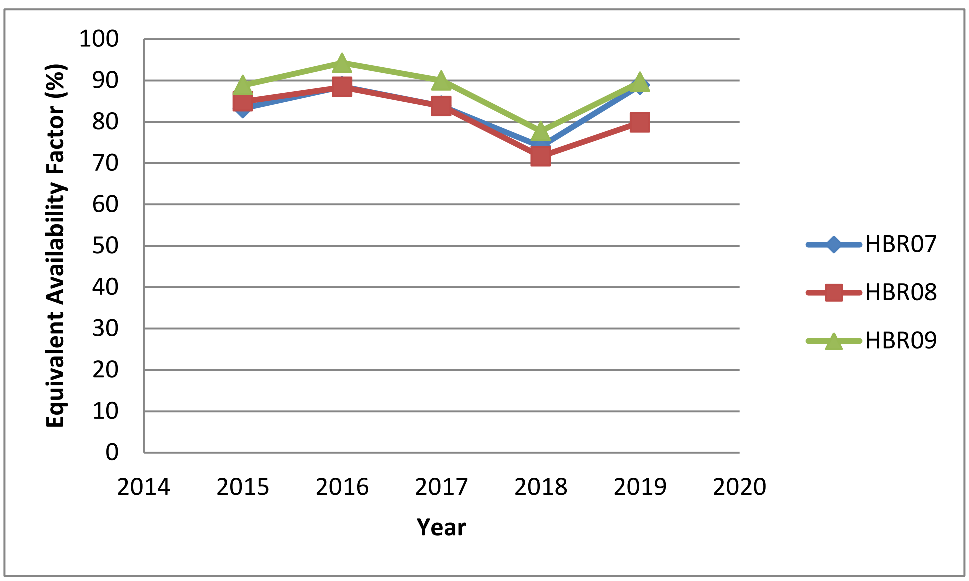
Q. HOW HAS THE HIGH BRIDGE PLANT PERFORMED BASED ON THE EAF METRIC?

A. The High Bridge plant is comprised of Unit 7 and Unit 8 gas turbines and Unit 9 steam turbine in combined cycle. The historical EAF for these units can be seen in Figure 16 below.

Figure 16

Historic and Current Equivalent Availability Factor (EAF)

High Bridge Plant



For 2018, High Bridge 7 EAF was 74.0 percent, High Bridge 8 EAF was 71.6 percent, and High Bridge 9 EAF was 77.7 percent due to a planned steam turbine overhaul, which was fourth quartile. For our combined cycle plants, any steam turbine overhaul work also requires the gas turbines to be out of service since the units are not designed to be operated in simple cycle, which has a corresponding effect on the EAF for each units.

Through July 2019, High Bridge 7 EAF is 88.9 percent and High Bridge 8 EAF is 89.6 percent, both of which are second quartile. High Bridge 8 EAF is 79.8 percent due to Hot Gas Path inspection, which is fourth quartile. Overall the plant is forecasting EAF to be at 87.4 percent at year end, which is above the plant goal of 82.5 percent.

Q. WHAT DO YOU CONCLUDE FROM THESE METRICS?

A. I conclude that the High Bridge plant is operating well.

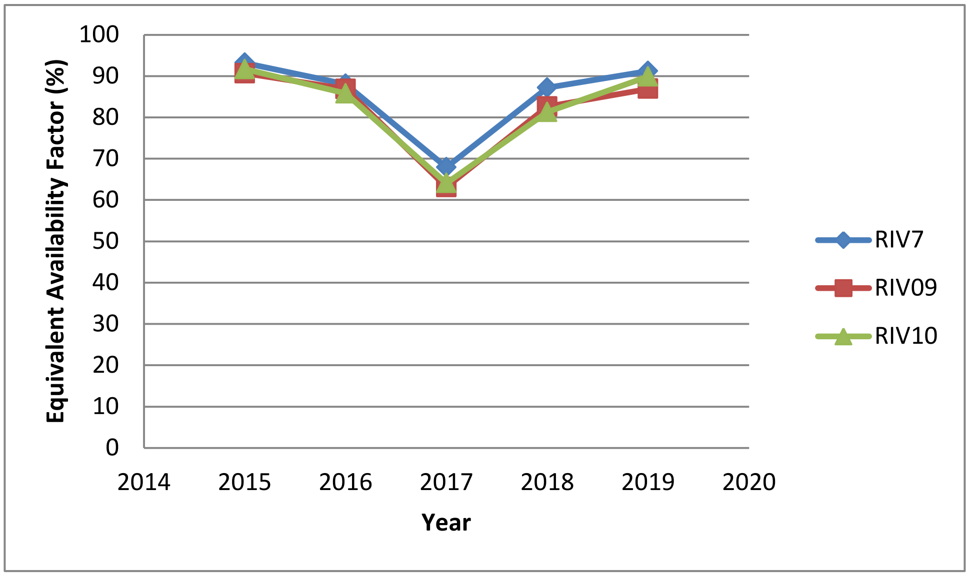
Q. HOW HAS THE RIVERSIDE PLANT PERFORMED BASED ON THE EAF METRIC?

A. The Riverside plant is comprised of a repowered Unit 7 steam turbine in combined cycle with Unit 9 and Unit 10 gas turbines. The historical EAF for these units can be seen in Figure 17 below.

Figure 17

Historic and Current Equivalent Availability Factor (EAF)

Riverside Plant



For 2018, Riverside 7 EAF was 87.2 percent, which was second quartile, whereas Riverside 9 EAF was 82.6 percent and Riverside 10 EAF was 81.3 percent, both of which were fourth quartile.

Through July 2019, Riverside 7 EAF is 91.2 percent and Riverside 10 EAF is 89.9 percent, both of which are second quartile. Riverside 9 EAF is 86.9 percent, which is third quartile. Overall the plant is forecasting EAF to be at 89.2 percent at year end, which is above the plant goal of 88.1 percent.

Q. WHAT DO YOU CONCLUDE FROM THESE METRICS?

A. I conclude that the Riverside plant has been operating well.

Q. WHAT IS THE IMPACT OF SEASONAL DERATES ON THE COMPANY'S INTERMEDIATE PLANTS?

A. The intermediate combined cycle plants see a negative effect from seasonal derating during the summer months. The seasonal rating of a unit can impact its stated availability without truly affecting its performance. In this situation, a unit will see a calculated performance drop in its Net Dependable Capacity (NDC) due to warmer ambient conditions. When air is warmer, its density decreases. This affects the ability of the compressor section of the combustion turbine to supply adequate air for full load combustion. Performance on a given unit is not being impacted by any events, but rather its capacity changes due to ambient temperature conditions. This affects combined cycle units in the NSPM region to a greater extent than units in other regions because of the wide range of ambient weather conditions we experience.

Xcel Energy uses a two-season capacity rating (summer/winter) for the NDC of all generating units. This methodology has a seasonal impact on our combined cycle units during the summer months. For the NSPM region, summer is defined as May through October. This is consistent with industry practice. Other major utilities against which Xcel Energy performs benchmarking also reduce their Net Maximum Capacity (NMC) during the summer months to eliminate the effect of seasonal derating and create a higher EAF performance.

Q. HOW DO YOU EVALUATE FORCED OUTAGES?

A. Any unplanned loss of generating capacity (e.g., through a forced outage or derate) is systematically evaluated through the work management process, the event assessment process, or both. These processes determine the cause of the event and identify corrective actions that are undertaken as governed by Company policy. We take every plant outage very seriously and have a comprehensive corporate policy and procedure for assessing and analyzing the causes of an outage. Exhibit___(RAC-1), Schedule 11 provides this policy. All events impacting the generating capacity of a unit (e.g., unplanned outages or unit derates) require completion of an Event Assessment Report. This report documents all pertinent information associated with the event and includes interviews with personnel involved.

In the event of an outage, we:

- Conduct a root-cause analysis to determine what caused the unplanned loss of capacity and document the incident in writing;
- Document all corrective actions taken to bring the plant back online; and
- Meet regularly to discuss corrective actions and repair progress, tracking the issue until it is resolved.

By collecting this information, we hope to improve our internal processes and prevent similar occurrences in the future. I discuss our process improvements further below.

Unplanned loss of generating capacity events are reviewed both individually and collectively across the fleet to improve operating and maintenance practices. The causes of unplanned loss of generating capacity events can be generally grouped into the following four categories:

- Boiler Tube Leaks;

- Human Performance Events;
- Quality Assurance/Quality Control Related Issues; and
- Work Management Process Issues.

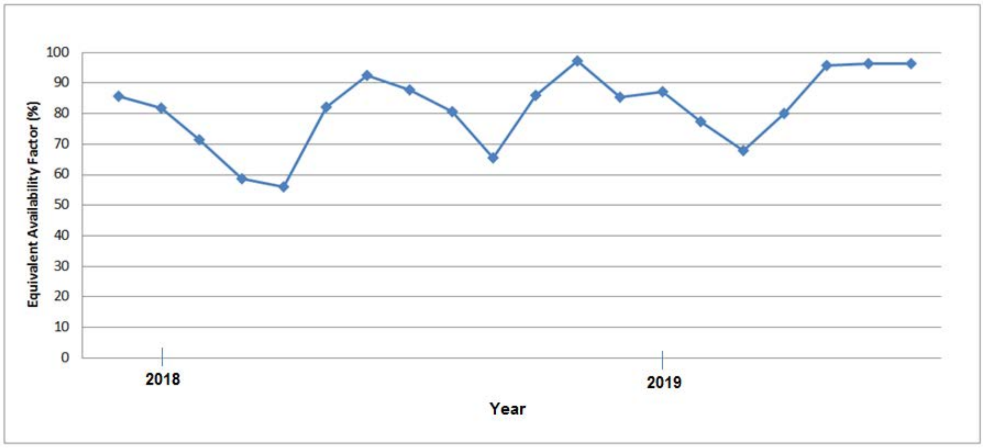
As mentioned, Schedule 10 identifies the causes of each outage from 2016 through July 2019.

B. Best Practices and Productivity Improvements

Q. ARE YOU SATISFIED WITH THE PERFORMANCE OF THE NSPM GENERATING FLEET?

A. While our units are not always in the first quartile for EAF performance (often due to planned overhauls and other planned outages), we believe that our units have generally been operating well and meeting our goals for reliable generation. The most significant impact to our plant EAF performance has been due to planned overhauls in the spring and fall, which are necessary to prevent more costly forced outages during the summer peak demand. Figure 18 shows this relationship and demonstrates how we have sacrificed EAF performance in the shoulder months to ensure our units are available and reliable during the summer.

Figure 18
Historic and Current Equivalent Availability Factor (EAF)
NSP-MN



As shown in Figure 18 above, our units have typically performed within or near the fist quartile for EAF during the summer months when they are needed the most. This is particularly significant considering that our combined cycle plants are somewhat arbitrarily impacted by seasonal derates in the summer.

Q. DURING THE LAST RATE CASE YOU DISCUSSED THE COMPANY'S NEW OPERATING MODEL. HOW HAS THE OPERATING MODEL BEEN PERFORMING?

A. We believe that the Generation Operating Model which was launched in late 2011 has been successful in its purpose of standardizing processes, creating efficiencies, and identifying and sharing best practices across the fleet to ultimately improve plant performance and reduce costs. Due to this success, the Company is utilizing these lessons learned and transitioning to the next phase of the Operating Model in 2019. The most significant component of this transition is the development of the Performance Optimization department which further centralizes our technical support services and develops new departments to transition our organizational structure to match our evolving generation portfolio.

Q. WHAT ARE THE KEY COMPONENTS OF THE PERFORMANCE OPTIMIZATION DEPARTMENT WITHIN THE NEW OPERATING MODEL?

A. The Performance Optimization department was designed to provide a broad fleet focus with centralized functions and common processes to implement a fleet wide asset management strategy and effectively drive systematic improvement in fleet asset and equipment health. Performance Optimization will increase the use of data, advanced analytics, and financial analysis to improve business decision making. The Performance Optimization department can be broken down into Reliability Engineering, Fleet Engineering, and Analytics and Practices.

Q. WHICH FUNCTIONS ARE INCLUDED IN THE RELIABILITY ENGINEERING DEPARTMENT?

A. The Reliability Engineering department is responsible for the daily engineering activities at our plants. This department is organized by plant technologies to optimize the sharing of best practices for each technology. Our coal and RDF units have similar technologies in regard to design, system, and operating characteristics. The Reliability Engineers provide onsite support for our operations and maintenance departments, ensure our plant design basis is maintained, and ensure we implement a consistent asset strategy across the fleet. We have similar engineering support and strategies for our combined cycle and simple cycle units and our renewable generation to account for our increasing renewable portfolio.

Q. WHAT ARE THE FUNCTIONS OF THE FLEET ENGINEERING DEPARTMENT?

A. The Fleet Engineering department is responsible for developing and implementing asset and equipment strategies consistently across the fleet. This department is broken into fleet engineering teams for common systems and components including Electrical and Controls, Boilers and Balance of Plant, Steam Turbines and Gas Turbines, Materials Engineering, and Non-Destructive Examination and Testing. The department is organized by common systems and components to more efficiently and effectively share and implement system best practices and lessons learned. This department also includes an Asset Strategy and Budget Integration team to ensure that fleet asset strategies are effectively integrated and prioritized within our budgets.

Q. WHICH FUNCTIONS ARE INCLUDED IN THE ANALYTICS AND PRACTICES DEPARTMENT?

A. The Analytics and Practices department includes both a Monitoring and Diagnostics team and a System and Equipment Analytics team. The Monitoring and Diagnostics team utilizes the Company's remote monitoring capability and predictive analytics to identify abnormal operational issues and alert plant personnel for corrective actions prior to failure to minimize costs. The System and Equipment Analytics team integrates equipment monitoring, asset performance management analytical tools, and financial analysis to improve existing equipment maintenance practices and transition equipment maintenance towards performance-based and condition-based maintenance practices.

Q. HOW HAS THE NEW OPERATING MODEL IMPACTED PLANT RELIABILITY?

A. While each of our generating units is different, there are sufficient commonalities that we can further implement best practices and consistent program initiatives throughout our fleet. Additionally, by centralizing the management of our fleet, we can capture economies of scale to more efficiently procure service and materials.

Q. PLEASE PROVIDE EXAMPLES OF APPLICATION OF BEST PRACTICES AND EFFICIENCY OR PRODUCTIVITY INITIATIVES.

A. As we transition to the next phase of the Operating Model, we have also developed a Continuous Improvement team that is responsible for identifying and implementing best practices across the fleet.

Also, as discussed in our last rate case, some of the key Operating Model initiatives which will continue include:

- Human Performance Program, which seeks to reduce human error and can be found in Exhibit___(RAC-1), Schedule 12;
- Quality Assurance (QA)/ Quality Control (QC) Program, which can be found in Schedule 5 and seeks to reduce unplanned outage rates and improve unit reliability through stronger QA/QC requirements, contractor oversight, and identification and reporting of non-conformance;
- Work Planning and Scheduling Process, which standardizes planning and scheduling across the Xcel Energy fleet to help ensure the right materials and resources are available at the right time to improve productivity and efficiency; and

- Overhaul Management, which standardizes management of overhaul processes and resources.

Q. ARE THERE OTHER ASPECTS OF THE COMPANY'S WORK YOU WISH TO NOTE?

A. Yes. The Company has been constantly improving its work management process. The most significant improvement is the transition from Maximo to SAP software in 2016. This transition further extended and improved the Company's Work and Asset Management capabilities and process efficiencies, and standardized practices within Energy Supply. Along with SAP, mobility solutions, including wireless tablets, were also instituted to field workers. This allowed for field employees to access, transfer, complete and manage their assigned work orders and service requests generated remotely from SAP. This solution is part of our journey as we strive towards One Xcel Way and improve productivity of the mobile field worker. Some of our immediate benefits enable our field workers to be able to receive up-to-date access to work crew locations and real-time information about work orders, including scope, delays, hold processes and costs. They also have the ability to annotate PDFs, redline drawings, electronically sign documents and perform real-time data synchronization. These devices also integrate with Geographical Information Systems.

The use of these mobile solutions through tablets allows us to capture work delays as they occur and permit the field worker to add pertinent notes to any work activity. This information is then used to improve overall work planning and scheduling practices. The mobile devices have other applications loaded to further assist the field worker on the job, including access to lock-out tag-out application, thermography scanning, and instrument data recording tools.

The Company has also been transitioning from Preventative Maintenance (PM) to more Predictive Maintenance (PdM) to extend maintenance intervals and reduce costs. As we integrate more of our equipment into our control systems, we have been able to improve upon our equipment diagnostics modeling and predictive analytics. This trend will continue with the expansion of the Monitoring and Diagnostic center and implementation of the new System and Equipment Analytics team.

In addition to expanding our remote monitoring capability, we also continue to expand our on-site predictive monitoring programs. Examples of these PdM activities include: 1) Thermography, 2) Vibration Analysis, 3) Acoustic Monitoring, 4) Lubrication Sampling and Analysis, and 5) Miscellaneous Non-Destructive Evaluation (NDE) (*e.g.,* Eddy current testing to determine condenser tube wall thickness). PdM activities are also being used to diagnose equipment problems when unusual conditions are detected.

Q. WHAT ARE YOUR CONCLUSIONS WITH RESPECT TO THE GENERATION OPERATING MODEL?

A. I believe that moving Energy Supply to a fleet-based model has improved performance. Operational improvements could be lost without a centralized governance model. Moving to a fleet-based approach allows the individual plants to leverage the power of the lessons learned. Our model facilitates knowledge transfer of leading practices through formalized, structured interactions and by centralizing critical functions, such as engineering and overhaul management. I believe that expanding these core concepts into the next phase of the Operating Model will continue to improve our plant performance.

Q. IN ADDITION TO THE IMPROVEMENTS YOU JUST DESCRIBED, IS THE COMPANY DOING ANYTHING TO MITIGATE PROCUREMENT COSTS?

A. Yes. The Company utilizes Master Materials Agreements (MMAs) and Master Service Agreements (MSAs) to mitigate procurement costs. The Company strategically identifies which materials and services are required for our business needs and enters into agreements to obtain these at favorable pricing. Our most significant agreements include the following:

- Wind Turbine Maintenance MSA;
  - We have extended the Service, Maintenance, and Warranty agreements for existing wind farms and established new agreements for our expanding wind fleet. These agreements include scheduled maintenance, inspections, repairs, and routine operations support of our wind turbines, balance of plant equipment, and site grounds.
- Combustion Turbine Parts Exchange Program MSA;
  - This agreement was established in 2013 and allows the Company to purchase major gas turbine components which then immediately go into service. Instead of investing in complete sets of emergency spare parts for each plant, we utilize long-term contracts with a qualified parts supplier to provide the parts on a just-in-time basis. This has resulted in better pricing, reduced ownership costs, and fewer overhauls of our gas turbines.
- Combustion Turbine Overhaul MSA;

  - This agreement was established in 2015 and provides combustion turbine overhaul and maintenance services, including Combustion Inspections, Hot Gas Path Inspections, and Major Overhauls.
- Steam Turbine Overhaul MSA;
  - This agreement was established in 2016 and provides steam turbine and generator maintenance services including equipment disassembly, cleaning, inspections, and reassembly. There are also negotiated time and material rates for additional repair work scope if requested by the Company. This MSA leveraged a long-term agreement with a single contractor to establish competitive pricing, transparent work scope and clear pricing structures, and improved predictability of steam turbine maintenance costs and schedules.
- Chemicals Supply MSAs;
  - Our chemical supply MSAs are competitively bid for each major chemical and have resulted in favorable pricing from our suppliers. This includes agreements for activated carbon, aqueous ammonia, lime, sulfuric acid, and other miscellaneous chemicals. By competitively bidding and negotiating long-term agreements with negotiated mark-ups above base commodity index pricing, we leverage our volume purchases to ensure supply and remove pricing risk premiums that are inherent in long-term fixed contracts.

Q. PLEASE DESCRIBE THE MASTER SERVICES AGREEMENT INITIATIVE.

A. Keeping Xcel Energy's generation facilities running smoothly and efficiently requires the careful coordination of a wide range of maintenance processes and activities, including specialized efforts during outages. Much of this maintenance work is completed by contractors, including contractors with specific skills that are not cultivated in-house, such as work on railroad lines and cooling tower inspections.

The contracts required for each subcontractor are often complex and time-consuming to prepare and execute. We therefore launched the Master Services Agreement (MSA) with three main objectives:

- Reduction of costs due to "volume purchasing" at competitively-bid rates and the reduction of the associated transactional inefficiencies of negotiating services agreements on an individual or plant-by-plant basis;
- Consistent contract terms and conditions across business units and projects, which reduces the time spent in negotiation and allows the Company greater control of contractual risk; and
- QA and QC control, through standard contractual terms, allowing stricter adherence to the Company's operating and safety standards.

Q. WHAT BENEFITS HAVE RESULTED FROM THE MSA INITIATIVE?

A. The MSA initiative has reduced the number of service agreements for plant maintenance that we were executing with the same companies on a plant-by-plant basis. This allows our staff to focus on higher-value requests-for-proposals and negotiations, as opposed to one-time purchase orders. It has also resulted in a list of key providers for each work category, which allows plant employees to issue maintenance orders more quickly by having competitively-bid pricing, safety appendices, and terms and conditions already in place.

By aggregating the work performed by contractors across Xcel Energy and using longer-term contracts, we can negotiate better terms and pricing. We estimate that the process of acquiring bids and negotiating longer-term contracts results in a cost reduction of two to seven percent for labor, materials, and equipment.

Q. CAN YOU QUANTIFY THESE BENEFITS?

A. Yes. We continuously monitor our Master Service Agreements to ensure they are being utilized by the Company, and we are seeing value in continuing their terms. The Company is forecasting a 2019 year-end savings total for Xcel Energy Inc. of $97.8 million for the Energy Supply MSAs. Table 7 below summarizes the benefits of these Master Services Agreements.

Table 7

2019 MSA Year End Savings Forecast ($ millions)

(all of Xcel Energy Inc.)

Category Allocation	2019 YE Savings Forecast ($ millions)
Boiler Systems	4.44
Chemicals Gases and Lubes	4.66
Construction	0.35
Fleet	0.43
Maintenance Services	3.71
MRO Materials	0.70
Other	0.30
Turbine and Generator Systems	5.99
Wind	77.25
Total Energy Supply Savings	**97.83**

VI. CONCLUSION

Q. PLEASE SUMMARIZE YOUR TESTIMONY.

A. I recommend that the Commission approve the Energy Supply capital investments and O&M budget presented in this rate case. Our 2020 through 2022 capital additions align with the Company's and State's policy goals and are part of a sound plan to address aging infrastructure and ensure system reliability as we transition to a carbon-free future. To support these capital investments and our existing assets, we have budgeted $142.8 ($103.9) million for O&M in 2020. We manage our O&M activities to keep costs low and operate as efficiently as possible.

Q. DOES THIS CONCLUDE YOUR PRE-FILED DIRECT TESTIMONY?

A. Yes.

Statement of Qualifications

Randy Anthony Capra

General Manager Power Generation, Energy Supply
Xcel Energy Inc.

Randy A. Capra is the General Manager of NSP Power Generation, Energy Supply Operations for Xcel Energy Inc., responsible for all fossil and renewable operations throughout the NSP generation fleet.

Mr. Capra has more than 30 years of regulated utility experience. He joined Xcel Energy is 1985. His career includes assignments in Instrument and Control Specialist, Plant Supervisor, Engineering Manager, Operations Manager, Plant Director and General Manager.

Throughout his career with Xcel Energy, he has held a number of positions of increasing responsibility in the areas of operations, maintenance, engineering, project management and support service functions.

Mr. Capra earned a Bachelor of Science degree in Electronic Engineering from the University of Minnesota – Duluth (UMD).

NSPM Total Company - Excluding the Following Wind Farms: Blazing Star II, Freeborn, Crowned Ridge, Mower, Community Wind North, Jeffers, and Dakota Range

	2016 Actual	2017 Actual	2018 Actual	2016-18 Act Avg	2019 Forecast	2020 Budget	2021 Budget	2022 Budget
Angus Plant	2,492,594	2,042,408	2,198,997	2,244,666	2,194,897	1,841,004	1,764,343	1,937,502
AS King Plant	24,704,794	21,297,022	25,355,172	23,785,663	20,519,920	20,494,685	24,420,304	21,450,084
Black Dog Station	8,729,585	7,427,549	5,452,103	7,203,079	7,254,463	6,142,135	5,562,986	9,957,929
Chemicals	-	-	-	-	424,060	4,894,613	5,215,076	4,946,571
Blue Lake Plant	1,156,422	1,183,990	1,113,645	1,151,352	989,843	1,455,281	1,205,233	1,644,552
Borders Wind	4,507,512	4,879,690	3,390,421	4,259,208	2,711,950	2,699,433	2,780,511	2,805,239
Courtenay Wind	1,308,627	5,724,832	4,980,270	4,004,576	4,161,775	4,062,866	4,080,930	4,135,545
Fibrominn	-	-	2,875,783	958,594	(329,420)	-	-	-
Foxtail Wind	-	-		-	845,948	3,338,669	3,579,434	3,362,868
Grand Meadows Wind	2,574,411	2,785,828	3,205,058	2,855,099	2,831,007	2,733,124	2,856,970	2,859,103
Granite City Plant	54,212	63,327		58,770				
High Bridge Plant	5,417,005	4,705,248	10,173,696	6,765,316	5,374,141	6,527,428	5,472,447	5,945,814
Inver Hills Plant	1,129,360	1,112,070	1,309,782	1,183,737	1,208,170	1,042,562	895,667	916,360
Lake Benton Wind	-	-	-	-	385,198	1,653,435	1,983,478	2,405,331
Chemicals	32,451	6,782		19,617	-	-	-	-
Nobles Wind	3,610,185	4,112,184	4,114,841	3,945,737	4,617,165	4,509,411	4,591,376	4,575,113
Pleasant Valley Wind	5,652,361	7,372,656	4,934,055	5,986,357	4,342,901	4,451,403	4,486,024	4,520,118
Red Wing Plant	5,089,991	5,471,224	5,046,205	5,202,473	4,845,703	4,940,835	5,736,103	5,835,799
Riverside Plant	6,669,373	9,490,481	5,917,660	7,359,171	5,762,932	6,048,978	5,970,645	5,507,421
Sherco Plant	51,557,614	38,019,495	46,716,244	45,431,118	42,330,722	40,973,329	40,177,216	33,482,433
St. Anthony Falls	510,191	861,332	740,693	704,072	549,963	647,798	528,746	666,353
Wilmarth Plant	5,960,023	7,055,002	5,928,121	6,314,382	5,494,258	5,437,325	5,479,299	5,477,832
Disbursed Generation	-	-	-	-	-	-	-	-
Other Energy Supply O&M	21,097,749	20,750,346	22,220,482	21,356,192	16,797,994	16,044,889	15,847,053	16,110,855
Total	$ 152,254,460	$ 144,361,466	$ 155,673,228	$ 150,763,051	$ 133,313,590	$ 139,939,203	$ 142,633,841	$ 138,542,822

Minnesota Jurisdiction Net of Interchange Allocation

	2016 Actual	2017 Actual	2018 Actual	2016-18 Act Avg	2019 Forecast	2020 Budget	2021 Budget	2022 Budget
Angus Plant	1,840,082	1,504,455	1,624,778	1,656,438	1,602,756	1,344,337	1,288,357	1,414,801
AS King Plant	18,237,568	15,687,565	18,734,233	17,553,122	14,900,812	14,892,132	17,697,421	15,553,279
Black Dog Station	6,444,353	5,471,195	4,028,408	5,314,652	5,295,036	4,485,104	4,062,199	7,271,471
Blazing Star I	-	-	-	-	309,657	3,574,140	3,808,148	3,612,081
Blue Lake Plant	853,694	872,137	822,841	849,557	722,802	1,062,674	880,084	1,200,883
Borders Wind	3,327,535	3,594,421	2,505,088	3,142,348	1,980,318	1,971,177	2,030,382	2,048,439
Courtenay Wind	966,054	4,216,959	3,679,783	2,954,266	3,039,008	2,966,782	2,979,973	3,019,854
Fibrominn	-	-	2,124,836	708,279	(240,549)	-	-	-
Foxtail Wind	-	-	-	-	617,728	2,437,960	2,613,771	2,455,631
Grand Meadows Wind	1,900,481	2,052,064	2,368,128	2,106,891	2,067,255	1,995,780	2,086,214	2,087,772
Granite City Plant	40,020	46,647	-	28,889	-	-	-	-
High Bridge Plant	3,998,940	3,465,925	7,517,062	4,993,976	3,923,515	4,766,453	3,996,086	4,341,748
Inver Hills Plant	833,716	819,160	967,762	873,546	882,229	761,299	654,033	669,143
Lake Benton Wind	-	-	-	-	281,279	1,207,370	1,448,374	1,756,419
Minnesota Valley Plant	23,956	4,996	-	9,651	-	-	-	-
Nobles Wind	2,665,110	3,029,069	3,040,342	2,911,507	3,371,542	3,292,858	3,352,711	3,340,835
Pleasant Valley Wind	4,172,685	5,430,760	3,645,636	4,416,360	3,171,269	3,250,500	3,275,780	3,300,676
Red Wing Plant	3,757,532	4,030,150	3,728,501	3,838,728	3,522,770	3,605,880	4,186,600	4,248,694
Riverside Plant	4,923,463	6,990,768	4,372,395	5,428,875	4,208,086	4,417,079	4,359,879	4,021,624
Sherco Plant	38,060,852	28,005,479	34,517,336	33,527,889	30,751,107	29,746,504	29,178,893	24,339,456
St. Anthony Falls	376,633	634,464	547,277	519,458	400,385	471,607	384,931	485,417
Wilmarth Plant	4,399,807	5,196,774	4,380,124	4,658,902	3,987,343	3,941,202	3,971,426	3,970,520
Disbursed Generation	-	-	-	-	-	-	-	-
Other Energy Supply O&M	15,574,776	15,284,879	16,418,097	15,759,251	12,229,292	11,680,940	11,536,771	11,736,238
Total	$ 112,397,258	$ 106,337,868	$ 115,022,627	$ 111,252,584	$ 97,023,638	$ 101,871,778	$ 103,792,034	$ 100,874,981

NSPM Total Company Including New Wind Generation

	2016 Actual	2017 Actual	2018 Actual	2016-18 Act Avg	2019 Forecast	2020 Budget	2021 Budget	2022 Budget
Angus Plant	2,492,594	2,042,408	2,198,997	2,244,666	2,194,897	1,841,004	1,764,343	1,937,502
AS King Plant	24,704,794	21,297,022	25,355,172	23,785,663	20,519,920	20,494,685	24,420,304	21,450,084
Black Dog Station	8,729,585	7,427,549	5,452,103	7,203,079	7,254,463	6,142,135	5,562,986	9,957,929
Chemicals	-	-	-	-	424,060	4,894,613	5,215,076	4,946,571
Blazing Star II	-	-	-	-	-	647,666	4,892,420	5,098,368
Blue Lake Plant	1,156,422	1,183,990	1,113,645	1,151,352	989,843	1,455,281	1,205,233	1,644,552
Borders Wind	4,507,512	4,879,690	3,390,421	4,259,208	2,711,950	2,699,433	2,780,511	2,805,239
Community Wind North	-	-	-	-	-	143,387	949,752	836,223
Courtenay Wind	1,308,627	5,724,832	4,980,270	4,004,576	4,161,775	4,062,866	4,080,930	4,135,545
Crowned Ridge Wind	-	-	-	-	-	1,147,231	4,693,364	5,864,493
Dakota Range Wind	-	-	-	-	-	-	452,396	5,828,060
Fibrominn	-	-	2,875,783	958,594	(329,420)	-	-	-
Foxtail Wind	-	-	-	-	845,948	3,338,669	3,579,434	3,362,868
Freeborn Wind	-	-	-	-	-	492,436	5,710,153	6,049,573
Chemicals	2,574,411	2,785,828	3,205,058	2,855,099	2,831,007	2,733,124	2,856,970	2,859,103
Granite City Plant	54,212	63,327	-	39,180	-	-	-	-
High Bridge Plant	5,417,005	4,705,248	10,173,696	6,765,316	5,374,141	6,527,428	5,472,447	5,945,814
Inver Hills Plant	1,129,360	1,112,070	1,309,782	1,183,737	1,208,170	1,042,562	895,667	916,360
Jeffers Wind	-	-	-	-	-	198,274	1,195,211	1,145,442
Lake Benton Wind	-	-	-	-	385,198	1,653,435	1,983,478	2,405,331
Minnesota Valley Plant	32,451	6,782		19,617	-	-	-	-
Mower Wind	-	-	-	-	-	202,872	3,105,780	3,152,437
Nobles Wind	3,610,185	4,112,184	4,114,841	3,945,737	4,617,165	4,509,411	4,591,376	4,575,113
Pleasant Valley Wind	5,652,361	7,372,656	4,934,055	5,986,357	4,342,901	4,451,403	4,486,024	4,520,118
Red Wing Plant	5,089,991	5,471,224	5,046,205	5,202,473	4,845,703	4,940,835	5,736,103	5,835,799
Riverside Plant	6,669,373	9,490,481	5,917,660	7,359,171	5,762,932	6,048,978	5,970,645	5,507,421
Sherco Plant	51,557,614	38,019,495	46,716,244	45,431,118	42,330,722	40,973,329	40,177,216	33,482,433
St. Anthony Falls	510,191	861,332	740,693	704,072	549,963	647,798	528,746	666,353
Wilmarth Plant	5,960,023	7,055,002	5,928,121	6,314,382	5,494,258	5,437,325	5,479,299	5,477,832
Disbursed Generation	-	-	-	-	-	-	-	-
Other Energy Supply O&M	21,097,749	20,750,346	22,220,482	21,356,192	16,797,994	16,044,889	15,847,053	16,110,855
Total	$ 152,254,460	$ 144,361,466	$ 155,673,228	$ 150,763,051	$ 133,313,590	$ 142,771,069	$ 163,632,917	$ 166,517,418

Minnesota Jurisdiction Net of Interchange Allocation

	2016 Actual	2017 Actual	2018 Actual	2016-18 Act Avg	2019 Forecast	2020 Budget	2021 Budget	2022 Budget
Angus Plant	1,840,082	1,504,455	1,624,778	1,656,438	1,602,756	1,344,337	1,288,357	1,414,801
AS King Plant	18,237,568	15,687,565	18,734,233	17,553,122	14,900,812	14,892,132	17,697,421	15,553,279
Black Dog Station	6,444,353	5,471,195	4,028,408	5,314,652	5,295,036	4,485,104	4,062,199	7,271,471
Blazing Star I	-	-	-	-	309,657	3,574,140	3,808,148	3,612,081
Blazing Star II	-	-	-	-	-	472,938	3,572,539	3,722,926
Blue Lake Plant	853,694	872,137	822,841	849,557	722,802	1,062,674	880,084	1,200,883
Borders Wind	3,327,535	3,594,421	2,505,088	3,142,348	1,980,318	1,971,177	2,030,382	2,048,439
Community Wind North	-	-	-	-	-	104,704	693,527	610,626
Courtenay Wind	966,054	4,216,959	3,679,783	2,954,266	3,039,008	2,966,782	2,979,973	3,019,854
Crowned Ridge Wind	-	-	-	-	-	837,364	3,427,184	4,282,365
Dakota Range Wind	-	-	-	-	-	-	330,348	4,255,761
Fibrominn	-	-	2,124,836	708,279	(240,549)	-	-	-
Foxtail Wind	-	-	-	-	617,728	2,437,960	2,613,771	2,455,631
Freeborn Wind	-	-	-	-	-	359,586	4,169,663	4,417,514
Grand Meadows Wind	1,900,481	2,052,064	2,368,128	2,106,891	2,067,255	1,995,780	2,086,214	2,087,772
Granite City Plant	40,020	46,647	-	28,889	-	-	-	-
High Bridge Plant	3,998,940	3,465,925	7,517,062	4,993,976	3,923,515	4,766,453	3,996,086	4,341,748
Inver Hills Plant	833,716	819,160	967,762	873,546	882,229	761,299	654,033	669,143
Jeffers Wind	-	-	-	-	-	144,784	872,766	836,424
Lake Benton Wind	-	-	-	-	281,279	1,207,370	1,448,374	1,756,419
Minnesota Valley Plant	23,956	4,996	-	9,651	-	-	-	-
Mower Wind	-	-	-	-	-	148,141	2,267,900	2,301,970
Nobles Wind	2,665,110	3,029,069	3,040,342	2,911,507	3,371,542	3,292,858	3,352,711	3,340,835
Pleasant Valley Wind	4,172,685	5,430,760	3,645,636	4,416,360	3,171,269	3,250,500	3,275,780	3,300,676
Red Wing Plant	3,757,532	4,030,150	3,728,501	3,838,728	3,522,770	3,605,880	4,186,600	4,248,694
Riverside Plant	4,923,463	6,990,768	4,372,395	5,428,875	4,208,086	4,417,079	4,359,879	4,021,624
Sherco Plant	38,060,852	28,005,479	34,517,336	33,527,889	30,751,107	29,746,504	29,178,893	24,339,456
St. Anthony Falls	376,633	634,464	547,277	519,458	400,385	471,607	384,931	485,417
Wilmarth Plant	4,399,807	5,196,774	4,380,124	4,658,902	3,987,343	3,941,202	3,971,426	3,970,520
Disbursed Generation	-	-	-	-	-	-	-	-
Other Energy Supply O&M	15,574,776	15,284,879	16,418,097	15,759,251	12,229,292	11,680,940	11,536,771	11,736,238
Total	112,397,258	106,337,868	115,022,627	111,252,584	97,023,638	103,939,295	119,125,961	121,302,567

NSPM Total Company - Excluding the Following Wind Farms: Blazing Star II, Freeborn, Crowned Ridge, Mower, Community Wind North, Jeffers, and Dakota Range

	2016 Actual	2017 Actual	2018 Actual	2016-18 Average	2019 Forecast	2020 Budget	2021 Budget	2022 Budget
Internal Labor	72,076,302	68,411,304	74,479,153	71,655,586	65,640,659	63,766,984	62,112,572	61,496,135
Contract Labor	36,772,021	38,755,328	37,070,615	37,532,655	29,978,262	36,141,743	40,281,684	38,045,890
Materials	24,090,329	17,786,468	18,215,699	20,030,832	18,176,331	21,128,323	20,788,247	20,111,280
Chemicals	8,636,145	8,537,992	6,865,136	8,013,091	8,040,685	6,673,417	6,466,332	6,746,463
Other	10,679,663	10,870,374	19,042,625	13,530,887	11,477,653	12,228,736	12,985,006	12,143,054
Total	$ 152,254,460	$ 144,361,466	$ 155,673,228	$ 150,763,051	$ 133,313,590	$ 139,939,203	$ 142,633,841	$ 138,542,822

Minnesota Jurisdiction Net of Interchange Allocation

	2016 Actual	2017 Actual	2018 Actual	2016-18 Average	2019 Forecast	2020 Budget	2021 Budget	2022 Budget
Internal Labor	53,208,154	50,392,341	55,030,579	52,877,024	47769744.64	46,420,175	45,195,558	44,773,206
Contract Labor	27,145,834	28,547,500	27,390,448	27,694,594	21816568.3	26,309,948	29,310,543	27,699,895
Materials	17,783,958	13,101,662	13,459,074	14,781,565	13227757.06	15,380,694	15,126,349	14,642,326
Chemicals	6,375,373	6,289,157	5,072,458	5,912,329	5851578.504	4,858,018	4,705,158	4,911,866
Other	7,883,939	8,007,209	14,070,067	9,987,072	8352819.14	8,902,100	9,448,403	8,840,937
Total	$ 112,397,258	$ 106,337,868	$ 115,022,627	$ 111,252,584	$ 97,018,468	$ 101,870,935	$ 103,786,011	$ 100,868,230

NSPM Total Company Including New Wind Generation

	2016 Actual	2017 Actual	2018 Actual	2016-18 Average	2019 Forecast	2020 Budget	2021 Budget	2022 Budget
Internal Labor	72,076,302	68,411,304	74,479,153	71,655,586	65,640,659	63,905,815	63,011,429	62,482,112
Contract Labor	36,772,021	38,755,328	37,070,615	37,532,655	29,978,262	37,717,486	53,801,717	54,854,795
Materials	24,090,329	17,759,626	18,215,699	20,021,885	18,176,331	21,295,039	21,535,205	22,465,690
Chemicals	8,636,145	8,564,834	6,865,136	8,022,038	8,040,685	6,673,717	6,467,532	6,747,663
Other	10,679,663	10,870,374	19,042,625	13,530,887	11,477,653	13,179,012	18,817,034	19,967,158
Total	$ 152,254,460	$ 144,361,466	$ 155,673,228	$ 150,763,051	$ 133,313,590	$ 142,771,069	$ 163,632,917	$ 166,517,418

Minnesota Jurisdiction Net of Interchange Allocation

	2016 Actual	2017 Actual	2018 Actual	2016-18 Average	2019 Forecast	2020 Budget	2021 Budget	2022 Budget
Internal Labor	53,208,154	50,392,341	55,030,579	52,877,024	47,772,290.41	46,524,309.19	45,872,781.41	45,516,202.86
Contract Labor	45,994,722	40,779,856	44,455,001	43,743,193	21,817,730.96	44,027,910.88	58,238,569.57	62,540,746.70
Materials	6,375,373	6,289,157	5,072,458	5,912,329	13,228,462.00	4,858,557.44	4,708,410.62	4,915,454.81
Chemicals	6,160,587	7,743,309	10,430,046	8,111,314	5,851,890.35	7,109,915.08	9,709,335.32	6,072,142.84
Other	658,422	1,133,205	34,542	608,723	8,353,264.28	1,418,602.41	596,864.08	2,258,019.80
Total	$ 112,397,258	$ 106,337,868	$ 115,022,627	$ 111,252,584	$ 97,023,638	$ 103,939,295	$ 119,125,961	$ 121,302,567

Company	Project ID	New Grandparent	Project Name	YE Amt	Activity Year
NSP-Minnesota	A.0001705.001	Renewable & New Generation	CRW G100-Crowned Ridge BOT Wind Farm	(329,773,530)	2020
NSP-Minnesota	A.0001702.001	Renewable & New Generation	BS2-G100-Blazing Star II Wind Farm	(311,190,744)	2020
NSP-Minnesota	A.0001704.001	Renewable & New Generation	FBW G100-Freeborn Wind Farm	(272,355,490)	2020
NSP-Minnesota	A.0001724.001	Renewable & New Generation	MWF Mower Wind Farm Purchase	(168,232,680)	2020
NSP-Minnesota	A.0001721.001	Renewable & New Generation	Jeffers Wind Purchase	(71,942,656)	2020
NSP-Minnesota	A.0001722.001	Renewable & New Generation	Community Wind North Purchase	(66,175,547)	2020
NSP-Minnesota	A.0001704.002	Renewable & New Generation	FBW G100-Freeborn Wind Farm Land	(15,690,190)	2020
NSP-Minnesota	A.0001702.005	Renewable & New Generation	BS2-Blazing Star II Wind Farm Tline GIA	(11,613,536)	2020
NSP-Minnesota	A.0001575.005	Reliability & Performance	HBC7C U7 CT Turbine Major Overhaul	(10,190,094)	2020
NSP-Minnesota	A.0001702.003	Renewable & New Generation	BS2-Blazing Star II Wind Farm TSG TLine	(8,844,626)	2020
NSP-Minnesota	A.0001579.136	Reliability & Performance	RIV9C U9 Major Inspection No. 1	(6,445,992)	2020
NSP-Minnesota	A.0001574.655	Environmental Compliance	SHCJC-Bottom Ash Pond 2	(6,160,468)	2020
NSP-Minnesota	A.0001704.004	Renewable & New Generation	FBW G100-Freeborn Wind Farm TSG Sub	(5,080,440)	2020
NSP-Minnesota	A.0001702.004	Renewable & New Generation	BS2-Blazing Star II Wind Farm TSG SUB	(4,441,025)	2020
NSP-Minnesota	A.0001704.005	Renewable & New Generation	FBW-G100-Freeborn Wind Farm Tline GIA	(3,202,419)	2020
NSP-Minnesota	A.0001701.006	Renewable & New Generation	J460 Blazing Star 1 Wind Interc	(3,139,408)	2020
NSP-Minnesota	A.0001579.071	Reliability & Performance	RIV0C -- U9 CT Compressor Upg	(2,618,055)	2020
NSP-Minnesota	A.0001704.003	Renewable & New Generation	FBW G100-Freeborn Wind Farm TSG Tline	(2,286,303)	2020
NSP-Minnesota	A.0001701.001	Renewable & New Generation	BS1-G100-Blazing Star I Wind Farm	(2,257,160)	2020
NSP-Minnesota	A.0001574.665	Reliability & Performance	SHC3C 37_1 & 37_2 FWHs Replace	(2,182,561)	2020
NSP-Minnesota	A.0001574.096	Reliability & Performance	SHC3C Unit Protection PLC Repl	(2,003,694)	2020
NSP-Minnesota	A.0001720.001	Renewable & New Generation	RRI Railroad Community Solar Garden	(1,632,765)	2020
NSP-Minnesota	A.0001574.155	Reliability & Performance	SHC3C U3 31 32 Sec Air Heat Ba	(1,464,188)	2020
NSP-Minnesota	A.0001579.500	Reliability & Performance	RIV Emergent Fund -Other prod	(1,192,908)	2020
NSP-Minnesota	A.0001566.168	Renewable & New Generation	NBL0C Gearbox Replacements	(1,122,004)	2020
NSP-Minnesota	A.0001575.500	Reliability & Performance	HBR Emergent Fund -Other prod	(1,050,719)	2020
NSP-Minnesota	A.0001565.083	Environmental Compliance	WLM0-Cap WLM Landfill Cells 8, 9, 10	(887,015)	2020
NSP-Minnesota	A.0001574.811	Reliability & Performance	SHC3-Isolation valves HP FWHs-22762	(868,861)	2020
NSP-Minnesota	A.0001574.135	Reliability & Performance	SHC3C Replace Ash Panel PLC	(862,471)	2020
NSP-Minnesota	A.0001574.789	Reliability & Performance	SHC3-Foxboro Contr & IO Repl 21991	(832,907)	2020
NSP-Minnesota	A.0001580.007	Renewable & New Generation	CWF0-Courtenay Gearbox Replacement	(750,852)	2020
NSP-Minnesota	A.0001611.009	Renewable & New Generation	PVW0-Pleasant Valley Gearbox Replacement	(725,063)	2020
NSP-Minnesota	A.0001574.663	Reliability & Performance	SHC3C Controls Replacement	(645,184)	2020
NSP-Minnesota	A.0001574.293	Reliability & Performance	SHC99 - Barn #54 Receiving Chute - 23436	(645,080)	2020
NSP-Minnesota	A.0001576.005	Renewable & New Generation	GDM0C Gearbox Replacements 201	(622,658)	2020
NSP-Minnesota	A.0001574.812	Reliability & Performance	SHC3-U3 HP Turb Nozzle Repl-22719	(615,778)	2020
NSP-Minnesota	A.0001575.166	Reliability & Performance	HBC7-U7 LP Lower Prehtr Hdr Repl-19491	(614,309)	2020
NSP-Minnesota	A.0001574.173	Reliability & Performance	SHC3C Emergent work	(589,332)	2020
NSP-Minnesota	A.0001574.657	Reliability & Performance	SHC3C Bottom Ash PLC Replace	(509,998)	2020
NSP-Minnesota	A.0001574.792	Environmental Compliance	SHC3-Lime Rcvng & DC PLC repl 21801	(507,678)	2020
NSP-Minnesota	A.0001574.683	Reliability & Performance	SHCJC Motor Protect Relay Replace	(506,966)	2020
NSP-Minnesota	A.0001574.662	Reliability & Performance	SHC3C BFPT Overspeed Ctrl Replace	(458,390)	2020
NSP-Minnesota	A.0001573.500	Reliability & Performance	BDS Emergent Fund -Other prod	(414,042)	2020
NSP-Minnesota	A.0001574.669	Reliability & Performance	SHC3C Rpl Stm Drum Separator Cans	(377,393)	2020
NSP-Minnesota	A.0001574.502	Reliability & Performance	SHC2-U2 Mill OH 2020 Fall	(353,370)	2020
NSP-Minnesota	A.0001574.521	Reliability & Performance	SHC3C Mill OH 2020 Fall	(347,633)	2020
NSP-Minnesota	A.0001574.522	Reliability & Performance	SHC3C Mill OH 2020 Spring	(347,633)	2020
NSP-Minnesota	A.0001574.519	Reliability & Performance	SHC3C Circuit Breaker Repl	(345,411)	2020
NSP-Minnesota	A.0001572.500	Reliability & Performance	ASK Emergent Fund -Steam prod	(338,632)	2020
NSP-Minnesota	A.0001580.008	Renewable & New Generation	CWF1-Generator Replacements	(319,028)	2020
NSP-Minnesota	A.0001574.797	Reliability & Performance	SHC2-Level 2 Mill OH 2020 Spring 15883	(303,092)	2020
NSP-Minnesota	A.0001574.487	Reliability & Performance	SHC1C Mill 2020 Fall	(302,814)	2020
NSP-Minnesota	A.0001574.678	Reliability & Performance	SHC3C Boiler Wall Air Ports	(285,755)	2020
NSP-Minnesota	A.0001562.148	Environmental Compliance	REW2C-REW2 - U2 baghouse bags	(282,335)	2020
NSP-Minnesota	A.0001702.006	Renewable & New Generation	BS2-Blazing Star II TSG Tline 115kV	(242,372)	2020
NSP-Minnesota	A.0001574.459	Reliability & Performance	SHC1C Level 2 Mill Summer 2020	(242,147)	2020
NSP-Minnesota	A.0001574.660	Environmental Compliance	SHC3C Addtnl O2 Probes	(226,050)	2020
NSP-Minnesota	A.0003000.698	Reliability & Performance	SER-CHM-Misc Tools-MN	(203,340)	2020
NSP-Minnesota	A.0001574.195	Reliability & Performance	SHC2C 2018 Small Project Routi	(177,825)	2020
NSP-Minnesota	A.0001574.180	Reliability & Performance	SHC1C 2018 Small Project Routi	(160,308)	2020
NSP-Minnesota	A.0001574.172	Reliability & Performance	SHCCC 2018 Small Project routi	(157,330)	2020
NSP-Minnesota	A.0001571.500	Reliability & Performance	ANS Emergent Fund -Other prod	(149,041)	2020
NSP-Minnesota	A.0001571.079	Reliability & Performance	ANS3C Rpl U3 Generator Breaker and MOD	(144,891)	2020
NSP-Minnesota	A.0001580.009	Renewable & New Generation	CWF1-Transformer Replacements	(143,297)	2020
NSP-Minnesota	A.0001564.005	Reliability & Performance	HNI0C Replace Sluiceway Bridge	(142,760)	2020
NSP-Minnesota	A.0001574.520	Reliability & Performance	SHC3C Damper Actuator repl	(141,556)	2020

Company	Project ID	New Grandparent	Project Name	YE Amt	Activity Year
NSP-Minnesota	A.0001574.294	Reliability & Performance	SHC99 - Coal Barn DS System - 23443	(141,088)	2020
NSP-Minnesota	A.0001574.174	Reliability & Performance	SHCJC 2018 Small Project routi	(126,621)	2020
NSP-Minnesota	A.0001611.010	Renewable & New Generation	PVW1-Generator Replacements	(124,802)	2020
NSP-Minnesota	A.0001576.013	Renewable & New Generation	GDM Eagle Take Permit	(118,431)	2020
NSP-Minnesota	A.0001611.011	Renewable & New Generation	PVW1-Transformer Replacements	(116,010)	2020
NSP-Minnesota	A.0001579.141	Reliability & Performance	RIV9 - Rplc Compressor Bleed Vlv - 23389	(110,923)	2020
NSP-Minnesota	A.0001573.088	Reliability & Performance	BDS0 -Rplc Statn#9 Air Compressor-23728	(104,016)	2020
NSP-Minnesota	A.0001574.296	Reliability & Performance	SHC99 -CESP-2020 #1 CC Rotor Asmbl-23375	(103,769)	2020
NSP-Minnesota	A.0001562.044	Reliability & Performance	REW1C REPLACE C7 ASH CONVEYOR	(100,882)	2020
NSP-Minnesota	A.0001562.087	Reliability & Performance	REW1C REPLACE BIN 11 AUGERS	(100,591)	2020
NSP-Minnesota	A.0001574.356	Reliability & Performance	SHC1C Control Room Roof Repl.	(100,358)	2020
NSP-Minnesota	A.0001574.252	Reliability & Performance	SHC99 Emergent work	(99,321)	2020
NSP-Minnesota	A.0001574.198	Reliability & Performance	SHCCC 2017 Emergent Work	(98,141)	2020
NSP-Minnesota	A.0001574.395	Reliability & Performance	SHC3C #32 BFP Overhaul	(96,594)	2020
NSP-Minnesota	A.0001574.190	Reliability & Performance	SHC3C 2018 Small Project Routi	(95,965)	2020
NSP-Minnesota	A.0001579.103	Reliability & Performance	RIV9 -Replace Lube Oil Pump - 23388	(95,700)	2020
NSP-Minnesota	A.0001573.214	Reliability & Performance	BDS6-Install U6 Turning Gear VFD-22766	(95,388)	2020
NSP-Minnesota	A.0001574.269	Reliability & Performance	SHC2C Emergent Projects	(90,721)	2020
NSP-Minnesota	A.0001573.089	Reliability & Performance	BDS0 - Rplc 11 Screen Wash Pump -23629	(89,727)	2020
NSP-Minnesota	A.0001574.268	Reliability & Performance	SHC1C Emergent Projects	(89,581)	2020
NSP-Minnesota	A.0001574.292	Environmental Compliance	SHC0 -Rplc DS Pmphouse Pipe vlv'20-23439	(85,922)	2020
NSP-Minnesota	A.0001574.216	Reliability & Performance	SHC3C 2016 Polisher Controls R	(82,777)	2020
NSP-Minnesota	A.0001574.423	Reliability & Performance	SHC3C Turb Isolation Vlv TG	(82,647)	2020
NSP-Minnesota	A.0001574.778	Environmental Compliance	SHC0-Lime slaking building roof 22109	(82,300)	2020
NSP-Minnesota	A.0001579.102	Reliability & Performance	RIV9 - Rplc Hydraulic Oil Pumps - 23386	(78,028)	2020
NSP-Minnesota	A.0003000.709	Renewable & New Generation	G100C PVW Eagle Take Permit	(76,644)	2020
NSP-Minnesota	A.0001574.295	Reliability & Performance	SHC0 -#54 Pit Floor Slope ReCover -23434	(75,989)	2020
NSP-Minnesota	A.0001564.027	Reliability & Performance	HNI4C Replace Unit 4 Shaft Seals	(70,571)	2020
NSP-Minnesota	A.0001559.113	Reliability & Performance	BLL7C Replace u7 battery	(60,191)	2020
NSP-Minnesota	A.0003000.559	Reliability & Performance	SER0C CHM Dissipation Factor	(60,000)	2020
NSP-Minnesota	A.0001565.500	Reliability & Performance	WLM Emergent Fund -Steam prod	(54,449)	2020
NSP-Minnesota	A.0001574.290	Reliability & Performance	SHC3 - 6A or 6B Conveyer Gearbox - 23381	(51,077)	2020
NSP-Minnesota	A.0001574.723	Environmental Compliance	SHC0C Stack CEMS Eqmt Repl	(48,090)	2020
NSP-Minnesota	A.0001574.291	Reliability & Performance	SHC99 - #52 Tripper Gearbox XMSN - 23380	(45,326)	2020
NSP-Minnesota	A.0001562.500	Reliability & Performance	REW Emergent Fund -Steam prod	(43,973)	2020
NSP-Minnesota	A.0001559.106	Reliability & Performance	BLL0C 78 LV BKR Buy	(37,187)	2020
NSP-Minnesota	A.0001611.005	Renewable & New Generation	PVW-Wind Expansion Project	(14,765)	2020
NSP-Minnesota	A.0001561.500	Reliability & Performance	IVH Emergent Fund -Other prod	(9,124)	2020
NSP-Minnesota	A.0001707.002	Renewable & New Generation	DKR0 Dakota Rnage Wind Land	(8,729)	2020
NSP-Minnesota	A.0001574.770	Reliability & Performance	SHC3C ID Fan HVAC PLC Rplc	(4,488)	2020
NSP-Minnesota	A.0001559.500	Reliability & Performance	BLL Emergent Fund -Other prod	(2,728)	2020
NSP-Minnesota	A.0001565.104	Reliability & Performance	WLM0C New Ash Loadout Building	(500)	2020
NSP-Minnesota	A.0001705.003	Renewable & New Generation	CRW-Crowned Ridge BOT Wind Tline TSG	(104)	2020
NSP-Minnesota	A.0001705.004	Renewable & New Generation	CRW-Crowned Ridge BOT Wind Sub TSG	(104)	2020
NSP-Minnesota	A.0001705.005	Renewable & New Generation	CRW-Crowned Ridge BOT Wind Farm GIA	(104)	2020
NSP-Minnesota	A.0001705.002	Renewable & New Generation	CRW-Crowned Ridge BOT Wind Farm Land	(100)	2020
NSP-Minnesota	A.0001707.001	Renewable & New Generation	DKR0 Dakota Range Wind Turbines	(353,069,462)	2021
NSP-Minnesota	A.0001707.004	Renewable & New Generation	DKR0 Dakota Range Wind TSG Sub	(14,747,578)	2021
NSP-Minnesota	A.0001707.005	Renewable & New Generation	DKR0 Dakota Range Wind 345Kv Line GIA	(12,913,773)	2021
NSP-Minnesota	A.0001574.286	Reliability & Performance	SHCJC Replace Auxiliary Boilers	(11,326,259)	2021
NSP-Minnesota	A.0001572.204	Reliability & Performance	ASK1C Secondary Superheater Replace	(9,290,304)	2021
NSP-Minnesota	A.0001579.137	Reliability & Performance	RIV10C U10 Major Inspection No. 1	(6,719,274)	2021
NSP-Minnesota	A.0001723.003	Reliability & Performance	MEC3 - Replace Turbine Blades - 23663	(4,642,899)	2021
NSP-Minnesota	A.0001574.087	Environmental Compliance	SHC3C U3 Landfill Cell 4	(3,424,090)	2021
NSP-Minnesota	A.0001574.808	Environmental Compliance	SHC99 Stormwater Management 22619	(3,352,084)	2021
NSP-Minnesota	A.0001579.080	Reliability & Performance	RIV0C --U10 CT Compressor Upgr	(2,767,708)	2021
NSP-Minnesota	A.0001579.122	Reliability & Performance	RIV7-Replace U7 GSU Transforme	(2,717,347)	2021
NSP-Minnesota	A.0001572.208	Reliability & Performance	ASK1C Cyclone Refractory Replace	(2,527,873)	2021
NSP-Minnesota	A.0001579.101	Reliability & Performance	RIV7 - Rplc L-1 LP Rotor Blading - 22491	(2,506,955)	2021
NSP-Minnesota	A.0001572.122	Environmental Compliance	ASK1C- Replace SCR Catalyst 20	(2,454,668)	2021
NSP-Minnesota	A.0001723.002	Reliability & Performance	MEC2 - Combustion Inspection - 23606	(2,335,112)	2021
NSP-Minnesota	A.0001574.288	Reliability & Performance	SHC1 - Rplc Hot & Int. AH Basket - 23407	(2,275,186)	2021
NSP-Minnesota	A.0001562.057	Environmental Compliance	REW0C LANDFILL CELL 5 CONSTRUC	(2,023,394)	2021
NSP-Minnesota	A.0001562.086	Reliability & Performance	REW1C U1 GENERATOR REWIND	(1,891,071)	2021
NSP-Minnesota	A.0001572.048	Reliability & Performance	ASK1C-Inst Emerson DCS Evergre	(1,842,143)	2021
NSP-Minnesota	A.0001579.063	Reliability & Performance	RIV0C Emerson DCS Evergreen 20	(1,699,916)	2021

Company	Project ID	New Grandparent	Project Name	YE Amt	Activity Year
NSP-Minnesota	A.0001559.014	Reliability & Performance	BLL8-U8 CT Control System Repl	(1,663,866)	2021
NSP-Minnesota	A.0001559.015	Reliability & Performance	BLL7-U7 CT Control System Repl	(1,663,866)	2021
NSP-Minnesota	A.0001566.168	Renewable & New Generation	NBL0C Gearbox Replacements	(1,579,827)	2021
NSP-Minnesota	A.0001579.079	Reliability & Performance	RIV0C --U10 CT Cntrl Sys Upg	(1,546,819)	2021
NSP-Minnesota	A.0001579.084	Reliability & Performance	RIV0C --U9 CT Control System U	(1,546,819)	2021
NSP-Minnesota	A.0001559.005	Reliability & Performance	BLLC8 U8 Exhaust Silencer Repl	(1,538,736)	2021
NSP-Minnesota	A.0001572.120	Reliability & Performance	ASK1C --11 RSA Transformer	(1,463,427)	2021
NSP-Minnesota	A.0001579.500	Reliability & Performance	RIV Emergent Fund -Other prod	(1,406,299)	2021
NSP-Minnesota	A.0001564.028	Reliability & Performance	HNI0C Replace Trash Rack Raker	(1,377,459)	2021
NSP-Minnesota	A.0001575.500	Reliability & Performance	HBR Emergent Fund -Other prod	(1,282,285)	2021
NSP-Minnesota	A.0001572.250	Reliability & Performance	ASK1-Generator Stator Rewedge - 23429	(1,158,837)	2021
NSP-Minnesota	A.0001572.152	Reliability & Performance	ASK1-480V Plant Swgr Bus 3-4 R	(1,149,576)	2021
NSP-Minnesota	A.0001576.005	Renewable & New Generation	GDM0C Gearbox Replacements 201	(1,046,447)	2021
NSP-Minnesota	A.0001580.007	Renewable & New Generation	CWF0-Courtenay Gearbox Replacement	(1,043,529)	2021
NSP-Minnesota	A.0001572.222	Reliability & Performance	ASK99C 480V Coal Yrd Swgr Bus3-4 Rplc	(964,314)	2021
NSP-Minnesota	A.0001573.205	Reliability & Performance	BDS0C-Replace Fire Protection Panels	(963,944)	2021
NSP-Minnesota	A.0001611.004	Environmental Compliance	PVW0C Eagle Take Permit	(844,062)	2021
NSP-Minnesota	A.0001580.010	Environmental Compliance	CWF FAA Radar Lighting System-23131	(773,987)	2021
NSP-Minnesota	A.0001610.009	Environmental Compliance	BWF FAA Radar Lighting System-23132	(773,987)	2021
NSP-Minnesota	A.0001611.009	Renewable & New Generation	PVW0-Pleasant Valley Gearbox Replacement	(765,579)	2021
NSP-Minnesota	A.0001591.004	Reliability & Performance	-17478 ANS0C BOP Evrgren Ctrl	(756,475)	2021
NSP-Minnesota	A.0001574.817	Reliability & Performance	SHC1-U1 DCS HW & Security Server-22684	(748,594)	2021
NSP-Minnesota	A.0001579.093	Reliability & Performance	RIV9C-Install Preheater Harps Unit 9	(668,879)	2021
NSP-Minnesota	A.0001579.097	Reliability & Performance	RIV10C-Install Preheater Harps Unit 10	(668,695)	2021
NSP-Minnesota	A.0001573.500	Reliability & Performance	BDS Emergent Fund -Other prod	(666,337)	2021
NSP-Minnesota	A.0001574.795	Reliability & Performance	SHC1-Upgrade U1 BMS HMI 21987	(654,676)	2021
NSP-Minnesota	A.0001579.143	Reliability & Performance	RIV0C-LCI Hardware and Ctrls Replace	(619,257)	2021
NSP-Minnesota	A.0001574.764	Reliability & Performance	SHC1C Bus 13 14 Prot Relays Rplc	(599,870)	2021
NSP-Minnesota	A.0001574.471	Reliability & Performance	SHC99-SHC99-Rpl SR Slew Drives	(569,363)	2021
NSP-Minnesota	A.0001574.298	Reliability & Performance	SHC99 - Barn #51 Discharge Chute - 23437	(569,201)	2021
NSP-Minnesota	A.0001579.127	Reliability & Performance	RIV7C-Install Circ Water Pumps CESP 1086	(561,244)	2021
NSP-Minnesota	A.0001559.112	Reliability & Performance	BLL7C U7-Excitation System Replacement	(526,611)	2021
NSP-Minnesota	A.0001559.114	Reliability & Performance	BLL8C U8 Excitation System Replacement	(526,611)	2021
NSP-Minnesota	A.0001562.038	Environmental Compliance	REW0 - EPA 316b-Traveling Screens -23724	(512,059)	2021
NSP-Minnesota	A.0001559.104	Reliability & Performance	BLL0C LCI Controls Replacement	(506,979)	2021
NSP-Minnesota	A.0001573.210	Reliability & Performance	BDS0C-Replace Obsolete EDG Controls	(465,698)	2021
NSP-Minnesota	A.0001572.177	Reliability & Performance	ASK1C Repl ID Fan Suction Exp	(461,402)	2021
NSP-Minnesota	A.0001572.500	Reliability & Performance	ASK Emergent Fund -Steam prod	(456,366)	2021
NSP-Minnesota	A.0001701.013	Renewable & New Generation	BS1 - Blazing Star1 PCMM - 23572	(424,763)	2021
NSP-Minnesota	A.0001705.009	Renewable & New Generation	CRW0 - Replace Generator - 23550	(424,763)	2021
NSP-Minnesota	A.0001706.008	Renewable & New Generation	LBW - Lake Benton PCMM - 23577	(424,763)	2021
NSP-Minnesota	A.0001574.180	Reliability & Performance	SHC1C 2018 Small Project Routi	(403,788)	2021
NSP-Minnesota	A.0001574.198	Reliability & Performance	SHCCC 2017 Emergent Work	(382,377)	2021
NSP-Minnesota	A.0001579.085	Reliability & Performance	RIV0C -- Inst U9 Auto Tuning P	(382,058)	2021
NSP-Minnesota	A.0001561.014	Reliability & Performance	IVH3C U3-4 UG Cable Replace	(371,245)	2021
NSP-Minnesota	A.0001703.009	Renewable & New Generation	FXW - Foxtail PCMM - 23574	(364,083)	2021
NSP-Minnesota	A.0001574.482	Reliability & Performance	SHC1-U1 Mill 2021 Fall	(356,750)	2021
NSP-Minnesota	A.0001562.030	Reliability & Performance	REW0C RDF WALKING FLOOR REPLAC	(356,685)	2021
NSP-Minnesota	A.0001574.524	Reliability & Performance	SHC3C Mill OH 2021 Spring	(355,203)	2021
NSP-Minnesota	A.0001579.086	Reliability & Performance	RIV0C -- Inst U10 Auto Tuning	(351,610)	2021
NSP-Minnesota	A.0001562.031	Reliability & Performance	REW1C U1 TURBINE BLADE REPLACE	(351,314)	2021
NSP-Minnesota	A.0003000.698	Reliability & Performance	SER-CHM-Misc Tools-MN	(349,780)	2021
NSP-Minnesota	A.0001574.190	Reliability & Performance	SHC3C 2018 Small Project Routi	(348,939)	2021
NSP-Minnesota	A.0001574.523	Reliability & Performance	SHC3C Mill OH 2021 Fall	(347,717)	2021
NSP-Minnesota	A.0001580.008	Renewable & New Generation	CWF1-Generator Replacements	(336,855)	2021
NSP-Minnesota	A.0001574.195	Reliability & Performance	SHC2C 2018 Small Project Routi	(326,608)	2021
NSP-Minnesota	A.0001574.818	Reliability & Performance	SHC1-Turb Ctrl Vlv Internals 2021-22720	(319,835)	2021
NSP-Minnesota	A.0001574.798	Reliability & Performance	SHC1-Level 2 Mill OH 2021 Spring 15876	(308,968)	2021
NSP-Minnesota	A.0001574.799	Reliability & Performance	SHC2-Level 2 Mill OH 2021 Spring 15874	(308,968)	2021
NSP-Minnesota	A.0001574.533	Reliability & Performance	SHC0C Seal Wtr Pump Strainer	(307,443)	2021
NSP-Minnesota	A.0001574.504	Reliability & Performance	SHC2-U2 Mill OH 2021 Fall	(302,315)	2021
NSP-Minnesota	A.0001579.078	Reliability & Performance	RIV0C -- Inst Water Panel Auto	(291,484)	2021
NSP-Minnesota	A.0001575.164	Reliability & Performance	HBC9C-Replace Seal Steam Superheater	(288,233)	2021
NSP-Minnesota	A.0001573.215	Reliability & Performance	BDS6-Install 62 Air Compressor-22767	(286,119)	2021
NSP-Minnesota	A.0001572.176	Reliability & Performance	ASK1C Repl Hydrojet PC HF Sens	(284,024)	2021
NSP-Minnesota	A.0001574.734	Reliability & Performance	SHC0C Fire Prot Admin_Mapper Bldg	(274,737)	2021

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NSP-Minnesota	A.0001574.741	Reliability & Performance	SHC0C Service H2O Pipe Rplc	(273,051)	2021
NSP-Minnesota	A.0001571.079	Reliability & Performance	ANS3C Rpl U3 Generator Breaker and MOD	(260,935)	2021
NSP-Minnesota	A.0001574.731	Reliability & Performance	SHC0C Fuel Oil Pump F.P.	(255,782)	2021
NSP-Minnesota	A.0001562.500	Reliability & Performance	REW Emergent Fund -Steam prod	(246,477)	2021
NSP-Minnesota	A.0001565.118	Environmental Compliance	WLM1C Replace U1 Baghouse Bags	(244,527)	2021
NSP-Minnesota	A.0001576.006	Renewable & New Generation	GDM0C Generator Replacements 2	(239,716)	2021
NSP-Minnesota	A.0001572.027	Reliability & Performance	ASK1C-Admin Bldg HVAC Replace	(239,412)	2021
NSP-Minnesota	A.0001571.500	Reliability & Performance	ANS Emergent Fund -Other prod	(239,055)	2021
NSP-Minnesota	A.0001573.112	Reliability & Performance	BDS2 - Ovhl 22 Circ Water Pump - 23694	(239,048)	2021
NSP-Minnesota	A.0001574.738	Reliability & Performance	SHC0 2RSA H_Bushng Rplcmnt	(235,273)	2021
NSP-Minnesota	A.0001573.206	Reliability & Performance	BDS0C-Replace CV Positioners	(234,906)	2021
NSP-Minnesota	A.0001574.754	Reliability & Performance	SHC1C ID Fan Damper Drives Rplc 18	(230,127)	2021
NSP-Minnesota	A.0001579.138	Reliability & Performance	RIV10C U10 Comb Dynamics Replace	(225,604)	2021
NSP-Minnesota	A.0001579.139	Reliability & Performance	RIV9C U9 Comb Dynamics Replace	(225,499)	2021
NSP-Minnesota	A.0001574.172	Reliability & Performance	SHCCC 2018 Small Project routi	(215,045)	2021
NSP-Minnesota	A.0001702.001	Renewable & New Generation	BS2-G100-Blazing Star II Wind Farm	(210,400)	2021
NSP-Minnesota	A.0001565.500	Reliability & Performance	WLM Emergent Fund -Steam prod	(200,074)	2021
NSP-Minnesota	A.0001704.001	Renewable & New Generation	FBW G100-Freeborn Wind Farm	(200,000)	2021
NSP-Minnesota	A.0003000.682	Reliability & Performance	SHCJC Tools and Equip pur	(200,000)	2021
NSP-Minnesota	A.0001573.135	Reliability & Performance	BDS5C HRSG Thermocouple	(194,206)	2021
NSP-Minnesota	A.0003000.699	Reliability & Performance	SER-SMC-Misc Tools & Equipment	(192,000)	2021
NSP-Minnesota	A.0001574.762	Reliability & Performance	SHC1C Rewind BCP Motor 2021	(180,520)	2021
NSP-Minnesota	A.0001565.086	Environmental Compliance	WLM2 -Replace U2 CEMS Analyzers -23754	(178,911)	2021
NSP-Minnesota	A.0001565.085	Environmental Compliance	WLM1 -Replace U1 CEMS Analyzers -23753	(178,699)	2021
NSP-Minnesota	A.0001574.174	Reliability & Performance	SHCJC 2018 Small Project routi	(172,119)	2021
NSP-Minnesota	A.0001574.800	Environmental Compliance	SHC3-SHC3-Haul Road 2021 19888	(171,395)	2021
NSP-Minnesota	A.0001574.419	Reliability & Performance	SHC3C Control Room Roof Repl	(169,724)	2021
NSP-Minnesota	A.0001575.041	Reliability & Performance	HBC7C U7 Exh Exp Joint	(165,945)	2021
NSP-Minnesota	A.0001579.077	Reliability & Performance	RIV0C -- DP Mon & Gen Gas Drye	(165,831)	2021
NSP-Minnesota	A.0001575.042	Reliability & Performance	HBC8C U8Exh Exp Joint	(164,233)	2021
NSP-Minnesota	A.0003000.697	Reliability & Performance	SER-MMR- Misc Tools & Equip	(155,000)	2021
NSP-Minnesota	A.0001707.003	Renewable & New Generation	DKR0 Dakota Range Wind TSG 345Kv Line	(154,977)	2021
NSP-Minnesota	A.0001574.788	Environmental Compliance	SHC1-Upper Field 2nd PS 22098	(154,750)	2021
NSP-Minnesota	A.0001573.180	Reliability & Performance	BDS0C Plt Elec Dist Sys Mods 2021	(152,518)	2021
NSP-Minnesota	A.0003000.658	Reliability & Performance	ASK0C- Tool Blanket	(150,000)	2021
NSP-Minnesota	A.0001565.036	Reliability & Performance	WLM0C Inst Station Aux Power S	(147,206)	2021
NSP-Minnesota	A.0001574.819	Reliability & Performance	SHC1-U1 TCS HMI Repl-22764	(143,290)	2021
NSP-Minnesota	A.0001574.790	Reliability & Performance	SHC0-CS1 Gas Bottle Storage 21784	(135,797)	2021
NSP-Minnesota	A.0001574.750	Reliability & Performance	SHC1C Scrubber Duct Exp Jnts Rplc 2021	(135,335)	2021
NSP-Minnesota	A.0001573.121	Reliability & Performance	BDS2 - Install DC Seal Oil Pump - 23408	(129,665)	2021
NSP-Minnesota	A.0001572.107	Reliability & Performance	ASK1C Inst GRF Damper Drives	(129,266)	2021
NSP-Minnesota	A.0001576.013	Renewable & New Generation	GDM Eagle Take Permit	(127,066)	2021
NSP-Minnesota	A.0001580.009	Renewable & New Generation	CWF1-Transformer Replacements	(125,454)	2021
NSP-Minnesota	A.0001611.011	Renewable & New Generation	PVW1-Transformer Replacements	(122,493)	2021
NSP-Minnesota	A.0001574.486	Reliability & Performance	SHC1-U1 Secoal Coal Detectors	(114,646)	2021
NSP-Minnesota	A.0001611.010	Renewable & New Generation	PVW1-Generator Replacements	(114,288)	2021
NSP-Minnesota	A.0001579.142	Reliability & Performance	RIV10 - Rplc Compressor Bleed Vlv -23334	(111,416)	2021
NSP-Minnesota	A.0001573.010	Reliability & Performance	BDS5C Cooling Water Strainer R	(109,435)	2021
NSP-Minnesota	A.0001574.302	Reliability & Performance	SHC99-CESP-2021 #2 CC Rotor Asmbl-23363	(103,717)	2021
NSP-Minnesota	A.0001574.303	Reliability & Performance	SHC99 -CESP-2021 #4 CC Rotor Asmbl-23366	(103,717)	2021
NSP-Minnesota	A.0001574.297	Reliability & Performance	SHC99-CESP-2020 #3 CC Rotor Asmbl-23379	(103,710)	2021
NSP-Minnesota	A.0001573.100	Environmental Compliance	BDS0C Dredge Spoils Dewater	(101,923)	2021
NSP-Minnesota	A.0001575.168	Reliability & Performance	HBC0 -New Instmnt Air Compressor -23445	(96,697)	2021
NSP-Minnesota	A.0001573.120	Reliability & Performance	BDS2 -Rplc Circ Pump Disch Valves -23271	(96,593)	2021
NSP-Minnesota	A.0001574.347	Reliability & Performance	SHC1C Boiler Ignitor Replaceme	(96,027)	2021
NSP-Minnesota	A.0001579.144	Reliability & Performance	RIV10 -Rplc Lube Oil Pump -23387	(95,273)	2021
NSP-Minnesota	A.0001562.134	Reliability & Performance	REW1C Repl Chutes U1 and Refract	(89,561)	2021
NSP-Minnesota	A.0001574.673	Reliability & Performance	SHC3C 1st Floor HVAC PLC Replace	(87,630)	2021
NSP-Minnesota	A.0001574.468	Reliability & Performance	SHC3C Secoal Detector repl	(86,086)	2021
NSP-Minnesota	A.0001574.732	Reliability & Performance	SHC0C U1_2 Computer Room F.P.	(70,843)	2021
NSP-Minnesota	A.0001573.019	Reliability & Performance	BDS5C 21 Lighting Transformer	(70,458)	2021
NSP-Minnesota	A.0001571.085	Reliability & Performance	ANS4C Replace Unit 4 Battery	(70,406)	2021
NSP-Minnesota	A.0003000.214	Reliability & Performance	C100C PMO Tool Blanket-New	(70,000)	2021
NSP-Minnesota	A.0001574.300	Environmental Compliance	SHC99 - Rplc RCD DS Pipe 2021 - 23442	(66,297)	2021
NSP-Minnesota	A.0001574.173	Reliability & Performance	SHC3C Emergent work	(66,179)	2021
NSP-Minnesota	A.0001579.089	Reliability & Performance	RIV0C -- Auto Sprklr Prot Oil	(65,648)	2021

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NSP-Minnesota	A.0001573.118	Reliability & Performance	BDS0 -#52 Cooling Wtr Instrument -23361	(65,229)	2021
NSP-Minnesota	A.0001559.115	Reliability & Performance	BLL8-Replace u8 battery	(60,174)	2021
NSP-Minnesota	A.0003000.679	Reliability & Performance	RIV0C-Tool Blanket	(60,000)	2021
NSP-Minnesota	A.0001579.091	Reliability & Performance	RIV0C Inst Flange Guards Lube	(59,532)	2021
NSP-Minnesota	A.0001573.203	Reliability & Performance	BDS5C-Repl U5 Fuel Gas Heater CV	(58,099)	2021
NSP-Minnesota	A.0001579.123	Reliability & Performance	RIV7-Turbine Under Deck Draina	(56,272)	2021
NSP-Minnesota	A.0003000.577	Reliability & Performance	SER0C MMR Video Probe 2021	(55,002)	2021
NSP-Minnesota	A.0001575.046	Reliability & Performance	HBC8C U8 CT Servo Replace 2	(54,520)	2021
NSP-Minnesota	A.0003000.583	Reliability & Performance	SER0C PMO DAS Upgrade 2021	(51,000)	2021
NSP-Minnesota	A.0001574.666	Reliability & Performance	SHC3C CT Vibration System	(50,307)	2021
NSP-Minnesota	A.0003000.669	Reliability & Performance	HBC0C HB CC Tool Blanket	(50,000)	2021
NSP-Minnesota	A.0001573.204	Reliability & Performance	BDS2C-Install Cond Vac Trip Manifold	(49,315)	2021
NSP-Minnesota	A.0001579.073	Reliability & Performance	RIV0C -- Replace 61 Battery	(42,923)	2021
NSP-Minnesota	A.0001559.500	Reliability & Performance	BLL Emergent Fund -Other prod	(40,317)	2021
NSP-Minnesota	A.0003000.661	Reliability & Performance	BDS0C Tool Blanket	(40,315)	2021
NSP-Minnesota	A.0001571.073	Reliability & Performance	ANS0C Replace Admin Battery	(40,205)	2021
NSP-Minnesota	A.0003000.708	Reliability & Performance	C100C MTR-Replaced Failed Equip 21	(36,000)	2021
NSP-Minnesota	A.0003000.685	Reliability & Performance	WLM0C Tools & Equipment B	(29,997)	2021
NSP-Minnesota	A.0001561.500	Reliability & Performance	IVH Emergent Fund -Other prod	(21,000)	2021
NSP-Minnesota	A.0003000.672	Reliability & Performance	IVH0C Misc tools and Equip	(20,000)	2021
NSP-Minnesota	A.0003000.657	Reliability & Performance	ANS0C Tools and Equip Ca	(20,000)	2021
NSP-Minnesota	A.0003000.659	Reliability & Performance	BLL0C Tools Blanket	(20,000)	2021
NSP-Minnesota	A.0003000.676	Renewable & New Generation	NBLCo Misc Tools and Equi	(20,000)	2021
NSP-Minnesota	A.0003000.696	Reliability & Performance	SER-RTC-Misc Tools & Equipment	(20,000)	2021
NSP-Minnesota	A.0003000.703	Reliability & Performance	C100C CSC Tank Ladder and Platform	(20,000)	2021
NSP-Minnesota	A.0001574.269	Reliability & Performance	SHC2C Emergent Projects	(19,056)	2021
NSP-Minnesota	A.0001574.268	Reliability & Performance	SHC1C Emergent Projects	(18,335)	2021
NSP-Minnesota	A.0001574.252	Reliability & Performance	SHC99 Emergent work	(16,489)	2021
NSP-Minnesota	A.0003000.671	Reliability & Performance	HNIC0 Misc Tools and Equ	(15,000)	2021
NSP-Minnesota	A.0003000.680	Reliability & Performance	REW0C Tool Blanket	(15,000)	2021
NSP-Minnesota	A.0003000.730	Reliability & Performance	C100-PMO - Tool Blanket 2021	(13,692)	2021
NSP-Minnesota	A.0003000.667	Renewable & New Generation	GDM0C Grand Mead Cap Tool	(10,000)	2021
NSP-Minnesota	A.0003000.128	Renewable & New Generation	CWF Tools & Misc Equipment	(9,999)	2021
NSP-Minnesota	A.0003000.662	Renewable & New Generation	BRDR Small Tools Equip	(9,999)	2021
NSP-Minnesota	A.0003000.678	Renewable & New Generation	PLV Tools Equip	(9,999)	2021
NSP-Minnesota	A.0001574.733	Reliability & Performance	SHC0C Electric & Electronic Room FP	(8,523)	2021
NSP-Minnesota	A.0003000.492	Reliability & Performance	SER-CSC-Floor Scale Replace	(4,000)	2021
NSP-Minnesota	A.0001576.018	Renewable & New Generation	GDM - Battery	(18,927,797)	2022
NSP-Minnesota	A.0001573.224	Reliability & Performance	BDS5 - Ovhl U5 Hot Gas Path - 22403	(8,821,219)	2022
NSP-Minnesota	A.0001571.090	Reliability & Performance	ANS4 - U4 Hot Gas Path - 10341	(5,249,861)	2022
NSP-Minnesota	A.0001574.115	Environmental Compliance	SHC3C U3 Repl FABRIC FILTER BA	(4,526,246)	2022
NSP-Minnesota	A.0001573.169	Reliability & Performance	BDS0C Reverse Osmosis 2nd Pass	(2,867,355)	2022
NSP-Minnesota	A.0001573.226	Reliability & Performance	BDS0 -BlackDog Rd Erosion Wall -23299	(2,718,798)	2022
NSP-Minnesota	A.0001579.072	Reliability & Performance	RIV0C -- Replace Water Treamentment System	(2,404,532)	2022
NSP-Minnesota	A.0001561.030	Reliability & Performance	IVH3C Turbine Controls	(2,280,010)	2022
NSP-Minnesota	A.0001573.212	Reliability & Performance	BDS2C-Replace U2 Turbine L-0 Blades	(2,090,841)	2022
NSP-Minnesota	A.0001566.168	Renewable & New Generation	NBL0C Gearbox Replacements	(1,995,518)	2022
NSP-Minnesota	A.0001559.048	Reliability & Performance	BLL8C-CESP GSU 171-227 MVA 18-115kV	(1,869,180)	2022
NSP-Minnesota	A.0001579.500	Reliability & Performance	RIV Emergent Fund -Other prod	(1,863,059)	2022
NSP-Minnesota	A.0001573.182	Reliability & Performance	BDS2C U2 Turning Gear Replace	(1,778,024)	2022
NSP-Minnesota	A.0001559.006	Reliability & Performance	BLLC7 U7 Exhaust Silencer Repl	(1,537,841)	2022
NSP-Minnesota	A.0001591.007	Reliability & Performance	-12186 ANS4C U4 Repl Mark V Cn	(1,403,272)	2022
NSP-Minnesota	A.0001575.500	Reliability & Performance	HBR Emergent Fund -Other prod	(1,384,550)	2022
NSP-Minnesota	A.0001573.070	Reliability & Performance	BDS5C U52 Ovation System Evergreen	(1,209,593)	2022
NSP-Minnesota	A.0001576.006	Renewable & New Generation	GDM0C Generator Replacements 2	(998,153)	2022
NSP-Minnesota	A.0001573.500	Reliability & Performance	BDS Emergent Fund -Other prod	(968,111)	2022
NSP-Minnesota	A.0001573.057	Reliability & Performance	BDS0C 480V Load Center	(948,622)	2022
NSP-Minnesota	A.0001574.474	Reliability & Performance	SHCJC Dust Collector replacement	(943,210)	2022
NSP-Minnesota	A.0001571.011	Reliability & Performance	ANSC0 Replace U4 Silencer	(926,541)	2022
NSP-Minnesota	A.0001572.227	Environmental Compliance	ASK1C-316b Permit	(893,346)	2022
NSP-Minnesota	A.0001591.003	Reliability & Performance	-17052 ANS2C Repl U2 gen break	(863,609)	2022
NSP-Minnesota	A.0001573.056	Reliability & Performance	BDS2C U2 LP Steam to Crossover	(778,385)	2022
NSP-Minnesota	A.0001611.009	Renewable & New Generation	PVW0-Pleasant Valley Gearbox Replacement	(770,234)	2022
NSP-Minnesota	A.0001576.005	Renewable & New Generation	GDM0C Gearbox Replacements 201	(696,470)	2022
NSP-Minnesota	A.0001565.111	Reliability & Performance	WLM0C Replace U0 Scalping Conveyor	(694,935)	2022
NSP-Minnesota	A.0001723.004	Reliability & Performance	MEC3 - Turbine Valves - 23664	(648,857)	2022

Company	Project ID	New Grandparent	Project Name	YE Amt	Activity Year
NSP-Minnesota	A.0001579.083	Reliability & Performance	RIV0C --Aux boiler Controls Upgrade	(645,971)	2022
NSP-Minnesota	A.0001579.069	Reliability & Performance	RIV0C -- Instrument Air Sys Rep	(632,248)	2022
NSP-Minnesota	A.0001566.169	Renewable & New Generation	NBL0-Generator Replacement 2022	(554,416)	2022
NSP-Minnesota	A.0001571.082	Reliability & Performance	ANS4C U4-Ex 2100 E -Excitation Sys Rpl	(538,141)	2022
NSP-Minnesota	A.0001580.007	Renewable & New Generation	CWF0-Courtenay Gearbox Replacement	(524,018)	2022
NSP-Minnesota	A.0001562.138	Reliability & Performance	REW0C Replace Scalping Conveyor	(513,323)	2022
NSP-Minnesota	A.0001575.169	Reliability & Performance	HBC0 - Boiler Feed Pump CESP - 23730	(511,762)	2022
NSP-Minnesota	A.0001572.214	Reliability & Performance	ASK1C AQCS Battery Replacement	(481,344)	2022
NSP-Minnesota	A.0001572.232	Reliability & Performance	ASK1C-TurboToc PLC Upgrade	(475,358)	2022
NSP-Minnesota	A.0001571.081	Reliability & Performance	ANS4C U4-LCI Controls Replacement	(460,020)	2022
NSP-Minnesota	A.0001565.114	Environmental Compliance	WLM0C Landfill Cell 7 and 6 Cap	(459,420)	2022
NSP-Minnesota	A.0001574.180	Reliability & Performance	SHC1C 2022 Small Project Routi	(456,328)	2022
NSP-Minnesota	A.0001562.155	Reliability & Performance	REW2-Replace Bus 21 Switchgear	(455,806)	2022
NSP-Minnesota	A.0001562.156	Reliability & Performance	REW1-Replace Bus 11 Switchgear	(455,030)	2022
NSP-Minnesota	A.0001574.198	Reliability & Performance	SHCCC 2022 Emergent Work	(445,489)	2022
NSP-Minnesota	A.0001572.233	Reliability & Performance	ASK99C-Transfer House 1 Control System	(442,396)	2022
NSP-Minnesota	A.0001572.234	Reliability & Performance	ASK99C-Transfer House 2 Control System	(442,396)	2022
NSP-Minnesota	A.0001574.304	Reliability & Performance	SHC2 -Turb Ctrl Vlv Internals 2022-22721	(436,051)	2022
NSP-Minnesota	A.0001572.500	Reliability & Performance	ASK Emergent Fund -Steam prod	(429,843)	2022
NSP-Minnesota	A.0001702.011	Renewable & New Generation	BS2 - Blazing Star2 PCMM - 23573	(424,540)	2022
NSP-Minnesota	A.0001704.009	Renewable & New Generation	FBW - Freeborn PCMM - 23575	(424,540)	2022
NSP-Minnesota	A.0001574.190	Reliability & Performance	SHC3C 2022 Small Project Routi	(406,781)	2022
NSP-Minnesota	A.0001562.154	Reliability & Performance	REW0-Replace Duct Scrubber Controls	(403,715)	2022
NSP-Minnesota	A.0001561.015	Reliability & Performance	IVH5C U5-6 UG Cable Replacemen	(381,924)	2022
NSP-Minnesota	A.0001565.037	Reliability & Performance	WLM1C Replace U1 Rear Wall	(376,538)	2022
NSP-Minnesota	A.0001565.042	Reliability & Performance	WLM2C Replace U2 Rear Wall	(376,538)	2022
NSP-Minnesota	A.0001561.029	Reliability & Performance	IVH3C Gas Valve Ctrl Repl	(374,045)	2022
NSP-Minnesota	A.0001574.195	Reliability & Performance	SHC2C 2022 Small Project Routi	(365,283)	2022
NSP-Minnesota	A.0001565.077	Environmental Compliance	WLM0C Slaker PLC Replacement	(358,524)	2022
NSP-Minnesota	A.0001573.223	Reliability & Performance	BDS2 -Rplc Turbine Valve Internal -23318	(356,911)	2022
NSP-Minnesota	A.0001574.493	Reliability & Performance	SHC1C Mill OH 2022 Fall	(356,911)	2022
NSP-Minnesota	A.0001574.526	Reliability & Performance	SHC3C Mill OH 2022 Spring	(355,443)	2022
NSP-Minnesota	A.0001573.187	Reliability & Performance	BDS2C Redundant Aux Oil Pump	(353,011)	2022
NSP-Minnesota	A.0001574.525	Reliability & Performance	SHC3C Mill OH 2022 Fall	(347,777)	2022
NSP-Minnesota	A.0001580.008	Renewable & New Generation	CWF1-Generator Rplacments	(338,903)	2022
NSP-Minnesota	A.0001574.810	Reliability & Performance	SHC3-CESP Turb Control Valves 22604	(324,570)	2022
NSP-Minnesota	A.0001573.123	Reliability & Performance	BDS0 - Install U3 Turbine Floor - 23359	(317,038)	2022
NSP-Minnesota	A.0001565.500	Reliability & Performance	WLM Emergent Fund -Steam prod	(314,799)	2022
NSP-Minnesota	A.0001574.491	Reliability & Performance	SHC1C Mill 2022 Spring	(309,183)	2022
NSP-Minnesota	A.0001574.802	Reliability & Performance	SHC2-Level 2 Mill OH 2022 Spring 15910	(309,183)	2022
NSP-Minnesota	A.0001579.064	Reliability & Performance	RIV7C 61 & 62 Transformers Rep	(305,921)	2022
NSP-Minnesota	A.0001562.149	Reliability & Performance	REW1C-REW1 - Replace U1 Superheater	(303,173)	2022
NSP-Minnesota	A.0001562.135	Environmental Compliance	REW0C Repl Baghouse Controls	(302,775)	2022
NSP-Minnesota	A.0001562.007	Reliability & Performance	REW0613-Condenser Retube	(301,967)	2022
NSP-Minnesota	A.0003000.682	Reliability & Performance	SHCJC Tools and Equip pur	(296,000)	2022
NSP-Minnesota	A.0001562.500	Reliability & Performance	REW Emergent Fund -Steam prod	(295,872)	2022
NSP-Minnesota	A.0001572.251	Environmental Compliance	ASK1-11&12 Travel Water Screen - 23631	(276,344)	2022
NSP-Minnesota	A.0001571.500	Reliability & Performance	ANS Emergent Fund -Other prod	(274,665)	2022
NSP-Minnesota	A.0001565.117	Reliability & Performance	WLM1C Replace U1 Gratebed 2018	(260,941)	2022
NSP-Minnesota	A.0001565.124	Environmental Compliance	WLM2C Replace U2 Baghouse Bag	(252,461)	2022
NSP-Minnesota	A.0001562.039	Environmental Compliance	REW0 - EPA 316b-Svc Water Pumps - 23725	(250,068)	2022
NSP-Minnesota	A.0001572.236	Environmental Compliance	ASK1C-Econ Outlet Exp Joint	(247,170)	2022
NSP-Minnesota	A.0001574.172	Reliability & Performance	SHCCC 2022 Small Project routi	(229,590)	2022
NSP-Minnesota	A.0001573.117	Reliability & Performance	BDS2C Water Induction Monitor	(218,697)	2022
NSP-Minnesota	A.0001579.016	Reliability & Performance	RIV7C-U7 Turbine Roof Replace	(215,579)	2022
NSP-Minnesota	A.0001573.186	Reliability & Performance	BDS2C Redundant LO Vapor Extractor	(212,069)	2022
NSP-Minnesota	A.0001565.068	Environmental Compliance	WLM1C U1 Replace Baghouse Wiri	(207,146)	2022
NSP-Minnesota	A.0001565.069	Environmental Compliance	WLM2C U2 Replace Baghouse Wiri	(207,146)	2022
NSP-Minnesota	A.0001574.682	Reliability & Performance	SHCJC 3, 4 Xshr Fdr Floor Resto	(198,814)	2022
NSP-Minnesota	A.0003000.699	Reliability & Performance	SER-SMC-Misc Tools & Equipment	(192,000)	2022
NSP-Minnesota	A.0001574.174	Reliability & Performance	SHCJC 2022 Small Project routi	(183,681)	2022
NSP-Minnesota	A.0001574.801	Reliability & Performance	SHC3-Landfl Mtnc Grg Lim Rcv HVAC PLC	(183,668)	2022
NSP-Minnesota	A.0001562.139	Reliability & Performance	REW2C Repl U2 Trvlg Gate Bed	(176,275)	2022
NSP-Minnesota	A.0001574.537	Environmental Compliance	SHC3C-Limestone RR track	(173,397)	2022
NSP-Minnesota	A.0001574.803	Environmental Compliance	SHC3-Haul Road 2022 15792	(171,402)	2022
NSP-Minnesota	A.0001562.136	Reliability & Performance	REW0C C9 Internal Repl	(168,923)	2022

Company	Project ID	New Grandparent	Project Name	YE Amt	Activity Year
NSP-Minnesota	A.0001573.225	Reliability & Performance	BDS5 - Rplc U5 Duct Burner PLC - 23400	(165,197)	2022
NSP-Minnesota	A.0001573.128	Reliability & Performance	BDS5C CT Expansion Joint	(161,771)	2022
NSP-Minnesota	A.0001574.200	Reliability & Performance	SHC1C #13 Boiler FeedPump Over	(159,236)	2022
NSP-Minnesota	A.0001574.687	Reliability & Performance	SHCJC 3A Gate to 4A-B Upgrade	(157,096)	2022
NSP-Minnesota	A.0003000.658	Reliability & Performance	ASK0C- Tool Blanket	(150,000)	2022
NSP-Minnesota	A.0001562.051	Reliability & Performance	REW1C REPLACE U1 TRAVELING GRA	(141,706)	2022
NSP-Minnesota	A.0001565.120	Reliability & Performance	WLM1C Replace U1 B11 Screw Auger 21	(140,567)	2022
NSP-Minnesota	A.0001574.306	Reliability & Performance	SHC99-CESP 2022 #1 CC Rotor Asmbl-23370	(132,287)	2022
NSP-Minnesota	A.0001565.059	Reliability & Performance	WLM2-Replace U2 B21 Screw Auge	(131,066)	2022
NSP-Minnesota	A.0001565.123	Reliability & Performance	WLM2C Replace U2 B22 Screw Auger 20	(130,570)	2022
NSP-Minnesota	A.0001580.009	Renewable & New Generation	CWF1-Transformer Replacements	(123,559)	2022
NSP-Minnesota	A.0001611.011	Renewable & New Generation	PVW1-Transformer Replacements	(123,237)	2022
NSP-Minnesota	A.0001611.010	Renewable & New Generation	PVW1-Generator Replacements	(113,185)	2022
NSP-Minnesota	A.0001574.463	Reliability & Performance	SHC3-U3 Stock Fdr Speed repl	(103,352)	2022
NSP-Minnesota	A.0003000.698	Reliability & Performance	SER-CHM-Misc Tools-MN	(101,900)	2022
NSP-Minnesota	A.0001573.207	Reliability & Performance	BDS2C-Install Lube Oil Trip Manifold	(89,624)	2022
NSP-Minnesota	A.0003000.697	Reliability & Performance	SER-MMR- Misc Tools & Equip	(86,630)	2022
NSP-Minnesota	A.0001574.305	Environmental Compliance	SHC0-Rplc DS Pmp House Pipe vlv'22-23438	(85,858)	2022
NSP-Minnesota	A.0001562.116	Reliability & Performance	REW2C REPLACE U2 FUEL CHUTES 2	(85,608)	2022
NSP-Minnesota	A.0001579.115	Environmental Compliance	RIV0-U0 Install CEMS power red	(79,328)	2022
NSP-Minnesota	A.0001579.135	Reliability & Performance	RIV0C 62 Battery Replace	(77,535)	2022
NSP-Minnesota	A.0001574.358	Reliability & Performance	SHC1C North Blr Bldg Roof Repl	(75,487)	2022
NSP-Minnesota	A.0001574.769	Reliability & Performance	SHC3C CR HVAC PLC 2nd Flr Replace	(69,984)	2022
NSP-Minnesota	A.0001573.221	Reliability & Performance	BDS2 -Ovhl #21 Cndnsr Vcm Pump - 23675	(69,297)	2022
NSP-Minnesota	A.0001573.222	Reliability & Performance	BDS2 - Ovhl #22 Cndnsr Vcm Pump - 23676	(69,297)	2022
NSP-Minnesota	A.0001573.227	Reliability & Performance	BDS0 -Process Net Virtualization -23559	(69,173)	2022
NSP-Minnesota	A.0001579.017	Reliability & Performance	RIV7C-71 UPS Battery Replaceme	(68,679)	2022
NSP-Minnesota	A.0001574.805	Reliability & Performance	SHC0-Coal conveyor F.P. 20631	(63,980)	2022
NSP-Minnesota	A.0001579.087	Reliability & Performance	RIV0C --Replace 60 EWS Battery	(61,924)	2022
NSP-Minnesota	A.0003000.679	Reliability & Performance	RIV0C-Tool Blanket	(60,000)	2022
NSP-Minnesota	A.0003000.578	Reliability & Performance	SER0C MMR Video Probe 2022	(55,000)	2022
NSP-Minnesota	A.0001574.688	Reliability & Performance	SHCJC Rpl #1 RR Track	(50,076)	2022
NSP-Minnesota	A.0001574.731	Reliability & Performance	SHC0C Fuel Oil Pump F.P.	(50,000)	2022
NSP-Minnesota	A.0003000.669	Reliability & Performance	HBC0C HB CC Tool Blanket	(50,000)	2022
NSP-Minnesota	A.0001573.228	Reliability & Performance	BDS0 -Rplc Fire Protection Header -23560	(47,375)	2022
NSP-Minnesota	A.0003000.661	Reliability & Performance	BDS0C Tool Blanket	(42,852)	2022
NSP-Minnesota	A.0001565.065	Reliability & Performance	WLM1C C7 & C8 VFD	(42,348)	2022
NSP-Minnesota	A.0001573.102	Reliability & Performance	BDS0C Office Area Heaters	(41,997)	2022
NSP-Minnesota	A.0001575.171	Reliability & Performance	HBC0 - Rmv & Rplc BFP Spare YR1 -23731	(40,944)	2022
NSP-Minnesota	A.0003000.567	Reliability & Performance	SER0C MMR Alloy Analyzer 2022	(38,000)	2022
NSP-Minnesota	A.0001573.219	Reliability & Performance	BDS0 - Ovhl #51 Closed CW Pump - 23677	(33,908)	2022
NSP-Minnesota	A.0001573.220	Reliability & Performance	BDS0 - Ovhl #52 Closed CW Pump - 23678	(33,908)	2022
NSP-Minnesota	A.0003000.571	Reliability & Performance	SER0C MMR St Microscope 2022	(33,000)	2022
NSP-Minnesota	A.0003000.707	Reliability & Performance	C100C CSC Aerosol Can Crusher	(32,180)	2022
NSP-Minnesota	A.0001559.108	Reliability & Performance	BLL0C 78 LV BKR Buy - 2021	(31,331)	2022
NSP-Minnesota	A.0001579.073	Reliability & Performance	RIV0C -- Replace 61 Battery	(30,538)	2022
NSP-Minnesota	A.0001559.500	Reliability & Performance	BLL Emergent Fund -Other prod	(29,973)	2022
NSP-Minnesota	A.0001561.500	Reliability & Performance	IVH Emergent Fund -Other prod	(25,086)	2022
NSP-Minnesota	A.0003000.214	Reliability & Performance	C100C PMO Tool Blanket-New	(25,000)	2022
NSP-Minnesota	A.0003000.563	Reliability & Performance	SER0C CSC Drum Packer Crusher	(21,000)	2022
NSP-Minnesota	A.0003000.657	Reliability & Performance	ANS0C Tools and Equip Ca	(20,000)	2022
NSP-Minnesota	A.0003000.672	Reliability & Performance	IVH0C Misc tools and Equip	(20,000)	2022
NSP-Minnesota	A.0003000.676	Renewable & New Generation	NBLCo Misc Tools and Equi	(20,000)	2022
NSP-Minnesota	A.0003000.659	Reliability & Performance	BLL0C Tools Blanket	(20,000)	2022
NSP-Minnesota	A.0003000.696	Reliability & Performance	SER-RTC-Misc Tools & Equipment	(19,998)	2022
NSP-Minnesota	A.0003000.568	Reliability & Performance	SER0C MMR Digital System 2022	(18,000)	2022
NSP-Minnesota	A.0003000.671	Reliability & Performance	HNIC0 Misc Tools and Equ	(15,000)	2022
NSP-Minnesota	A.0003000.680	Reliability & Performance	REW0C Tool Blanket	(15,000)	2022
NSP-Minnesota	A.0001579.089	Reliability & Performance	RIV0C -- Auto Sprklr Prot Oil	(13,000)	2022
NSP-Minnesota	A.0001591.004	Reliability & Performance	-17478 ANS0C BOP Evrgren Ctrl	(10,000)	2022
NSP-Minnesota	A.0003000.128	Renewable & New Generation	CWF Tools & Misc Equipment	(9,999)	2022
NSP-Minnesota	A.0003000.662	Renewable & New Generation	BRDR Small Tools Equip	(9,999)	2022
NSP-Minnesota	A.0003000.667	Renewable & New Generation	GDM0C Grand Mead Cap Tool	(9,999)	2022
NSP-Minnesota	A.0003000.678	Renewable & New Generation	PLV Tools Equip	(9,999)	2022
NSP-Minnesota	A.0001574.666	Reliability & Performance	SHC3C CT Vibration System	(9,834)	2022
NSP-Minnesota	A.0003000.564	Reliability & Performance	SER0C CSC Rolloff Container 1	(8,000)	2022

Company	Project ID	New Grandparent	Project Name	YE Amt	Activity Year
NSP-Minnesota	A.0003000.565	Reliability & Performance	SER0C CSC Rolloff Container 2	(8,000)	2022
NSP-Minnesota	A.0001574.173	Reliability & Performance	SHC3C Emergent work	(7,177)	2022
NSP-Minnesota	A.0001574.738	Reliability & Performance	SHC0 2RSA H_Bushng Rplcmnt	(6,128)	2022
NSP-Minnesota	A.0001565.036	Reliability & Performance	WLM0C Inst Station Aux Power S	(5,732)	2022
NSP-Minnesota	A.0001574.269	Reliability & Performance	SHC2C Emergent Projects	(2,066)	2022
NSP-Minnesota	A.0001574.268	Reliability & Performance	SHC1C Emergent Projects	(1,988)	2022
NSP-Minnesota	A.0001574.252	Reliability & Performance	SHC99 Emergent work	(1,788)	2022
NSP-Minnesota	A.0001574.733	Reliability & Performance	SHC0C Electric & Electronic Room FP	(1,666)	2022
NSP-Minnesota	A.0001574.673	Reliability & Performance	SHC3C 1st Floor HVAC PLC Replace	(1,475)	2022
NSP-Minnesota	A.0001707.001	Renewable & New Generation	DKR0 Dakota Range Wind Turbines	7,156,496	2022

Company Descr	Project ID	New Grandparent	Project Name	YE Amt	Activity Year	Project Description	Project Justification
NSP-Minnesota	A.0001705.001	Renewable & New Generation	CRW G100-Crowned Ridge BOT Wind Farm	(329,773,530)	2020	Purchase a 200MW Wind Farm from NextEra near Watertown, SD. The wind farm will consist of 73 GE 2.3-116 90HH and 15 GE 2.1 -116 80HH wind turbine generators, a collection system, Operations and Maintenance building, access roads, collector substation, and a transmission interconnection line.	Qualifies for a Federal Production Tax Credit (PTC).
NSP-Minnesota	A.0001702.001	Renewable & New Generation	BS2-G100-Blazing Star II Wind Farm	(311,190,744)	2020	Construct a 200 MW New Wind Farm in Lincoln County, MN. The wind farm includes 100 V110 and V116 Vestas Turbines at 2.0 MWs each, a collector system, O&M building, access roads, collector substation, and approximately 10 miles of transmission line.	Qualifies for a Federal Production Tax Credit (PTC).
NSP-Minnesota	A.0001704.001	Renewable & New Generation	FBW G100-Freeborn Wind Farm	(272,355,490)	2020	Construct a 150- 200 MW New Wind Farm in Freeborn County, MN. The wind farm includes 75-100 V110 and V116 Vestas Turbines at 2.0 MWs each, a collector system, O&M building, access roads, collector substation, and transmission line.	Qualifies for a Federal Production Tax Credit (PTC).
NSP-Minnesota	A.0001724.001	Renewable & New Generation	MWF Mower Wind Farm Purchase	(168,232,680)	2020	Purchase the 98.9 MW Mower County Wind Facility, following repowering by current owner. Current owner will repower each of the existing 43 Siemens 2.3 MW MKII turbine generators with new, 108-meter diameter rotors and other components.	Repower and acquisition of this facility will contribute to Xcel's objective of integrating more renewable energy into its portfolio. Qualifies for a Federal Production Tax Credit (PTC).
NSP-Minnesota	A.0001721.001	Renewable & New Generation	Jeffers Wind Purchase	(71,942,656)	2020	Repower the 44 MW Jeffers Wind Farm in Cottonwood County, MN. This project will install 20 Vestas Turbines (V110 2.2) at 2.2 MWs each. These will replace the existing Clipper wind turbines.	Rated to generate 195,418 MWh annually. Acquisition / Repower of this wind farm will contribute towards Xcel's objective of integrating more renewable energy in its portfolio. Qualifies for a Federal Production Tax Credit (PTC)
NSP-Minnesota	A.0001722.001	Renewable & New Generation	Community Wind North Purchase	(66,175,547)	2020	Repower the 26.4 MW Community Wind North Farm in Buffalo Ridge, MN. The installation includes 12 Vestas Turbines (V110 2.2) at 2.2 MWs each. These will replace the Clipper wind turbines.	Rated to generate 107,306 MWh annually. Acquisition / Repower of this wind farm will contribute towards Xcel's objective of integrating more renewable energy in its portfolio Qualifies for a Federal Production Tax Credit (PTC)
NSP-Minnesota	A.0001704.002	Renewable & New Generation	FBW G100-Freeborn Wind Farm Land	(15,690,190)	2020	Construct a 150- 200 MW New Wind Farm in Freeborn County, MN. The wind farm includes 75- 100 V110 and V116 Vestas Turbines at 2.0 MWs each, a collector system, O&M building, access roads, collector substation, and transmission line.	Qualifies for a Federal Production Tax Credit (PTC).
NSP-Minnesota	A.0001702.005	Renewable & New Generation	BS2-Blazing Star II Wind Farm Tline GIA	(11,613,536)	2020	Construct a 200 MW New Wind Farm in Lincoln County, MN. The wind farm includes 100 V110 and V116 Vestas Turbines at 2.0 MWs each, a collector system, O&M building, access roads, collector substation, and approximately 10 miles of transmission line.	Qualifies for a Federal Production Tax Credit (PTC).
NSP-Minnesota	A.0001575.005	Reliability & Performance	HBC7C U7 CT Turbine Major Overhaul	(10,190,094)	2020	HBC0218 - Labor cost to perform major overhaul on U7 CT. During a major overhaul, all combustion parts are replaced, all turbine blades and vanes are replaced. The rotor is pulled out of the CT, disassembled, and restacked.	Per OEM specification, a major overhaul is required at 48,000 hours.
NSP-Minnesota	A.0001702.003	Renewable & New Generation	BS2-Blazing Star II Wind Farm TSG TLine	(8,844,626)	2020	Construct a 200 MW New Wind Farm in Lincoln County, MN. The wind farm includes 100 V110 and V116 Vestas Turbines at 2.0 MWs each, a collector system, O&M building, access roads, collector substation, and approximately 10 miles of transmission line.	Qualifies for a Federal Production Tax Credit (PTC).
NSP-Minnesota	A.0001579.136	Reliability & Performance	RIV9C U9 Major Inspection No. 1	(6,445,992)	2020	Major Inspection outage No. 1 for Riverside's Combined Cycle Unit 9. Included in this capital project is the labor and rental equipment needed to replace hot gas path parts as well as a full inspection of the units compressor. Parts include: Stage 1, 2, and 3 turbine nozzles, buckets, shrouds, and diaphragms.	The combustion turbine OEM, GE, recommends that a Major Inspection be performed at 24,000 EOH or 900 factored starts (whichever comes first) after the hot gas path inspection . For Unit 9, the first Major Inspection is projected to be performed in 2020. During a Major Inspection, the existing parts will be removed from the turbine and the refurbished parts will be installed.
NSP-Minnesota	A.0001574.655	Environmental Compliance	SHCJC-Bottom Ash Pond 2	(6,160,468)	2020	Construct 20 acre Bottom Ash Pond 2, with GCL/HDPE composite liner and its own return water system. The BAP Study was completed, along with updated cost estimates. The cost estimate reflects the change in composite liner materials to meet the new CCR regulations. The new pond has a lined area of 18.86 acres and includes a new discharge structure. Permitting will commence in 2019 with construction in 2020 and 2021.	Construction of BA Pond 2 will reduce O&M costs and address safety issues. Management of the ash in the Bottom Ash Pond includes annual excavation of ash with a backhoe. The ash is hauled to the ponds for use in other Pond dike construction projects. These costs are reasonable, however the periodic (every 5-7 years) of dredging of fines for disposal in the Scrubber Ponds has been inconsistent and costly. Construction of a second BA Pond will allow for alternating operation of the BA Ponds, resulting in easier and less costly excavation and dredging. Further, construction of BA Pond 2 will reduce potential safety risks associated with excavation work in the existing pond.
NSP-Minnesota	A.0001704.004	Renewable & New Generation	FBW G100-Freeborn Wind Farm TSG Sub	(5,080,440)	2020	Construct a 150- 200 MW New Wind Farm in Freeborn County, MN. The wind farm includes 75- 100 V110 and V116 Vestas Turbines at 2.0 MWs each, a collector system, O&M building, access roads, collector substation, and transmission line.	Qualifies for a Federal Production Tax Credit (PTC).
NSP-Minnesota	A.0001702.004	Renewable & New Generation	BS2-Blazing Star II Wind Farm TSG SUB	(4,441,025)	2020	Construct a 200 MW New Wind Farm in Lincoln County, MN. The wind farm includes 100 V110 and V116 Vestas Turbines at 2.0 MWs each, a collector system, O&M building, access roads, collector substation, and approximately 10 miles of transmission line.	Qualifies for a Federal Production Tax Credit (PTC).
NSP-Minnesota	A.0001704.005	Renewable & New Generation	FBW-G100-Freeborn Wind Farm Tline GIA	(3,202,419)	2020	Construct a 150- 200 MW New Wind Farm in Freeborn County, MN. The wind farm includes 75- 100 V110 and V116 Vestas Turbines at 2.0 MWs each, a collector system, O&M building, access roads, collector substation, and transmission line.	Qualifies for a Federal Production Tax Credit (PTC).
NSP-Minnesota	A.0001701.006	Renewable & New Generation	J460 Blazing Star 1 Wind Interc	(3,139,408)	2020	Construct a 200 MW New Wind Farm in Lincoln County, MN. The wind farm includes 100 V110 and V116 Vestas Turbines at 2.0 MWs each, a collector system, O&M building, access roads, and collector substation.	Part of Blazing Star 1 wind farm
NSP-Minnesota	A.0001579.071	Reliability & Performance	RIV0C -- U9 CT Compressor Upg	(2,618,055)	2020	Replace S-0 thru S-4 and S-17 compressor vanes and exhaust guide vanes (EGV) with PSM parts. The work will be completed at the same time as the U9 major overhaul to minimize costs.	Some compressor damage was found during the last 2013 Combustor Inspection. Review by Technical Resources and Loss Control led to a recommendation to address known GE compressor issues.
NSP-Minnesota	A.0001704.003	Renewable & New Generation	FBW G100-Freeborn Wind Farm TSG Tline	(2,286,303)	2020	Construct a 150- 200 MW New Wind Farm in Freeborn County, MN. The wind farm includes 75- 100 V110 and V116 Vestas Turbines at 2.0 MWs each, a collector system, O&M building, access roads, collector substation, and transmission line.	Qualifies for a Federal Production Tax Credit (PTC).
NSP-Minnesota	A.0001701.001	Renewable & New Generation	BS1-G100-Blazing Star I Wind Farm	(2,257,160)	2020	Construct a 200 MW New Wind Farm in Lincoln County, MN. The wind farm includes 100 V110 and V116 Vestas Turbines at 2.0 MWs each, a collector system, O&M building, access roads, and collector substation.	Qualifies for a Federal Production Tax Credit (PTC).
NSP-Minnesota	A.0001574.665	Reliability & Performance	SHC3C 37_1 & 37_2 FWHs Replace	(2,182,561)	2020	Replace the 37-1 and 37-2 Feedwater Heaters.	The heaters are original from 1987 and tube failures are projected to be significant enough to warrant replacement of these heaters.
NSP-Minnesota	A.0001574.096	Reliability & Performance	SHC3C Unit Protection PLC Repl	(2,003,694)	2020	This project will replace the existing U3 Unit Protection 31 and 32 PLCs (programmable logic controllers) and their associated IO. The U3 Unit Protection PLC system uses two large fully redundant processors with distributed IO to protect the U3 boiler, turbine and generator. The present ladder diagram based logic operates on outdated mid 1980s Square D Symax PLCs. The purpose of this project is to replace the Square D PLC hardware with new PLC equipment. In general the system hardware would be modernized but the existing system basis of design and logic would be replicated.	The existing Square-D Symax PLCs were installed in the mid-1980s and now the OEM no longer supports the equipment. The supply of spare cards and other spare parts are limited to primarily rotating spares from existing stock into service followed by repairing the removed card to be placed back into stock. Salvaged components from a partial replacement / upgrade may be used to maintain the remainder of the original PLC installation. It is imperative the system be in a working, and at an up to date and supported status. Repairing failed cards and parts is increasingly expensive without necessarily increasing reliability.
NSP-Minnesota	A.0001720.001	Renewable & New Generation	RRI Railroad Community Solar Garden	(1,632,765)	2020	0.5MW lowincome community solar garden on railroad island.	MPUC order E002/M-17-527
NSP-Minnesota	A.0001574.155	Reliability & Performance	SHC3C U3 31 32 Sec Air Heat Ba	(1,464,188)	2020	Replace all 3 layers of air heater baskets in both Unit 3 secondary air heaters as well as the cold end grating. The basket layers include the hot end layer, intermediate layer and the cold end layer. To replace the baskets, the circumferential seals must first be removed in order to remove the baskets. During this operation, inspections will be made on the radial seals, circumferential seals or bypass seals, and the rotor post seals. If it is determined at that time to replace the seals, they will be procured and replace prior to completion.	Heating element baskets are normally replaced when they have reached their service life of upon inspection to determine the degradation and wear from years of use. The hot end basket material is starting to migrate downward resulting in the elements observe red to be worn thin and breaking off. If these baskets are not replaced, this trend will continue and the system will be inefficient and not perform per the intended use of the air preheaters.
NSP-Minnesota	A.0001579.500	Reliability & Performance	RIV Emergent Fund -Other prod	(1,192,908)	2020	This fund covers unexpected equipment failures and discovery issues from overhaul inspections.	Emergent work for unexpected and unplanned equipment failures.
NSP-Minnesota	A.0001566.168	Renewable & New Generation	NBL0C Gearbox Replacements	(1,122,004)	2020	Replace failed gearboxes. Cost includes the crane and labor to remove the rotor, gearbox, and main shaft, and then reinstall the components.	Gearboxes fail with planetary section damage and need to be replaced.
NSP-Minnesota	A.0001575.500	Reliability & Performance	HBR Emergent Fund -Other prod	(1,050,719)	2020	This fund covers unexpected equipment failures and discovery issues from overhaul inspections.	Emergent work for unexpected and unplanned equipment failures.
NSP-Minnesota	A.0001565.083	Environmental Compliance	WLM0-Cap WLM Landfill Cells 8, 9, 10	(887,015)	2020	Project to cap three cells at the Wilmarth ADF (cells 8, 9 and 10). The total acreage is approximately 3 acres. The cost includes purchase of materials, contractor mobilization, erosion control, surveying, completion of work, QA/QC, engineering, site restoration and contingency. Per discussion in Fall 2016 with Wilmarth management and Xcel Environmental services, it was determined that there is an economic advantage to doing three cells at once versus the original plan of capping Cell 10 in 2017 and only doing Cells 8 and 9 in 2020.	Xcel is required by MPCA permit # SW-298-008 to cap landfill cells as necessary. Capping the three cells in one year (2020) versus capping Cell 10 in 2017 and Cells 8 and 9 in 2020 (as was the original plan) will help the company realize significant cost savings based on contractor mobilization costs, purchasing greater quantity of materials, potential costs related to engineering, etc.
NSP-Minnesota	A.0001574.811	Reliability & Performance	SHC3-Isolation valves HP FWHs-22762	(868,861)	2020	Install four 16 inch isolation valves on the Unit 3 Feedwater system. This will allow double isolation on either set of HP heaters so that tube repairs can be performed online. This will likely require piping analysis due to the weight of the valves. The corresponding FWHs are to be replaced in 2020 and 2023 (currently), this project could be performed at the same time as those projects.	In order to enter the confined space of the feedwater heater, double isolation is required to meet safety standards. Tube leaks currently require the unit to be shut down and cooled down before repairs can be performed.

Company Descr	Project ID	New Grandparent	Project Name	YE Amt	Activity Year	Project Description	Project Justification
NSP-Minnesota	A.0001574.135	Reliability & Performance	SHC3C Replace Ash Panel PLC	(862,471)	2020	Replace the Square D PLC which runs the AQCS portion of the ash system (fabric filter ash blowers and pressure feeders, recycle ash, and ash delivery to solid storage silos). Replacement would involve the elimination of the hardwired upright control panel and a migration to a graphics based HMI.	This Square D PLC is nearing the end of life after operating for 25 years. From a manufacturing standpoint, the PLS is obsolete.
NSP-Minnesota	A.0001574.789	Reliability & Performance	SHC3-Foxboro Contr & IO Repl 21991	(832,907)	2020	Replace the outdated controllers and IO on U3 Foxboro DCS. Eliminate Obsolete FBM 100 Pulse IO modules on dampers by replacing with Smart field devices (Beck Drives).	FCP controllers are Mature in 2018 which means they will no longer be available from Schneider. FBM 100 Pulse IO modules are Obsolete and not supported by supplier. Industry has gone to SMART field devices. All other IO modules are expected to be Mature in 2020.
NSP-Minnesota	A.0001580.007	Renewable & New Generation	CWF0-Courtenay Gearbox Replacement	(750,852)	2020	Replace failed gearboxes. Cost includes the crane and labor to remove the rotor, gearbox, and main shaft, and then reinstall the components.	Gearboxes fail with planetary section damage and need to be replaced.
NSP-Minnesota	A.0001611.009	Renewable & New Generation	PVW0-Pleasant Valley Gearbox Replacement	(725,063)	2020	Replace failed gearboxes. Cost includes the crane and labor to remove the rotor, gearbox, and main shaft, and then reinstall the components.	Gearboxes fail with planetary section damage and need to be replaced.
NSP-Minnesota	A.0001574.663	Reliability & Performance	SHC3C Controls Replacement	(645,184)	2020	U3 BFPT Controls Replacement-Replacement of the obsolete Unit 3 electronic-analog feed pump turbine controls. Project will cover the procurement and installation of new BFP turbine control systems to replace existing GE MDT 20 system. New control will include the controllers the associated hardware, software, and field-mounted equipment required to integrate into the existing control oil system as well as the proposed turbine control upgrade system. Replacement Project for SHC-11256	The boiler feed pump is classified as Critical equipment for unit operation. As a result of routine and regular maintenance observations and inspections over time, the existing controls equipment are considered obsolete. Although the existing system historically has not caused problems, the potential for a breakdown in the equipment could be costly to repair and cause significant downtime of the unit.
NSP-Minnesota	A.0001574.293	Reliability & Performance	SHC99 - Barn #54 Receiving Chute - 23436	(645,080)	2020	Replace chute work coming from 53, 55, 52 FDR, going to 54 conv. This is to include the receiving dust box on 54 conv tail end. Chute work is to be of new technology 'controlled flow' chute work to greatly reducer the fugitive dust in the area. 53 to 54 section $193,000 55 to 54 section $280,000 52 fdr to 54 section $229,000 54 Load Zone section $50,000	This project will reduce fugitive dust inside the enclosed coal barn. Alternative types of coal may cause more dust than our current coal type.
NSP-Minnesota	A.0001576.005	Renewable & New Generation	GDM0C Gearbox Replacements 201	(622,658)	2020	GDM0220 - Replace failed gearboxes in GE 1.5 SLE wind turbines. Cost includes the crane and labor to remove the rotor, gearbox, and main shaft, and then reinstall the components.	Gearboxes fail with planetary section damage and need to be replaced.
NSP-Minnesota	A.0001574.812	Reliability & Performance	SHC3-U3 HP Turb Nozzle Repl-22719	(615,778)	2020	Replace the Sherco Unit 3 first stage high pressure turbine nozzle plates--four in total. The nozzle plates are installed in a fit in the high pressure turbine inner casing. Project would require complete high pressure turbine disassembly to access the nozzle plates. The upper half and lower half of the high pressure turbine inner casings would be shipped to an off-site shop for old nozzle plate removal and new nozzle plate installation. These nozzle plates are complicated to manufacture and are made of an exotic material. Lead time to manufacture new nozzle plates is approximately 6 months.	During the Spring 2017 high pressure and intermediate pressure turbine replacement project it was discovered that the first stage high pressure turbine nozzle plates were installed in the wrong radial location. This was a factory assembly error by ALSTOM when the high pressure turbine inner casing was being assembled in Elblag, Poland prior to the original retrofit in 2011. During the Sherco 3 restoration project from 2012 through 2013, the HP turbine inner casing was in the ALSTOM Richmond, VA shop and the nozzle mis-orientation was not noticed and the nozzle plates were not removed. The plant has been troubleshooting a significant vibration problem on the front of the Unit 3 steam turbine and the results of the troubleshooting efforts indicate that this nozzle mis-orientation may be related to the cause of the vibration. General Electric did not recommend re-orienting the nozzle plates to their correct radial location during the Spring 2017 outage due to the risk involved. It is quite possible that the nozzle plates are friction welded to their fit within the inner casing as a result of the 2011 LP turbine failure, making spare nozzle plates necessary.
NSP-Minnesota	A.0001575.166	Reliability & Performance	HBC7-U7 LP Lower Prehtr Hdr Repl-19491	(614,309)	2020	Replace lower preheater header.	In 2014, 86% of header stubs were found cracked.
NSP-Minnesota	A.0001574.173	Reliability & Performance	SHC3C Emergent work	(589,332)	2020	This fund covers unexpected equipment failures and discovery issues from overhaul inspections.	Emergent work for unexpected and unplanned equipment failures.
NSP-Minnesota	A.0001574.657	Reliability & Performance	SHC3C Bottom Ash PLC Replace	(509,998)	2020	Replace existing PLC with new controller and work station during the Unit 3, 2020 outage. Project would include removing six, hard wired local control stations and replace them with one wireless, hand held unit capable of local control of slag gates.	Existing PLC will be obsolete by 2020. Local control panels are corroded due to exposure to ash water.
NSP-Minnesota	A.0001574.792	Environmental Compliance	SHC3-Lime Rcvng & DC PLC repl 21801	(507,678)	2020	Replace the Lime Receiving and Lime Receiver Dust Collector PLCs with a single PLC to decrease the complexity of the system and ease future troubleshooting.	The Lime Receiving, and Lime Receiver Dust Collector PLC's use SquareD failing components. As these components are failing, the inventory on plant site is shrinking. Components cannot be purchased from Vendors, and cannot be guaranteed when bought from other sources. The systems that they control are essential to environmental compliance.
NSP-Minnesota	A.0001574.683	Reliability & Performance	SHCJC Motor Protect Relay Replace	(506,966)	2020	Existing Coal Yard Medium and Low Voltage MCCs have 35 GE Lodtrak III motor protection relays currently installed, which are obsolete and are failing at an increasing rate of 5-10 per year. Spare parts can no longer be procured. A drop in replacement is available from Littlefuse (model MPU-32 with adapter mounting plate, RTD input module and Current input module). A few have been purchased for installation as an interim measure and to validate. Replacement Project for SHC-17070	Lodtrak III motor protection relays are 30 yrs old, obsolete and can no longer be procured. 30-35 will need to be purchased and installed to maintain Coal Yard reliability.
NSP-Minnesota	A.0001574.662	Reliability & Performance	SHC3C BFPT Overspeed Ctrl Replace	(458,390)	2020	Replace the current mechanical overspeed trip systems with triple redundant electronic overspeed trip systems on both boiler feedpump turbines on Unit 3. The replacement of these systems should be combined with a multi-unit package project for all 3 Sherco units in order to reduce costs and ensure that we have the same system on all 3 Sherco units. This will reduce the likelihood of operator error and reduce the loading on technical resources. The overspeed system on the Unit 3 main turbine is being replaced with an electronic system during this same time frame as part of the restoration project. Replacement Project for SHC-12778	The electronic overspeed tripping system will eliminate the need to perform actual mechanical overspeed trips, which in the case of the boiler feedpump turbines requires personnel to stand directly adjacent to the unit being tested. A failure of equipment at overspeed conditions could lead to a catastrophic event and injuries. The industry is moving away from the existing systems because of the risk involved with actually overspeeding the equipment in order to test the prevention systems.
NSP-Minnesota	A.0001573.500	Reliability & Performance	BDS Emergent Fund -Other prod	(414,042)	2020	This fund covers unexpected equipment failures and discovery issues from overhaul inspections.	Emergent work for unexpected and unplanned equipment failures.
NSP-Minnesota	A.0001574.669	Reliability & Performance	SHC3C Rpl Stm Drum Separator Cans	(377,393)	2020	Replace Steam Drum Separator cans and associated hardware. An inspection is needed for the integrity of the drum once all the hardware has been removed.	Steam drum separator cans deteriorate past the point of refurbishment. Separator cans improve the quality of steam from the drum entering superheat tubing. Without these new cans superheat tubing will be damaged.
NSP-Minnesota	A.0001574.502	Reliability & Performance	SHC2-U2 Mill OH 2020 Fall	(353,370)	2020	Project consists of replacing capital components as needed including but not limited to new journal assemblies, floor segments, classifier blades, and vane wheel.	Unit 1 has 7 mills whose performance is tracked through operating data (mill motor amps, coal fineness, etc.) to determine the frequency of overhauls. The major grinding components tend to wear out after about 1.5 million tons of throughput, or every 3-7 years depending upon usage. Maintaining pulverizer performance is essential to maintain boiler reliability, performance, and to stay within emission regulations.
NSP-Minnesota	A.0001574.521	Reliability & Performance	SHC3C Mill OH 2020 Fall	(347,633)	2020	Project consists of replacing capital components as needed, including but not limited to new roll-wheel assemblies, floor segments, classifier blades, rotating throat assembly, and the inverted cone.	Unit 3 has 10 mills whose performance is tracked through operating data (mill motor amps, coal fineness, etc.) to determine the frequency of overhauls. The major grinding components tend to wear out after about 1.5-2 million tons of throughput, or about every 5 years depending upon usage. Maintaining mill performance is essential to maintain boiler reliability, performance, and to stay within applicable emission regulations.
NSP-Minnesota	A.0001574.522	Reliability & Performance	SHC3C Mill OH 2020 Spring	(347,633)	2020	Includes replacement of worn ceramic surfaces, wear liners, classifier vane blade replacements, air inlet vane replacement, RTV, roll to ring adjustment, hardwire weld overlay on floor, replace mill rolls, replace hardox wall liners, replace outlet valve discs, replace door springs, all external repairs, classifier replacement, inverted cone replacement, pyrite area and pyrite hopper repairs, and replacement of pyrite supply valve and jet pump/piping.	Unit 3 has 7 coal mills whose performance is tracked though operating data (mill motor amps, coal fineness, etc.) to determine the frequency of Level 1, Level 2, and Level 3 overhauls. Typically there are 2-3 Level 2 overhauls per year.
NSP-Minnesota	A.0001574.519	Reliability & Performance	SHC3C Circuit Breaker Repl	(345,411)	2020	Replace Q=4 x 480V LK Circuit Breakers-Group 1 is defined as 305/313/315/319 SUS	These Circuit Breaker Units are over 25 years old and have demonstrated that they are no longer reliable and have become obsolete; therefore, they need to be replaced.
NSP-Minnesota	A.0001572.500	Reliability & Performance	ASK Emergent Fund -Steam prod	(338,632)	2020	This fund covers unexpected equipment failures and discovery issues from overhaul inspections.	Emergent work for unexpected and unplanned equipment failures.
NSP-Minnesota	A.0001580.008	Renewable & New Generation	CWF1-Generator Replacements	(319,028)	2020	Replace failed generator in Vestas V100 wind turbines. Cost includes the crane and labor to remove the generator and then reinstall it.	High operating temperatures and a high vibration environment have lead to generator failures in the industry. Upon failure, the wind turbine can not be run. First quarter 2018 operations cost reduction strategy is to accept the risk of these failures as opposed to paying additional for warranty.
NSP-Minnesota	A.0001574.797	Reliability & Performance	SHC2-Level 2 Mill OH 2020 Spring 15883	(303,092)	2020	Includes replacement of worn ceramic surfaces, wear liners, classifier vane blade replacements, air inlet vane replacement, RTV, roll to ring adjustment, hardwire weld overlay on floor, replace mill rolls, replace hardox wall liners, replace outlet valve discs, replace door springs, all external repairs, classifier replacement, inverted cone replacement, pyrite area and pyrite hopper repairs, and replacement of pyrite supply valve and jet pump/piping.	Unit 2 has 7 mills whose performance is tracked through operating data (mill motor amps, coal fineness, etc.) to determine the frequency of Level 1, Level 2, and Level 3 overhauls. Typically there are 2-3 Level 2 overhauls per year.

Company Descr	Project ID	New Grandparent	Project Name	YE Amt	Activity Year	Project Description	Project Justification
NSP-Minnesota	A.0001574.487	Reliability & Performance	SHC1C Mill 2020 Fall	(302,814)	2020	Project consists of replacing capital components as needed including but not limited to new journal assemblies, floor segments, classifier blades, and vane wheel.	Unit 1 has 7 mills whose performance is tracked through operating data (mill motor amps, coal fineness, etc.) to determine the frequency of overhauls. The major grinding components tend to wear out after about 1.5 million tons of throughput, or every 3-7 years depending upon usage. Maintaining pulverizer performance is essential to maintain boiler reliability, performance, and to stay within emission regulations.
NSP-Minnesota	A.0001574.678	Reliability & Performance	SHC3C Boiler Wall Air Ports	(285,755)	2020	Since the installation of the Low NOx burner and over-fired air system on Unit 3, the boiler water walls have suffered from accelerated corrosion, also known as water wall wastage. SmartBurn has completed a conceptual CFD analysis showing that a boundary air system could reduce the water wall wastage by as much as 80%. The conceptual design proposed by SmartBurn was simply adding narrow slots on either end of each of the 10 windboxes. The windbox to furnace differential pressure (dP) was shown to allow enough velocity of the "boundary air" to blanket a large portion of the vulnerable water wall sections protecting them from the reduced atmospheric corrosion. A second option evaluated by SmartBurn included adding many small penetrations through the side walls of the boiler; however, this option would require substantial ductwork and therefore did not seem as reasonable as the first proposed design. Ideally, this project would go into service in conjunction with the water wall replacement project.	A water wall replacement project is already scheduled, but if action is not taken to protect both the existing and future wall panels, reliability will be threatened as tube leaks are more than likely to occur. Once tube leaks begin to occur they will occur more frequently. If coal blends are switched such that the sulfur and/or chlorine content increases, water wall corrosion could increase at an exponential rate. A boundary air system will help mitigate this issue. During the 2011 overhaul, the issue was discovered and action had to be taken to padweld very large sections of the water wall. In addition to the padwelding, the walls were overlayed with a ceramic coating known as "Green Shield". The entire repair including the addition of the coating was very expensive and is not seen as a long term fix.
NSP-Minnesota	A.0001562.148	Environmental Compliance	REW2C-REW2 - U2 baghouse bags	(282,335)	2020	This project will replace all Unit 2 fabric filter bags in all four compartments of the baghouse, replace bag tubesheets (thimbles), and internally coat the hoppers with Magnalux #304 Acid Resistant Coating.	The pulse jet bags are at the end of their life expectancy and over time have become hardened with "bag cake" from moisture in the ash. Once hardened, the cake cannot be removed with standard cleaning practices. The bag tubesheets corrode from acid in the flue gas and are at a point that repairs can be expected. The Magnalux #304 Acid Resistant Coating has significantly reduced repair costs in the Unit 2 Baghouse by greatly extending the life expectancy of the compartments and ducting.
NSP-Minnesota	A.0001702.006	Renewable & New Generation	BS2-Blazing Star II TSG Tline 115kV	(242,372)	2020	Construct a 200 MW New Wind Farm in Lincoln County, MN. The wind farm includes 100 V110 and V116 Vestas Turbines at 2.0 MWs each, a collector system, O&M building, access roads, collector substation, and approximately 10 miles of transmission line.	Qualifies for a Federal Production Tax Credit (PTC).
NSP-Minnesota	A.0001574.459	Reliability & Performance	SHC1C Level 2 Mill Summer 2020	(242,147)	2020	Includes replacement of worn ceramic surfaces, wear liners, classifier vane blade replacements, air inlet vane replacement, RTV, roll to ring adjustment, hardwire weld overlay on floor, replace mill rolls, replace hardox wall liners, replace outlet valve discs, replace door springs, all external repairs, classifier replacement, inverted cone replacement, pyrite area and pyrite hopper repairs, and replacement of pyrite supply valve and jet pump/piping.	Unit 1 has 7 mills whose performance is tracked through operating data (mill motor amps, coal fineness, etc.) to determine the frequency of Level 1, Level 2, and Level 3 overhauls. Typically there are 2-3 Level 2 overhauls per year.
NSP-Minnesota	A.0001574.660	Environmental Compliance	SHC3C Addtnl O2 Probes	(226,050)	2020	Sherco Unit 3 currently has 12 Yokigawa in-situ O2 probes used for Unit control. The probes are located in the vertical ductwork going to the three air heaters, four probes per air heater duct. The controllers are capable of utilizing 24 total inputs. The project is to add twelve additional O2 probes. A new platform and duct penetrations will be required.	Adding 12 additional O2 probes would allow for much better O2 distribution resolution. This would all for better boiler control as the actual excess O2 would be more accurate. Additionally, additional O2 probes would aid in boiler tuning as I&C and engineering would see a better representation of O2 distribution.
NSP-Minnesota	A.0003000.698	Reliability & Performance	SER-CHM-Misc Tools-MN	(203,340)	2020	CHM0121 Purchase of Miscellaneous Tools/Laboratory Instrumentation. These tools are used for analysis of water to monitor and control corrosion and scaling in power plants and to comply with monitoring requirements for NPDES and Solid Waste Permits.	Chemistry Resources functions as a non-profit in-house general laboratory for Xcel Energy. It provides analyses for mandatory regulatory monitoring programs and for operational and maintenance activities in the plants. All of its tools are used throughout Energy Supply's Minnesota fleet as well as backup support for Denver and Amarillo labs. Outside contractors have profit margins built into their costs with which to purchase tools. Plants have overhead budgets to purchase tools. Chemistry Resources has neither. Our only means of obtaining the tools necessary to perform the work is through the plants or capital. Having tools for the central Chemistry Resources lab is more cost effective than having identical sets of tools at each plant.
NSP-Minnesota	A.0001574.195	Reliability & Performance	SHC2C 2018 Small Project Routi	(177,825)	2020	Labor and materials that are categorized as capital expenditures. Must meet capitalization criteria categories and include material costs greater than $2,500, but in total cost less than $50,000.	These are small projects such as valve replacement, motors, etc. that have failed during plant operation.
NSP-Minnesota	A.0001574.180	Reliability & Performance	SHC1C 2018 Small Project Routi	(160,308)	2020	Labor and materials that are categorized as capital expenditures. Must meet capitalization criteria categories and include material costs greater than $2,500, but total cost less than $50,000.	These are small projects such as valve replacement, motors, etc. that have failed during plant operation.
NSP-Minnesota	A.0001574.172	Reliability & Performance	SHCCC 2018 Small Project routi	(157,330)	2020	Labor and materials that are categorized as capital expenditures. Must meet capitalization criteria categories and include material costs greater than $2,500, but total cost less than $50,000.	These are small projects such as valve replacement, motors, etc. that have failed during plant operation.
NSP-Minnesota	A.0001571.500	Reliability & Performance	ANS Emergent Fund -Other prod	(149,041)	2020	This fund covers unexpected equipment failures and discovery issues from overhaul inspections.	Emergent work for unexpected and unplanned equipment failures.
NSP-Minnesota	A.0001571.079	Reliability & Performance	ANS3C Rpl U3 Generator Breaker and MOD	(144,891)	2020	Replacement of unit 3 generator breaker and MOD.	Fugi will no longer provide parts or service after 2015.
NSP-Minnesota	A.0001580.009	Renewable & New Generation	CWF1-Transformer Replacements	(143,297)	2020	Replace failed transformer in Vestas V100 wind turbines. Cost includes the crane and labor to remove the transformer and then reinstall it.	Upon failure, the wind turbine can not be run. First quarter 2018 operations cost reduction strategy is to accept the risk of these failures as opposed to paying additional for warranty.
NSP-Minnesota	A.0001564.005	Reliability & Performance	HNI0C Replace Sluiceway Bridge	(142,760)	2020	Replace the existing concrete bridge crossing the trash sluice with a new concrete bridge.	The existing bridge has reached the end of its service life and needs to be replaced. A bridge failure would cut off vehicle access to the plant and could result in serious injury to personnel.
NSP-Minnesota	A.0001574.520	Reliability & Performance	SHC3C Damper Actuator repl	(141,556)	2020	Replace the controlling actuators on 24 baghouse bypass dampers. This would include the air cyclinders, control solenoids, and shaft boots.	The current control configuration is a fail open mode. This mode caused a major opacity violation when an electrical fuse blew allowing one bypass damper to open. New damper actuators are required to allow a fail in place mode when electrical problems occur. The current equipment cannot be modified.
NSP-Minnesota	A.0001574.294	Reliability & Performance	SHC99 - Coal Barn DS System - 23443	(141,088)	2020	Install new Dust Suppression system which sprays surfactant, mixed with water on the coal paths on 52 conv at a minimum, and 55, 53 conv's (and 52) at a maximum. This will be a new dust suppression skid, piping, etc. There is an existing tank on the north side of barn that could be reused.	This is a safety measure to reduce fugitive dust inside the enclosed coal barn. Potential switch to different coal type will create more dust than our current coal type.
NSP-Minnesota	A.0001574.174	Reliability & Performance	SHCJC 2018 Small Project routi	(126,621)	2020	Labor and materials that are categorized as capital expenditures. Must meet capitalization criteria categories and include material costs greater than $2,500, but total cost less than $50,000.	These are small projects such as valve replacement, motors, etc. that have failed during plant operation.
NSP-Minnesota	A.0001611.010	Renewable & New Generation	PVW1-Generator Replacements	(124,802)	2020	Replace failed generator in Vestas V100 wind turbines. Cost includes the crane and labor to remove the generator and then reinstall it.	High operating temperatures and a high vibration environment have lead to generator failures in the industry. Upon failure, the wind turbine can not be run. First quarter 2018 operations cost reduction strategy is to accept the risk of these failures as opposed to paying additional for warranty.
NSP-Minnesota	A.0001576.013	Renewable & New Generation	GDM Eagle Take Permit	(118,431)	2020	This project supports the activities required to coordinate and manage an Eagle Take Permit at the Grand Meadow Wind Farm. The tasks associated with this include: Point Count Surveys, Aerial Nest Survey, Weekly Nest Monitoring, Application Fee, and Consulting Services.	Nesting Eagles were observed in March 2016 on the adjacent Pleasant Valley Wind Farm. Xcel notified State and Federal agencies and an Eagle Take Permit is required. The agencies involved are MDNR (Minnesota Department of Natural Resources), USFWS (US Fish and Wildlife Service), and EERA (Energy Environmental Review and Analysis).
NSP-Minnesota	A.0001611.011	Renewable & New Generation	PVW1-Transformer Replacements	(116,010)	2020	Replace failed transformer in Vestas V100 wind turbines. Cost includes the crane and labor to remove the generator and then reinstall it.	Upon failure, the wind turbine can not be run. First quarter 2018 operations cost reduction strategy is to accept the risk of these failures as opposed to paying additional for warranty.
NSP-Minnesota	A.0001579.141	Reliability & Performance	RIV9 - Rplc Compressor Bleed Vlv - 23389	(110,923)	2020	Replace the #1, #2, #3, and #4 compressor bleed valve and actuator assemblies during the Unit 9 Major Outage. The new air operated valve assemblies that will be installed are an upgraded design and fully compliant with the GE TIL 1416-R1 - Compressor Bleed Valve Reliability Upgrades. The new valves are a bolt in replacement, with the only system modification being the installation of inline coalescing air filters on the instrument air supply manifold.	GE recommends replacement/overhaul of the compressor bleed valves and actuators on the Hot Gas Path based interval of 24,000 hrs. The existing valves are original, and by the time the unit reaches its Major Outage the existing valves will have been in service for 48,000 hrs, double the OEM recommended limit. The existing valves have experienced operational issues periodically, resulting in failed unit start-ups. In addition, periodic issues have been experienced with valves failing to open during shut down, which could lead to a compressor stall/surge condition. A compressor stall/surge is a very serious event that has the potential to cause significant compressor damage and lead to a costly and lengthy forced outage.
NSP-Minnesota	A.0001573.088	Reliability & Performance	BDS0 -Rplc Statn#9 Air Compressor-23728	(104,016)	2020	Replace the No. 9 Station Air Compressor with a new air compressor of a similar capacity.	Both the Nos. 8 and 9 station air compressor were new in the Black Dog Units 5&2 Repowering Project of 2002. No. 8 station air compressor failed in early 2018, and was replaced that year under an emergent capital project. At the time of the 8 compressor failure, Black Dog's air compressor service contractor stated that 9 station air compressor was in the same condition as the 8 compressor. No. 9 is currently available as a backup.
NSP-Minnesota	A.0001574.296	Reliability & Performance	SHC99 -CESP-2020 #1 CC Rotor Asmbl-23375	(103,769)	2020	Change out the rotating hammer assembly with CESP rotor Assembly on Sherco #1 Coal Crusher. Also change out worn / thin cage pieces, and wear plating inside the crusher.	Crusher is worn out and cannot provide a consistent coal fineness to the plant. This in turn affects the efficiency of the coal burning in the plant.
NSP-Minnesota	A.0001562.044	Reliability & Performance	REW1C REPLACE C7 ASH CONVEYOR	(100,882)	2020	This project will replace the C7 Bottom Ash Conveyor with a new dual strand forged link bottom carry conveyor. The conveyor will be equipped with a new geardrive, electric motor, and VFD.	The C7 conveyor was originally installed in 1987 and is nearing the end of its expected life. The entire tub assembly is worn to the point that ash leaks from all areas of the assembly. The existing design of the conveyor is a top carry configuration where the center bar has worn to the point such that ash falls through to the return side and gets carried to the tail section. The ash in the tail section must be cleaned out every shift by Operations personnel. To clean the tail section the end door must be removed which exposes plant personnel to fugitive airborne ash dust being the conveyor operates under positive pressure. Installing the new conveyor will standardize parts between other conveyors operating on the unit.

Company Descr	Project ID	New Grandparent	Project Name	YE Amt	Activity Year	Project Description	Project Justification
NSP-Minnesota	A.0001562.087	Reliability & Performance	REW1C REPLACE BIN 11 AUGERS	(100,591)	2020	This project will replace all (6X) RDF screw feeder augers in the metering bin with new assemblies. The new augers will be constructed with AR400 flighting and hardsurfaced overtop of the high abrasion wear areas. The replacement augers will be a like for like replacement as to those currently in-service.	The existing screw feeders have a 5 year life expectancy as seen throughout the life of the RDF burning process. After the 5 years it has been noted that the structural barrel of the augers wear to approximately 1/2 of their nominal thickness. Once the barrels have worn down to ~0.125" failures are immanent. Due to the design of the augers it is difficult to repair the barrels instead of replacing the entire auger assembly. When failures do occur with a screw feeder the unit must be taken off of RDF and placed on natural gas. Anytime the operators must swap fuel sources in quick response to a mechanical failure there is a risk of having an Air Quality Permit violation/exceedance. New augers with full height flighting require less cleaning and thus reduces plant operator's exposure to a cutting/cleaning hazard.
NSP-Minnesota	A.0001574.356	Reliability & Performance	SHC1C Control Room Roof Repl.	(100,358)	2020	Remove the existing roofing materials and install a new roofing system of like kind. The condition of the substructure will be assessed at the time of the tear off and addressed accordingly. The project would replace the roof covering the U1 Control room (11,300 SF).	The existing roof has exceeded its life cycle. Going forward, patching and repairing will add maintenance costs associated with stopping the leakage as it occurs.
NSP-Minnesota	A.0001574.252	Reliability & Performance	SHC99 Emergent work	(99,321)	2020	This fund covers unexpected equipment failures and discovery issues from overhaul inspections.	Emergent work for unexpected and unplanned equipment failures.
NSP-Minnesota	A.0001574.198	Reliability & Performance	SHCCC 2017 Emergent Work	(98,141)	2020	This fund covers unexpected equipment failures and discovery issues from overhaul inspections.	Emergent work for unexpected and unplanned equipment failures.
NSP-Minnesota	A.0001574.395	Reliability & Performance	SHC3C #32 BFP Overhaul	(96,594)	2020	Overhaul Boiler Feed Pump Estimates: $100,000- Pump $3,000- Potential seal face renewal $6,000- Electrical $65,000- Maintenance $174,000- Total	Pump overhauls are done on a 6 year interval for the main boiler feed pumps. The rebuild is essential for good equipment performance which is required for power plant operation.
NSP-Minnesota	A.0001574.190	Reliability & Performance	SHC3C 2018 Small Project Routi	(95,965)	2020	Labor and materials that are categorized as capital expenditures. Must meet capitalization criteria categories and include material costs greater than $2,500, but total cost less than $50,000.	These are small projects such as valve replacement, motors, etc that have failed during plant operation.
NSP-Minnesota	A.0001579.103	Reliability & Performance	RIV9 -Replace Lube Oil Pump - 23388	(95,700)	2020	Replace the existing #1 and #2 AC lube oil pumps and motors during the Unit 9 Major. The existing grease lubricated pumps require frequent maintenance and an overhaul every 16k hrs. Pump overhauls do not fit within Hot Gas Path outage windows so they have historically not been completed. An upgraded, forced oil lubricated 30k hr interval pump is available that offers increased reliability and longevity. It is expected that this upgraded pump design will operate reliably between Major Outage intervals, at which time pump overhauls would be completed.	The existing pumps are of a design that has been known to be problematic within the industry. They are also original and overdue for overhauls. 7FA gas turbines do not have shaft driven oil pumps, so lubricating oil for the turbine and generator bearings is supplied from either of the two 100% capacity AC lube oil pumps. One pump is always running unless the unit is in a maintenance outage, so the pumps accumulate operating hours even while the unit is offline in reserve shut down. In November 2016, the #1 AC lube oil pump on Unit 10 failed during operation. The damage to the pump was extensive and a forced outage was required to make repairs.
NSP-Minnesota	A.0001573.214	Reliability & Performance	BDS6-Install U6 Turning Gear VFD-22766	(95,388)	2020	Installation of a variable frequency drive (VFD) on the existing 5 HP turning gear motor to allow for reduced turning gear speeds during offline operation to reduce equipment wear. Project includes materials for the installation (may require a new 5 HP motor), turbine control system (MarkVIe) logic changes, field engineering for startup and commissioning, and company labor to perform the project. Project is scheduled to coincide with the end of the 2 year warranty period from GE in spring 2020.	Unit 6 is forecasted with a 5 - 10% capacity factor for peak load operation, therefore the unit will spend approximately 8,000 hours per year on turning gear while waiting to be dispatched. The unit will be classified by MISO as a quick start unit, capable of providing up to 150 MW within 10 minutes, so it must be on turning gear ready to start to achieve this commercial profile. Extended turning gear operation (greater than 50k hours) has been shown within the Xcel Energy fleet (and throughout the industry) to cause significant wear to compressor and turbine discs from blade rock while on gear and require major overhaul to repair or replace rotor components. Unit 6 will reach the 50k threshold within 7 years of operation if the turning gear speed is not reduced. By performing this project and reducing the turning gear speed by a factor of 10, this extends the turning gear component of the major overhaul interval to approximately 70 years and effectively beyond end of life for the unit, thereby mitigating the issue.
NSP-Minnesota	A.0001574.269	Reliability & Performance	SHC2C Emergent Projects	(90,721)	2020	This fund covers unexpected equipment failures and discovery issues from overhaul inspections.	Emergent work for unexpected and unplanned equipment failures.
NSP-Minnesota	A.0001573.089	Reliability & Performance	BDS0 - Rplc 11 Screen Wash Pump -23629	(89,727)	2020	Replace 11 screen wash pump bowl and rotating assembly, including stainless steel impellers and abrasion resistant Greene Tweed bearings for the bowl assembly.	11 screen wash pump is showing reduced capacity and in need of overhaul. Previous overhauls of 21 & 41 screen wash pumps have shown extensive damage and wear to the impellers and bowl assemblies, requiring replacement of the bowl assemblies with OEM recommended upgrades to SS impellers and abrasion resistant bearings. Performance data from 11 SWP indicates it will also have flow path damage.
NSP-Minnesota	A.0001574.268	Reliability & Performance	SHC1C Emergent Projects	(89,581)	2020	This fund covers unexpected equipment failures and discovery issues from overhaul inspections.	Emergent work for unexpected and unplanned equipment failures.
NSP-Minnesota	A.0001574.292	Environmental Compliance	SHC0 -Rplc DS Pmphouse Pipe vlv'20-23439	(85,922)	2020	Replace piping and valving in the Dust Suppression pump house by the recycle basin. Inspect piping for holes and thinning, and talk with Ops on problem valves.	Dust suppression water is used for majority of dust control in the coal yard. Piping is corroded and valving is reported to not be working properly.
NSP-Minnesota	A.0001574.216	Reliability & Performance	SHC3C 2016 Polisher Controls R	(82,777)	2020	Replacement of the legacy PLC, relay controls, and mechanical control panel for the Unit 3 Condensate Polisher.	Legacy equipment - Parts are becoming unavailable for the PLC and some of the stacked relay controls. Anticipate an increase in failure rate for the legacy controls which could delay a unit startup.
NSP-Minnesota	A.0001574.423	Reliability & Performance	SHC3C Turb Isolation Vlv TG	(82,647)	2020	Install a new isolation valve(s) in the HP turbine gland exhaust piping. The valve(s) will help to prevent the turbine from rolling off turning gear during the turbine pre-warming process during unit startups.	Each time the turbine rotor is kicked off gear, it coasts to a complete stop and causes the turning gear to re-engage. Repeated re-engagement of the gear is damaging to the rotor and turning gear. This can also lead to unit startup delays.
NSP-Minnesota	A.0001574.778	Environmental Compliance	SHC0-Lime slaking building roof 22109	(82,300)	2020	Replace the roof on the Lime slaking building which is on the east side of the crusher building in the coal yard.	The roof is in poor shape and leaks on switchgear in the room. Replacement is required to maintain the functionality of the equipment inside.
NSP-Minnesota	A.0001579.102	Reliability & Performance	RIV9 - Rplc Hydraulic Oil Pumps - 23386	(78,028)	2020	Replace the existing #1 and #2 hydraulic oil pumps and motors during the Unit 9 Major. The existing pumps are due for an overhaul, however they are obsolete and no longer supported by the manufacturer. Repair parts are also no longer available for the existing pumps, making it impractical to overhaul them. The new pumps that will be installed are the current, upgraded version that have several design improvements intended to improve the reliability of the pumps. As part of the project, a removable access hatch will be installed on the accessory module roof to facilitate motor removal without removal of the accessory module roof.	The existing pumps are due for an overhaul and are of an obsolete design that is no longer supported by the manufacturer, making it impractical to overhaul the existing pumps. 7FA gas turbines use two 100% capacity hydraulic pumps for operation of the hydraulic oil and lift oil systems. One pump is always running unless the unit is in a maintenance outage, so the pumps accumulate operating hours even while the unit is offline in reserve shut down. In the spring of 2017, one of the hydraulic oil pumps on Unit 10 failed during operation. As a result, the pump and motor needed to be replaced.
NSP-Minnesota	A.0003000.709	Renewable & New Generation	G100C PVW Eagle Take Permit	(76,644)	2020	This project supports the activities required to coordinate and manage an Eagle Take Permit at Pleasant Valley Wind Farm. The tasks associated with this include: Point Count Surveys, Aerial Nest Survey, Weekly Nest Monitoring, Application Fee, and Consulting Services.	Nesting eagles were observed in March 2016 on the Pleasant Valley Wind Farm. Xcel notified State and Federal agencies and an Eagle Take Permit is required. The agencies involved are MDNR (Minnesota Department of Natural Resources), USFWS (US Fish and Wildlife Service), and EERA (MN Energy Environmental Review and Analysis).
NSP-Minnesota	A.0001574.295	Reliability & Performance	SHC0 -#54 Pit Floor Slope ReCover -23434	(75,989)	2020	Remove/Rough up top layer of concrete floor and add floor covering of Concrete/Grout to create drainage in the bottom floor of the coal barn by the tail end of 54 conveyor. Drainage is to lead water to the sump pump.	This is a safety measure, particularly if Xcel switches to Belle Ayr coal, which will create more dust than our current coal type. This area is already a dusty area that is hard to keep up with cleaning due to declining personnel.
NSP-Minnesota	A.0001564.027	Reliability & Performance	HNI4C Replace Unit 4 Shaft Seals	(70,571)	2020	Replace the turbine shaft seals on both the upstream and downstream end. The seals will be either mechanical or packing modified with a plastic backer that helps absorb shaft movement. A clean water package may also be needed. The existing 304 SS shaft sleeves will be removed and new hardened sleeves will be installed that match well with the shaft seal material.	The existing packing cannot handle the added shaft movement while running. The center bearing was removed to make maintaining the unit safer. The current 304 SS sleeves are grooved from debris in the seal water. The packing is being used at a much higher rate. Annually we are spending about $6,000 per year on packing. The extra leakage causes slipping hazards in the plant. The shaft sleeves will continue to wear and likely within 5 years cause shaft damage that would require extensive disassembly and repairs.
NSP-Minnesota	A.0001559.113	Reliability & Performance	BLL7C Replace u7 battery	(60,191)	2020	Replace TAB 58-8 OPzS 800 - 58 cells	The battery string is approaching its end of design life and testing indicates that its health is trending with design. Battery installed 2004 with a design life of 15-years.
NSP-Minnesota	A.0003000.559	Reliability & Performance	SER0C CHM Dissipation Factor	(60,000)	2020	Purchase of Automatic Dissipation Factor Instrument	This instrument is necessary to maintain Operational Excellence in support of fleet wide operations. It is primarily used to analyze oil samples taken from Transformers to determine serviceability.
NSP-Minnesota	A.0001565.500	Reliability & Performance	WLM Emergent Fund -Steam prod	(54,449)	2020	This fund covers unexpected equipment failures and discovery issues from overhaul inspections.	Emergent work for unexpected and unplanned equipment failures.
NSP-Minnesota	A.0001574.290	Reliability & Performance	SHC3 - 6A or 6B Conveyer Gearbox - 23381	(51,077)	2020	Purchase and install new gearbox for 6A or 6B conveyor. Cost estimates are approximately $65K materials, $15K installation, and $8K project	Spare reducers with long lead time are needed to keep up reliability.
NSP-Minnesota	A.0001574.723	Environmental Compliance	SHC0C Stack CEMS Eqmt Repl	(48,090)	2020	Replacement of the gas rack probe controller and umbilical. Equipment life is 10 yrs.	Equipment 10 years old and is critical for the emission monitoring system. Loss of function would disable the CEMS instrumentation.
NSP-Minnesota	A.0001574.291	Reliability & Performance	SHC99 - #52 Tripper Gearbox XMSN - 23380	(45,326)	2020	Purchase and install new gearbox on 52 Tripper.Cost estimate is $31K Materials, $18K Maintenance, and $9K Project team	Spare reducers with long lead time are needed to keep up reliability.
NSP-Minnesota	A.0001562.500	Reliability & Performance	REW Emergent Fund -Steam prod	(43,973)	2020	This fund covers unexpected equipment failures and discovery issues from overhaul inspections.	Emergent work for unexpected and unplanned equipment failures.
NSP-Minnesota	A.0001559.106	Reliability & Performance	BLL0C 78 LV BKR Buy	(37,187)	2020	Buy 2 replacement breakers for the Units 7/8 480-V switchgear.	The protective relays on the existing breakers are no longer supported by the OEM. Relay failure requires new breaker. Additionally, the cost to refurbish breakers at about the 15-year point costs about 75% of new and doesn't address the relay issue above.
NSP-Minnesota	A.0001611.005	Renewable & New Generation	PVW-Wind Expansion Project	(14,765)	2020		
NSP-Minnesota	A.0001561.500	Reliability & Performance	IVH Emergent Fund -Other prod	(9,124)	2020	This fund covers unexpected equipment failures and discovery issues from overhaul inspections.	Emergent work for unexpected and unplanned equipment failures.
NSP-Minnesota	A.0001707.002	Renewable & New Generation	DKR0 Dakota Rnage Wind Land	(8,729)	2020	Construct a 300 MW New Wind Farm in Grant and Codington Counties, South Dakota. The wind farm includes 72- V136 Vestas Turbines rated at 4.2 MWs each, a collector system, O&M building, access roads, and collector substation.	This project qualifies for the Federal Production Tax Credit (PTC) at an 80% level.
NSP-Minnesota	A.0001574.770	Reliability & Performance	SHC3C ID Fan HVAC PLC Rplc	(4,488)	2020		Keeping the Coal Yard DCS up to the most current revision Emerson Software is also important because it allows us to meet our DCS security policy requirements, and CIP requirements.
NSP-Minnesota	A.0001559.500	Reliability & Performance	BLL Emergent Fund -Other prod	(2,728)	2020	This fund covers unexpected equipment failures and discovery issues from overhaul inspections.	Keeping the Coal Yard DCS up to the most current revision Emerson Software is also important because it allows us to meet our DCS security policy requirements, and CIP requirements.

Company Descr	Project ID	New Grandparent	Project Name	YE Amt	Activity Year	Project Description	Project Justification
NSP-Minnesota	A.0001565.104	Reliability & Performance	WLM0C New Ash Loadout Building	(500)	2020	Tear down and replace the existing Ash Loadout Building at the Wilmarth Generating Station. The building would be a 40' x 48'-8.5" x 16'-6" pre-engineered metal building. It would include new primary steel framing, secondary structural components, exterior insulated wall panels, standing seam metal roof, fiberglass reinforced plastic liner system for the interior walls, three new roll-up doors and gutters/downspouts	The existing Ash Loadout building is in very bad shape and is a potential safety hazard. Over 28 years of exposure from combined ash have eaten away at many of the roof perlins. Many perlins have had their bottom flanges completely eroded away which has given way to large sections of their webs also eroding after becoming susceptible to significant corrosion. In late 2015, we had 12-gauge angles installed on the bottom of the roof perlins to provide additional support. With the new fuel contracts and the life of the plant extending at least through the next decade, the old building will need to be replaced in order to meet our fuel commitments and reliability.
NSP-Minnesota	A.0001705.003	Renewable & New Generation	CRW-Crowned Ridge BOT Wind Tline TSG	(104)	2020	Purchase a 301MW Wind Farm from NextEra near Watertown, SD. The wind farm will consist of 117 GE 2.3-116 90HH and 15 GE 2.1 -116 80HH wind turbine generators, a collection system, Operations and Maintenance building, access roads, collector substation, and a transmission interconnection line.	Qualifies for a Federal Production Tax Credit (PTC).
NSP-Minnesota	A.0001705.004	Renewable & New Generation	CRW-Crowned Ridge BOT Wind Sub TSG	(104)	2020	Purchase a 301MW Wind Farm from NextEra near Watertown, SD. The wind farm will consist of 117 GE 2.3-116 90HH and 15 GE 2.1 -116 80HH wind turbine generators, a collection system, Operations and Maintenance building, access roads, collector substation, and a transmission interconnection line.	Qualifies for a Federal Production Tax Credit (PTC).
NSP-Minnesota	A.0001705.005	Renewable & New Generation	CRW-Crowned Ridge BOT Wind Farm GIA	(104)	2020	Purchase a 301MW Wind Farm from NextEra near Watertown, SD. The wind farm will consist of 117 GE 2.3-116 90HH and 15 GE 2.1 -116 80HH wind turbine generators, a collection system, Operations and Maintenance building, access roads, collector substation, and a transmission interconnection line.	Qualifies for a Federal Production Tax Credit (PTC).
NSP-Minnesota	A.0001705.002	Renewable & New Generation	CRW-Crowned Ridge BOT Wind Farm Land	(100)	2020	Purchase a 301MW Wind Farm from NextEra near Watertown, SD. The wind farm will consist of 117 GE 2.3-116 90HH and 15 GE 2.1 -116 80HH wind turbine generators, a collection system, Operations and Maintenance building, access roads, collector substation, and a transmission interconnection line.	Qualifies for a Federal Production Tax Credit (PTC).
NSP-Minnesota	A.0001707.001	Renewable & New Generation	DKR0 Dakota Range Wind Turbines	(353,069,462)	2021	Construct a 300 MW New Wind Farm in Grant and Codington Counties, South Dakota. The wind farm includes 72- V136 Vestas Turbines rated at 4.2 MWs each, a collector system, O&M building, access roads, and collector substation.	This project qualifies for the Federal Production Tax Credit (PTC) at an 80% level.
NSP-Minnesota	A.0001707.004	Renewable & New Generation	DKR0 Dakota Range Wind TSG Sub	(14,747,578)	2021	Construct a 300 MW New Wind Farm in Grant and Codington Counties, South Dakota. The wind farm includes 72- V136 Vestas Turbines rated at 4.2 MWs each, a collector system, O&M building, access roads, and collector substation.	This project qualifies for the Federal Production Tax Credit (PTC) at an 80% level.
NSP-Minnesota	A.0001707.005	Renewable & New Generation	DKR0 Dakota Range Wind 345Kv Line GIA	(12,913,773)	2021	Construct a 300 MW New Wind Farm in Grant and Codington Counties, South Dakota. The wind farm includes 72- V136 Vestas Turbines rated at 4.2 MWs each, a collector system, O&M building, access roads, and collector substation.	This project qualifies for the Federal Production Tax Credit (PTC) at an 80% level.
NSP-Minnesota	A.0001574.286	Reliability & Performance	SHCJC Replace Auxiliary Boilers	(11,326,259)	2021	Install new Auxiliary Boilers (ABs) to provide a reliable source of steam supply for unit cold start-up for the existing power plant and building heating. These ABs would also be used to supply start-up steam for the new combined cycle that is planned for the Sherco site. The new ABs would be designed to supply steam to the following (not necessarily concurrently): Existing SHERCO Coal Fired Units 1 and 2 for building heating Existing SHERCO Coal Fired Unit 3 for building heating and startup steam Future SHERCO Combined cycle for process heating in the combined cycle to enable fast start ups, but not for building heating.	The existing ABs are in poor condition. The #1 AB was removed from service and permanently decommissioned a number of years ago due to problems with the controls and numerous tube leaks. The #2 AB is serviceable and runs for a few hours each year to ensure it will operate if needed; however, it has been unreliable and requires extensive efforts each time to get it started. The #2 AB is over 40 years old and parts are not readily available to fix the unit. Steam from the Auxiliary boilers could also be sold to LPI as a back-up steam supply if the existing generation assets were not operating or if it was more economical to use that steam for electricity generation. A reliable source of steam for startup and building heating becomes increasingly important in the future, since there will be times where no coal unit will be operating to supply heat or start up steam to any other unit. Therefore a reliable source of startup steam and building heating will be needed. Steam supply from the new AB's will decrease our dependence on U1&2 for blackstart requirements and LPI steam supply. This provides more flexibility related to any economic outages/seasonal operation and potential earlier retirement of U1&2. The project also will maintain the customer service reliability we currently provide LPI and is part of the lowest cost steam supply scenario.
NSP-Minnesota	A.0001572.204	Reliability & Performance	ASK1C Secondary Superheater Replace	(9,290,304)	2021	Replace the secondary superheater section (SSH) of boiler per long-term recommendation of boiler reliability team. There are 35 inlet (front) platen sections, 35 intermediate (middle) platen sections, and 70 outlet (rear) pendant sections. This does include the replacement of the inlet and outlet headers.	Recent issues include one failure determined during a forced outage in 2016. an in-depth boiler inspection during the Spring 2013 annual outage indicated that 86 location in the front pendants require pad welding, as well as 184 locations in the middle pendants, and 6 locations in the rear pendants.
NSP-Minnesota	A.0001579.137	Reliability & Performance	RIV10C U10 Major Inspection No. 1	(6,719,274)	2021	Major Inspection outage No. 1 for Riverside's Combined Cycle Unit 10. Included in this capital project is the labor and rental equipment needed to replace Hot Gas Path parts. Parts include: Stage 1, 2, and 3 turbine nozzles, buckets, shrouds, and diaphragms as well as a full inspection of the units compressor section.	The combustion turbine OEM, GE recommends that at 24,000 EOH or 900 factored starts (whichever comes first) after the Hot Gas Path Inspection a Major Inspection be performed. For Unit 10, the first Major is projected to be performed in 2021. During a Major, the existing parts will be removed from the turbine and the refurbished parts will be installed. As these components age, they may undergo thermal mechanical fatigue, cracking, abnormal wear, foreign object damage, cooling hole damage or plugging, TBC coating damage, oxidation, corrosion, erosion, hot spots / burning, clearance issues, etc. The probability of seeing these problems increases above the OEM recommended maintenance interval. Any combination of these issues could result in unit trips, extended forced outages, and possibly major equipment damage.
NSP-Minnesota	A.0001723.003	Reliability & Performance	MEC3 - Replace Turbine Blades - 23663	(4,642,899)	2021	Unit 3 MEC L-0 Replacement	Unit 3 MEC L-0 Replacement
NSP-Minnesota	A.0001574.087	Environmental Compliance	SHC3C U3 Landfill Cell 4	(3,424,090)	2021	Construct 24 acre, GCL/HDPE composite lined, cell located West of Cell 3. Project includes an additional sump pump station, extension of fence and permitting (renewal for cell 4 and inclusion of cell 5). Fill rates have been evaluated and assuming the rates continue without changes, Cell 4 will need to be constructed in 2020.	The new cell is necessary for the continued disposal of AQCS ash from Sherco U3 and as backup disposal for King Fly Ash. Cell 4 design was approved my MPCA in current permit. Ash generation and utilization is assumed to continue at present rates.
NSP-Minnesota	A.0001574.808	Environmental Compliance	SHC99 Stormwater Management 22619	(3,352,084)	2021	Install systems to collect and divert storm water away from the Recycle Basin and Scrubber Pond.	Reducing water flow into the Recycle Basin will reduce the volume of water transferred to the Scrubber Solids Pond. Which will reduce the amount and cost of water treatment that will be needed at end of life of Sherco 1-3.
NSP-Minnesota	A.0001579.080	Reliability & Performance	RIV0C --U10 CT Compressor Upgr	(2,767,708)	2021	Replace S-0 thru S-4 and S-17 compressor vanes and exit guide vanes (EGV) with PSM parts. The work will be completed at the same time as the U10 major overhaul to minimize costs.	Some compressor damage was found during the last 2013 Combustor Inspection. Review by TechnicalResources and Loss Control led to a recommendation to address known GE compressor issues.
NSP-Minnesota	A.0001579.122	Reliability & Performance	RIV7-Replace U7 GSU Transforme	(2,717,347)	2021	Replacement of U7 GSU Transformer and 115kV disconnect.	This equipment was originally installed in 1985. The life expectancy of this type of equipment is typically 30 - 40 years. The 115kV disconnect should be replaced at the same time due to contact corrosion.
NSP-Minnesota	A.0001572.208	Reliability & Performance	ASK1C Cyclone Refractory Replace	(2,527,873)	2021	Replace the cyclone refractory in all 12 cyclones due to loss of refractory from erosion in an abrasive environment. The project scope includes the replacement of the entire refractory inside the cyclones and the re-entrant throat. The existing refractory and the new refractory is Corline. The approximate square footage of this work is 6,524 square feet. The stud density is 351 studs per square foot, so approximately 2,300,000 studs.	If the refractory is not replaced the cyclone boiler tubes will be damaged and cause tube leak repair forced outages. Erosion of the refractory is tracked and continually replaced on an O&M basis during short outages. Eventually the studs that hold the refractory in place are eroded to the point where they can no longer hold refractory and a re-studding and complete refractory replacement is required. Previous replacements were completed in 2007 and 2015.
NSP-Minnesota	A.0001579.101	Reliability & Performance	RIV7 - Rplc L-1 LP Rotor Blading - 22491	(2,506,955)	2021	Replace the L-1 blading on both ends of the Unit 7 Turbine LP rotor.	The L-1 blading is original to the unit and reached the end of its design life of 30 years in 2017. There is also a service bulletin from the OEM, Siemens, related to a known defect with the existing blading design that has caused failures on other units during operation. The service bulletin recommends replacing the existing blading with redesigned blading to reduce operational risk and improve reliability. In addition to the erosion damage that occurs on the leading edge of the blading, the blading material has a finite life and normal operating conditions slowly degrade the material over time. This degradation makes the blading more susceptible to cracking, which has the potential to lead to a catastrophic turbine failure. The blading should be replaced to minimize operational risk to the unit and plant personnel.
NSP-Minnesota	A.0001572.122	Environmental Compliance	ASK1C- Replace SCR Catalyst 20	(2,454,668)	2021	Replace the middle layer (143 modules) of the SCR with new catalyst during the 2020 annual outage. Each catalyst module has rough dimensions of 64" x 75" x 38" and weighs 2,900 lbs each. The lead times for new catalyst require that the purchase order be placed with catalyst supplier in the year prior to installation. The scope of the project to include the procurement and installation of new catalyst, removal and proper disposal of the existing catalyst, and ammonia injection tuning after installation.	Environmental. Compliance of NOx emissions.
NSP-Minnesota	A.0001723.002	Reliability & Performance	MEC2 - Combustion Inspection - 23606	(2,335,112)	2021	Unit 2 CT Combustion Inspection (2021)	Unit 2 CT Combustion Inspection (2021)
NSP-Minnesota	A.0001574.288	Reliability & Performance	SHC1 - Rplc Hot & Int. AH Basket - 23407	(2,275,186)	2021	Unit 1 has two tri-sector ljungstrom air heaters. Each air heater has three layers of baskets; hot, intermediate, and cold. The hot and intermediate end get replaced together during the 2021 overhaul.	An inspection in 2018 identified downward element migration of the hot baskets into the intermediate layer. As the elements loosen and move down, they break up which causes an increase in differential pressure and a loss in heat transfer. Prolonged operation of deteriorating baskets will lead to excessive differential pressure which will then limit the capability of the primary air and secondary air fans causing derates and eventually forcing the unit offline for basket cleaning. Replacing the baskets before critical DP increases and heat transfer losses will ensure continued reliable and efficient operation.

Company Descr	Project ID	New Grandparent	Project Name	YE Amt	Activity Year	Project Description	Project Justification
NSP-Minnesota	A.0001562.057	Environmental Compliance	REW0C LANDFILL CELL 5 CONSTRUC	(2,023,394)	2021	The construction of the Red Wing ADF South Central Cell provides RDF ash disposal capacity thru 2035 and provides critical sequencing space for the metal recovery project. The space allows for ash excavation to take place in existing cells and subsequent placement of processed ash in the South Central cell.	This is a mandated project as there will be no room in the other cells to place processed ash.
NSP-Minnesota	A.0001562.086	Reliability & Performance	REW1C U1 GENERATOR REWIND	(1,891,071)	2021	This project will replace the original 1948 General Electric generator stator windings. Activities associated with this project will include winding removal; stator frame and core cleaning and inspection; inspect, clean, and tighten associated clamping hardware; new winding installation; and applicable testing per IEEE and ANSI standards.	The 2007 Turbine Generator Major Overhaul Inspection and 2010 Life Extension Study both recommend a generator rewind based on age and condition of the generator. The current stator winding is 65 years old from original installation in 1948 while median life expectancy is 40 yrs. Cycling duty on RDF plants is higher than normal which has caused problems. Other concerns in the condition assessments identify girth cracks, slot wedge tightness, and endturn mechanical integrity as potential issues. The reports indicate a generator rewind is required for operation through 2027.
NSP-Minnesota	A.0001572.048	Reliability & Performance	ASK1C-Inst Emerson DCS Evergre	(1,842,143)	2021	Emerson to provide new hardware and software to support plant digital control system. To keep pace with advancements is the goal of the Ovation Evergreen program. This SureService customer support module provides a way to keep your Ovation system continuously up-to-date. The Evergreen program allows you to avoid a costly total system retrofit required when the components are too old to be salvaged. The Ovation Evergreen program plans for replacing the affected items, including networks, workstations, controllers and system software with the latest releases, and incorporating new I/O and security features.	Required.
NSP-Minnesota	A.0001579.063	Reliability & Performance	RIV0C Emerson DCS Evergreen 20	(1,699,916)	2021	This project will cover the cost of Emerson Process Management's 'Ovation Evergreen Program'. This program will provide full replacement of all workstation hardware, replacement of network equipment, and upgrade of the Ovation DCS software to the latest revision. For Riverside, this replacement is expected to be needed in 2014 and again in 2018. CAA determined in December 2011 that this qualifies as a capital expense.	Replacement of Riverside's Ovation hardware is necessary to ensure that the equipment will continue to operate reliably. This Control System is responsible for controlling and monitoring most of the Riverside plant equipment, and failure could lead to significant equipment damage and extended outages.
NSP-Minnesota	A.0001559.014	Reliability & Performance	BLL8-U8 CT Control System Repl	(1,663,866)	2021	Replacement of the Combustion Turbine Control System Hardware and Software.	The Combustion Turbine Control System hardware/Software needs to be refreshed periodically in order to ensure the system does not fall behind the obsolescence curve. There is difficulty with older systems in procuring replacement parts, finding good field service support, and meeting up to date cyber asset security requirements. The current system has been operating since 2005.
NSP-Minnesota	A.0001559.015	Reliability & Performance	BLL7-U7 CT Control System Repl	(1,663,866)	2021	Replace the Combustion Turbine Control System (AKA Speedtronic Mark V Turbine Controls) Hardware and Software on Blue Lake Unit 7	The Combustion Turbine Control System Hardware/Software needs to be refreshed periodically in order to ensure the system does not fall behind the obsolescence curve. There is difficulty with older systems in procuring replacement parts, finding good field service technicians, and meeting up to date cyber asset security requirements. The current system has been operating since 2005. GE ceased normal production of the SpeedTronic Mark V turbine Control system on March 31, 2004. As with many products, and particularly with electronics, the Mark V will eventually exceed its supportable life as parts and components become unavailable and technology resources become scarce. This makes it increasingly difficult to guarantee timely availability/reparability of parts for an extended period of time.
NSP-Minnesota	A.0001566.168	Renewable & New Generation	NBL0C Gearbox Replacements	(1,579,827)	2021	Replace failed gearboxes. Cost includes the crane and labor to remove the rotor, gearbox, and main shaft, and then reinstall the components.	Gearboxes fail with planetary section damage and need to be replaced.
NSP-Minnesota	A.0001579.079	Reliability & Performance	RIV0C --U10 CT Cntrl Sys Upg	(1,546,819)	2021	Replace the Combustion Turbine Control System hardware.	The Combustion Turbine Control System Hardware needs to be refreshed periodically in order to ensure the system does not fall behind the obsolescence curve. There is difficulty with older systems in procuring replacement parts, finding good field service technicians, and meeting current cyber asset security requirements. The existing system was installed in 2009.The current version of the Mark VI is operating on the Windows XP operating system. Microsoft is no longer issuing licenses for the XP operating system. Continued operation with the present hardware increases the risk of failure and potential long term outage. This includes servers, HMI's, switches, historian and obsolete control cards.
NSP-Minnesota	A.0001579.084	Reliability & Performance	RIV0C --U9 CT Control System U	(1,546,819)	2021	Replace the Combustion Turbine Control System Hardware.	The Combustion Turbine Control System Hardware needs to be refreshed periodically in order to ensure the system does not fall behind the obsolescence curve. There is difficulty with older systems in procuring replacement parts, finding good field service technicians, and meeting current cyber asset security requirements. The existing system was installed in 2009.The current version of the Mark VI is operating on the Windows XP operating system. Microsoft is no longer issuing licenses for the XP operating system. Continued operation with the present hardware increases the risk of failure and potential long term outage. This includes servers, HMI's, switches, historian and obsolete control cards.
NSP-Minnesota	A.0001559.005	Reliability & Performance	BLLC8 U8 Exhaust Silencer Repl	(1,538,736)	2021	Replace silencer on unit 8 CT exhaust stack.	The panels are used to reduce the decibels coming out the stack of the CT. The panels are melting and breaking up. They are made with a stainless steel that cannot standup to the higher temperature of a GE 7FA Ct. They where designed for a GE 7FE class CT that runs cooler exhaust temperatures.
NSP-Minnesota	A.0001572.120	Reliability & Performance	ASK1C --11 RSA Transformer	(1,463,427)	2021	Replace 11 RSA Transformer during the 2020 annual outage. This transformer was purchased in 1983 as a used transformer.	Next to the GSU Transformer, the 12 RSA Transformer (4KV) and 11 RSA Transformer (6.9KV (11/12 FD, 11 BFP)), are the most important transformers we have at the plant. Without them, we can not start the unit up for operation. In addition, without them, we cannot safely shutdown the unit. The diesels are very limited in capability, not enough power to run needed equipment for an orderly shutdown or start up. The diesels are not black start designed and only provide power to the 4KV busses. In the main plant, to obtain necessary power, we have to back feed the GSU. Back feeding requires us to come off line and without 11 or 12 RSA Transformers, we do not have auxiliary power until the back feed is established (blackout in the main plant). There are not any auxiliary means to provide power to the plant 4KV or 6.9KV busses with out 12 RSA or 11 RSA respectively.
NSP-Minnesota	A.0001579.500	Reliability & Performance	RIV Emergent Fund -Other prod	(1,406,299)	2021	This fund covers unexpected equipment failures and discovery issues from overhaul inspections.	Emergent work for unexpected and unplanned equipment failures.
NSP-Minnesota	A.0001564.028	Reliability & Performance	HNI0C Replace Trash Rack Raker	(1,377,459)	2021	Replace Trash Rack Raker and Controls.	The existing system requires routine maintenance that involves multiple work groups and renting a crane to remove the raker. The main hydraulic cylinder cost about $24k to replace it and shipping a 20 foot hydraulic cylinder damages the piston seals during travel. The system is reaching its end of life.
NSP-Minnesota	A.0001575.500	Reliability & Performance	HBR Emergent Fund -Other prod	(1,282,285)	2021	This fund covers unexpected equipment failures and discovery issues from overhaul inspections.	Emergent work for unexpected and unplanned equipment failures.
NSP-Minnesota	A.0001572.250	Reliability & Performance	ASK1-Generator Stator Rewedge - 23429	(1,158,837)	2021	100% Generator Stator Rewedge	Getting the Stator Rewedge was suggested during our next opportunity was suggested after the last Major Inspection. Another O&M project has been initiated to have the Generator Inspected at the same time as the Rewedge for cost efficiencies.
NSP-Minnesota	A.0001572.152	Reliability & Performance	ASK1-480V Plant Swgr Bus 3-4 R	(1,149,576)	2021	Replace 480V main plant switchgear bus 3/4 lineup. These switchgears are 1968 vintage. There are eight busses total in the plant and four in the coal yard. The replacement would include the disconnects, dry transformers (not oil filled), main breakers, tie breaker and feeder breakers, along with protective relaying. This continues a series of switchgear bus replacement projects, with the first one during the 2015 outage.	This will increase capacity. Due to projects installed over the last decade or so, the MCCs in the plant (boiler/turbine rooms) have been filling up to capacity, which leads to relay coordination issues and circuit coordination issues. The electrical system in the AQCS and cooling tower areas have good capacity, but the systems in the plant (boiler/turbine rooms) are nearing their designed capacity. Due to the age of the switchgear and lack of replacement and spare parts, there are challenges to keep the switchgear operational.
NSP-Minnesota	A.0001576.005	Renewable & New Generation	GDM0C Gearbox Replacements 201	(1,046,447)	2021	GDM0221 - Replace failed gearboxes in GE 1.5 SLE wind turbines. Cost includes the crane and labor to remove the rotor, gearbox, and main shaft, and then reinstall the components.	Gearboxes fail with planetary section damage and need to be replaced.
NSP-Minnesota	A.0001580.007	Renewable & New Generation	CWF0-Courtenay Gearbox Replacement	(1,043,529)	2021	Replace failed gearboxes. Cost includes the crane and labor to remove the rotor, gearbox, and main shaft, and then reinstall the components.	Gearboxes fail with planetary section damage and need to be replaced.
NSP-Minnesota	A.0001572.222	Reliability & Performance	ASK99C 480V Coal Yrd Swgr Bus3-4 Rplc	(964,314)	2021	Replace the 480V coal yard switchgear bus 3/4 lineup during the spring outage. These switchgears are 1968 vintage. There are eight busses total in the plant and three in the coal yard. The replacement would include the disconnects, dry transformers (not oil filled), main breakers, tie breaker and feeder breakers, along with protective relaying.	This will increase capacity. Due to projects installed over the last decade or so, the MCCs in the plant (boiler/turbine rooms) have been filling up to capacity, which leads to relay coordination issues and circuit coordination issues. The electrical system in the AQCS and cooling tower areas have good capacity, but the systems in the plant (boiler/turbine rooms) are nearing their designed capacity. Due to the age of the switchgear and lack of replacement and spare parts, there are challenges to keep the switchgear operational.
NSP-Minnesota	A.0001573.205	Reliability & Performance	BDS0C-Replace Fire Protection Panels	(963,944)	2021	Replace Fire Protection Panels and instruments in the Black Dog Power Plant.	Improves fire safety. Newer panels would have self-monitoring capabilities that the existing panels lack, resulting in a better protecting system.
NSP-Minnesota	A.0001611.004	Environmental Compliance	PVW0C Eagle Take Permit	(844,062)	2021	This project supports the activities required to coordinate and manage an Eagle Take Permit at Pleasant Valley Wind Farm. The tasks associated with this include: Point Count Surveys, Aerial Nest Survey, Weekly Nest Monitoring, Application Fee, and Consulting Services.	Nesting eagles were observed in March 2016 on the Pleasant Valley Wind Farm. Xcel notified State and Federal agencies and an Eagle Take Permit is required. The agencies involved are MDNR (Minnesota Department of Natural Resources), USFWS (US Fish and Wildlife Services), and EERA (MN Energy Environmental Review and Analysis).
NSP-Minnesota	A.0001580.010	Environmental Compliance	CWF FAA Radar Lighting System-23131	(773,987)	2021	Install ground based radar system and wind turbine FAA lights activated by that system.	The state of North Dakota requires that all wind farms have a radar activated FAA lighting system in service prior to December 31, 2021.
NSP-Minnesota	A.0001610.009	Environmental Compliance	BWF FAA Radar Lighting System-23132	(773,987)	2021	Install ground based radar system and wind turbine FAA lights activated by that system.	The state of North Dakota requires that all wind farms have a radar activated FAA lighting system in service prior to December 31, 2021.

Company Descr	Project ID	New Grandparent	Project Name	YE Amt	Activity Year	Project Description	Project Justification
NSP-Minnesota	A.0001611.009	Renewable & New Generation	PVW0-Pleasant Valley Gearbox Replacement	(765,579)	2021	Replace failed gearboxes. Cost includes the crane and labor to remove the rotor, gearbox, and main shaft, and then reinstall the components.	Gearboxes fail with planetary section damage and need to be replaced.
NSP-Minnesota	A.0001591.004	Reliability & Performance	-17478 ANS0C BOP Evrgren Ctrl	(756,475)	2021	This project is to upgrade Units 2, 3, and Balance of Plant for Unit 4 Evergreen System Upgrade.	Existing controls will become obsolete during this current budget cycle
NSP-Minnesota	A.0001574.817	Reliability & Performance	SHC1-U1 DCS HW & Security Server-22684	(748,594)	2021	Upgrade U1 DCS workstation hardware and add a security server (WSUS) to the controls network.	Updating the hardware will provide workstations for the IO and Wet Scrubber FATs and will also provide spares for the obsolete computers on U2 that are running outdated Windows XP software. This also eliminates the need for performing manual Windows Patches updates to 24 workstations (could take 80 manhours/month).
NSP-Minnesota	A.0001579.093	Reliability & Performance	RIV9C-Install Preheater Harps Unit 9	(668,879)	2021	Replace the first two preheater harps in #9 preheater. Replace the four lower 4" headers with new 6" headers. The tubes are left in place, but header replacement with redesign eliminates the stress at the tube to header attachment. This design reduces estimated project cost considerably.	This will replace the preheater harps which were poorly designed to handle thermal stresses caused by startup and shutdown of the unit resulting in numerous tube leaks and unit forced outages. The new harps will have thicker tubes and stronger welded joints at the header connection to avoid thermal stress related crack propagation resulting in leaks.
NSP-Minnesota	A.0001579.097	Reliability & Performance	RIV10C-Install Preheater Harps Unit 10	(668,695)	2021	Replace the first two preheater harps in #9 preheater. Each harp to be complete with an upper and lower header and two full rows of finned tubes.	This will replace the preheater harps which were poorly designed to handle thermal stresses caused by startup and shutdown of the unit resulting in numerous tube leaks and unit forced outages. The new harps will have thicker tubes and stronger welded joints at the header connection to avoid thermal stress related crack propagation resulting in leaks.
NSP-Minnesota	A.0001573.500	Reliability & Performance	BDS Emergent Fund -Other prod	(666,337)	2021	This fund covers unexpected equipment failures and discovery issues from overhaul inspections.	Emergent work for unexpected and unplanned equipment failures.
NSP-Minnesota	A.0001574.795	Reliability & Performance	SHC1-Upgrade U1 BMS HMI 21987	(654,676)	2021	Upgrade U1 BMS HMI: During the U1 major overhaul in 2021, replace the Unit 1 Burner Management Emerson Ovation DCS Equipment with security hardened workstations, servers, network switches and Domain Server. This includes all software updates/bug fixes, hardened software security, and complete configuration translation to the new Ovation VersionX.	This is a periodic update required for reliability. Increased controller fail rate is expected as controllers are nearing their normal life expectancy. A controller is a required interface between the field instrumentation into Ovation. The controllers will be six years old. Network switches typically last 4-5 years.
NSP-Minnesota	A.0001579.143	Reliability & Performance	RIV0C-LCI Hardware and Ctrls Replace	(619,257)	2021	Replace RIV LCI hardware/controls with new supported equipment	The LCI controls and portions of the LCI hardware will be nearing the end of their useful life. It will be necessary to upgrade in order to ensure reliable operation and parts availability.
NSP-Minnesota	A.0001574.764	Reliability & Performance	SHC1C Bus 13 14 Prot Relays Rplc	(599,870)	2021	Replace Bus 13 and Bus 14 Protective Relaying, including replacing approximately 225 electromechanical relays with approximately 45 microprocessor based relays for the following functions: Motor protection (ID/FD/PA Fans, Coal Mills, Pumps, Conveyors, etc) Feeder protection (SUS Feeds) Transformer Protection (MSA and RSA transformers) Bus Protection (Bus 13 and 14 protective relaying)	The replacement microprocessor based relays cost approximately half of a single electromechanical relay and a single relay can replace up to a dozen electromechanical relays. During the 2015 Unit 1 overhaul, Bus 11 and 12 relay maintenance required approximately 300 man-hours by relay technicians to clean, calibrate, test and reseal relaying with a bus outage typically lasting 5-6 days. The new microprocessor based relaying is expected to take 50 man-hours with a typical bus outage lasting 2-3 days. This will significantly reduce O&M costs and interruptions to critical plant and coal yard equipment. The replacement relays also have an oscillography function which captures significant events (trips, faults, etc) in its memory that significantly reduce the amount of time required to troubleshoot the cause. This can be very valuable in shortening a forced outage duration in the future.
NSP-Minnesota	A.0001574.471	Reliability & Performance	SHC99-SHC99-Rpl SR Slew Drives	(569,363)	2021	Replace Coal Stacker/Reclaimer Slew Drive Gearboxes to a Hydraulic unit. Removal of two old gearboxes and motors. Install new hydraulic power unit and 2 hydraulic motors and hydraulic brake. Cost includes new bull gear around the gantry. Update controls and electrical feeds for HPU system. Some structural modifications will be needed to mount the new equipment.	Current gearboxes are undersized. We change them twice a year just for repair and parts. And we spend for extra coal handling cost with the Stacker down. This replacement will also enhance safety by reducing repair time.
NSP-Minnesota	A.0001574.298	Reliability & Performance	SHC99 - Barn #51 Discharge Chute - 23437	(569,201)	2021	Replace chute work coming from 51 conv, going to 52 conv, and Scraper Loading Hopper. This is to include the receiving dust box on 52 conv tail end, and a new splitter gate. Chute work is to be of new technology 'controlled flow' chute work to greatly reduce fugitive dust in the area. Cost estimates are as follows: 51 to 52 and Hopper section $475,000 52 load zone section $41,000	This is a safety measure to reduce fugitive dust inside the enclosed coal barn, and will be particularly important if Xcel switches to the dustier Belle Ayr coal.
NSP-Minnesota	A.0001579.127	Reliability & Performance	RIV7C-Install Circ Water Pumps CESP 1086	(561,244)	2021	Provide one spare circulating water pump and motor for Riverside. The spare pump and motor will be identical to the existing installed pumps.	Minimize plant downtime in the event of another circulating water pump failure. The plant is de-rated if one circulating water pump is out of service. A spare circulating water pump and motor will allow the failed pump to be replaced in a few days.
NSP-Minnesota	A.0001559.112	Reliability & Performance	BLL7C U7-Excitation System Replacement	(526,611)	2021	Replace U7 Excitation System Controls with reliable, non-obsolete equipment.	The BLL U7 Excitation Systems Controls are nearing end of useful life. It is necessary to upgrade in order to ensure reliable operation and parts availability. GE Drives and Controls Inc. will cease normal production of the EX2000 Excitation control system effective March 30, 2004. As with many products, and particularly with electronics, the EX2000 will eventually exceed its supportable life as components become unavailable and technology resources become scarce. This makes it increasingly difficult to guarantee timely reparability of parts for an extended period of time.
NSP-Minnesota	A.0001559.114	Reliability & Performance	BLL8C U8 Excitation System Replacement	(526,611)	2021	Replace U8 Excitation System with reliable, non-obsolete equipment.	The BLL U8 Excitation System Controls are nearing end of useful life. It is necessary to upgrade in order to ensure reliable operation and parts availability.
NSP-Minnesota	A.0001562.038	Environmental Compliance	REW0 - EPA 316b-Traveling Screens -23724	(512,059)	2021	Screen house intake traveling screen modification. The new screens will include a fish handling and return system with sufficient water flow to avoid harming the fish flowing back into the source water. The design may include dual flow screens with smooth mesh to continuously protect fish from descaling or rotary screens with a low pressure vacuum return to remove fish prior to any high pressure sprays that may otherwise harm the creatures.	This is a mandated environmental project by the MPCA to ensure we are compliant with EPA regulation 316(b) of the Clean Water Act. Section 316(b) requires that National Pollutant Discharge Elimination System permits be obtained by any facility that contains a cooling water intake structure to ensure that the engineering design of the structure minimizes harmful impacts on the environment.
NSP-Minnesota	A.0001559.104	Reliability & Performance	BLL0C LCI Controls Replacement	(506,979)	2021	Replace the U7/U8 Shared LCI controls with non-obsolete equipment. Upgrade the existing EX2000 J-Frame HBU exciters (qty2) to an EX2100 e Redundant digital front end (DFE) excitation system	The LCI controls are nearing the end of their useful life. There have been several failures and parts availability is becoming an increasing problem It will be necessary to upgrade in order to ensure reliable operation and spare parts are available. GE drives and controls, Inc will cease normal production of the EX2000 Excitation Control system effective March 30, 2004. As with many products, and particularly with electronics, the EX2000 will eventually exceed its supportable life as components become unavailable and technology resources become scarce. This makes it increasingly difficult to guarantee timely reparability of parts for an extended period of time.
NSP-Minnesota	A.0001573.210	Reliability & Performance	BDS0C-Replace Obsolete EDG Controls	(465,698)	2021	Replace the obsolete controls on the Black Dog Emergency Diesel Generators.	The Black Dog Diesel Generators are required by the plant to recover from a loss of offsite power event. The Diesel Generators provide power to critical plant equipment to support a safe shutdown and provide protection to plant equipment to ensure that full plant capacity would be available in short order once offsite power is re-established (provides power to maintain boiler feed to prevent steam drum dry-out). The existing controls are original from initial Diesel Generator installation (1990s). We have had several controls component failures in the recent past, and we have been notified by our Diesel Generator Service Provider that the equipment we have is no longer available and they will have difficultly supporting it going foreword.
NSP-Minnesota	A.0001572.177	Reliability & Performance	ASK1C Repl ID Fan Suction Exp	(461,402)	2021	Replacement of four ID fan suction expansion joints.	Expansion joints are interior to the ID fan building and are over 40 years old. They are brittle and cannot be repaired.
NSP-Minnesota	A.0001572.500	Reliability & Performance	ASK Emergent Fund -Steam prod	(456,366)	2021	This fund covers unexpected equipment failures and discovery issues from overhaul inspections.	Emergent work for unexpected and unplanned equipment failures.
NSP-Minnesota	A.0001701.013	Renewable & New Generation	BS1 - Blazing Star1 PCMM - 23572	(424,763)	2021	To better understand the potential impacts to birds and bats, Xcel Energy executes a post-construction mortality monitoring (PCMM) study using methods developed in conjunction with U.S. Fish and Wildlife Service and Minnesota Department of Natural Resources as part of a Bird and Bat Conservation Strategy (BBCS).	The BBCS called for conducting a post-construction mortality monitoring study with the primary objectives of providing a summary of documented fatalities, presenting estimates of searcher efficienc and carcass persistence, and calculating fatality rates adjusted for bias during the study. The secondary objective was to monitor all turbines specifically for eagle and other large bird fatalities.
NSP-Minnesota	A.0001705.009	Renewable & New Generation	CRW0 - Replace Generator - 23550	(424,763)	2021	To better understand the potential impacts to birds and bats, Xcel Energy executes a post-construction mortality monitoring (PCMM) study using methods developed in conjunction with U.S. Fish and Wildlife Service and Minnesota Department of Natural Resources as part of a Bird and Bat Conservation Strategy (BBCS).	The BBCS called for conducting a post-construction mortality monitoring study with the primary objectives of providing a summary of documented fatalities, presenting estimates of searcher efficiency and carcass persistence, and calculating fatality rates adjusted for bias during the study. The secondary objective was to monitor all turbines specifically for eagle and other large bird fatalities.
NSP-Minnesota	A.0001706.008	Renewable & New Generation	LBW - Lake Benton PCMM - 23577	(424,763)	2021	To better understand the potential impacts to birds and bats, Xcel Energy executes a post-construction mortality monitoring (PCMM) study using methods developed in conjunction with U.S. Fish and Wildlife Service and Minnesota Department of Natural Resources as part of a Bird and Bat Conservation Strategy (BBCS).	The BBCS called for conducting a post-construction mortality monitoring study with the primary objectives of providing a summary of documented fatalities, presenting estimates of searcher efficiency and carcass persistence, and calculating fatality rates adjusted for bias during the study. The secondary objective was to monitor all turbines specifically for eagle and other large bird fatalities.
NSP-Minnesota	A.0001574.180	Reliability & Performance	SHC1C 2018 Small Project Routi	(403,788)	2021	Labor and materials that are categorized as capital expenditures. Must meet capitalization criteria categories and include material costs greater than $2,500, but total cost less than $50,000.	These are small projects such as valve replacement, motors, etc that have failed during plant operation.
NSP-Minnesota	A.0001574.198	Reliability & Performance	SHCCC 2017 Emergent Work	(382,377)	2021	This fund covers unexpected equipment failures and discovery issues from overhaul inspections.	Emergent work for unexpected and unplanned equipment failures.
NSP-Minnesota	A.0001579.085	Reliability & Performance	RIV0C -- Inst U9 Auto Tuning P	(382,058)	2021	Installation of an Automatic Tuning Package to improve Combustion Turbine operational performance and prevent unit tuning related trips.	This package has been installed on other fleet units (Ft. St. Vrain) with positive results (emissions improvements, unit efficiency improvements, and reduced need for seasonal tuning). Installation on all fleet GE 7FA Units is recommended by the fleet Combustion Turbine experts.
NSP-Minnesota	A.0001561.014	Reliability & Performance	IVH3C U3-4 UG Cable Replace	(371,245)	2021	IVH0219-Replace wiring for Units 3 & 4 to include underground wiring for aux power from transformers and control wiring.	There have been previous failures of underground wiring/cable at Wheaton in the past, which is an identical site. The direct buried cable and wiring is at end of life. Also requiring replacement are various connections in the GE units. These connections were made with "plugs" to allow for the various segments of the combustion turbine unit to be brought in on trucks and then placed/connected together. These plugs are beginning to fail. In addition, a contributing cause to the unit 3 PLC cabinet fire was the fact that the high side protection for the aux power to the units did not isolate when the underground fault occurred.

Company Descr	Project ID	New Grandparent	Project Name	YE Amt	Activity Year	Project Description	Project Justification
NSP-Minnesota	A.0001703.009	Renewable & New Generation	FXW - Foxtail PCMM - 23574	(364,083)	2021	To better understand the potential impacts to birds and bats, Xcel Energy executes a post-construction mortality monitoring (PCMM) study using methods developed in conjunction with U.S. Fish and Wildlife Service and Minnesota Department of Natural Resources as part of a Bird and Bat Conservation Strategy (BBCS).	The BBCS called for conducting a post-construction mortality monitoring study with the primary objectives of providing a summary of documented fatalities, presenting estimates of searcher efficiency and carcass persistence, and calculating fatality rates adjusted for bias during the study. The secondary objective was to monitor all turbines specifically for eagle and other large bird fatalities.
NSP-Minnesota	A.0001574.482	Reliability & Performance	SHC1-U1 Mill 2021 Fall	(356,750)	2021	Project consists of replacing capital components as needed including but not limited to new journal assemblies, floor segments, classifier blades, and vane wheel.	Unit 1 has 7 mills whose performance is tracked through operating data (mill motor amps, coal fineness, etc.) to determine the frequency of overhauls. The major grinding components tend to wear out after about 1.5 million tons of throughput, or every 3-7 years depending upon usage. Maintaining pulverizer performance is essential to maintain boiler reliability, performance, and to stay within emission regulations.
NSP-Minnesota	A.0001562.030	Reliability & Performance	REW0C RDF WALKING FLOOR REPLAC	(356,685)	2021	This project will replace the existing walking floor assembly. The replacement will include a whole new super structure utilizing 1/2" thick aluminum floor slats.	The walking floor was replaced in 2011 and has a 5 year life expectancy. At this time the floor is expected to be worn to the point of having holes. Worn slats will curl and buckle due to their reduced thickness. The floor is required to operate or both units will be offline
NSP-Minnesota	A.0001574.524	Reliability & Performance	SHC3C Mill OH 2021 Spring	(355,203)	2021	Project consists of replacing capital components as needed including but not limited to new roll-wheel assemblies, floor segments, classifier blades, rotating throat assembly, and the inverted cone.	Unit 3 has 10 mills whose performance is tracked through operating data (mill motor amps, coal fineness, etc.) to determine the frequency of overhauls. The major grinding components tend to wear out after about 1.5-2 million tons of throughput, or every 5 years depending upon usage. Maintaining mill performance is essential to maintain boiler reliability, performance, and to stay within emission regulations.
NSP-Minnesota	A.0001579.086	Reliability & Performance	RIV0C -- Inst U10 Auto Tuning	(351,610)	2021	Installation of an Automatic Tuning Package to improve Combustion Turbine operational performance and prevent unit tuning related trips.	This package has been installed on other fleet units (Ft. St. Vrain) with positive results (emissions improvements, unit efficiency improvements, and reduced need for seasonal tuning). Installation on all fleet GE 7FA units is recommended by the fleet Combustion Turbine experts.
NSP-Minnesota	A.0001562.031	Reliability & Performance	REW1C U1 TURBINE BLADE REPLACE	(351,314)	2021	This project would replace 3 rows of blades in the U1 HP turbine.	These blades were identified as needing replacement during the 2014 overhaul to ensure mechanically safe operation of the rotating assembly.
NSP-Minnesota	A.0003000.698	Reliability & Performance	SER-CHM-Misc Tools-MN	(349,780)	2021	Miscellaneous tools for chemistry laboratory	These tools are used for completing chemical analysis of samples from our plants
NSP-Minnesota	A.0001574.190	Reliability & Performance	SHC3C 2018 Small Project Routi	(348,939)	2021	Labor and materials that are categorized as capital expenditures. Must meet capitalization criteria categories and include material costs greater than $2,500, but total cost less than $50,000.	These are small projects such as valve replacement, motors, etc that have failed during plant operation.
NSP-Minnesota	A.0001574.523	Reliability & Performance	SHC3C Mill OH 2021 Fall	(347,717)	2021	Project consists of replacing capital components as needed including but not limited to new roll-wheel assemblies, floor segments, classifier blades, rotating throat assembly, and the inverted cone.	Unit 3 has 10 mills whose performance is tracked through operating data (mill motor amps, coal fineness, etc.) to determine the frequency of overhauls. The major grinding components tend to wear out after about 1.5-2 million tons of throughput, or every 5 years depending upon usage. Maintaining mill performance is essential to maintain boiler reliability, performance, and to stay within emission regulations.
NSP-Minnesota	A.0001580.008	Renewable & New Generation	CWF1-Generator Replacements	(336,855)	2021	Replace failed generator in Vestas V100 wind turbines. Cost includes the crane and labor to remove the generator and then reinstall it.	High operating temperatures and a high vibration environment have lead to generator failures in the industry. Upon failure, the wind turbine can not be run. First quarter 2018 operations cost reduction strategy is to accept the risk of these failures as opposed to paying additional for warranty.
NSP-Minnesota	A.0001574.195	Reliability & Performance	SHC2C 2018 Small Project Routi	(326,608)	2021	Labor and materials that are categorized as capital expenditures. Must meet capitalization criteria categories and include material costs greater than $2,500, but total cost less than $50,000.	These are small projects such as valve replacement, motors, etc that have failed during plant operation.
NSP-Minnesota	A.0001574.818	Reliability & Performance	SHC1-Turb Ctrl Vlv Internals 2021-22720	(319,835)	2021	Replace main turbine control valve internals including but not limited to stems, balance chambers, plugs, and seats.	The valve internals have been subject to damage due to excessive wear and tear due to frequent unit cycling and more frequent economic outages. There are four control valves, all four of which experience significant degradation. The control valves are critical safety devices used to prevent turbine overspeed after a unit trip and are also responsible for regulating steam admission to the turbine. Their mechanical integrity is essential to safe and reliable operation of the turbine.
NSP-Minnesota	A.0001574.798	Reliability & Performance	SHC1-Level 2 Mill OH 2021 Spring 15876	(308,968)	2021	Project consists of replacing capital components as needed including but not limited to new journal assemblies, floor segments, classifier blades, and vane wheel.	Sherco Units 1 & 2 each have 7 mills whose performance is tracked through operating data (mill motor amps, coal fineness, etc.) to determine the frequency of overhauls. The major grinding components tend to wear out after about 1.5 million tons of throughput, or every 3-7 years depending upon usage. Maintaining pulverizer performance is essential to maintain boiler reliability, performance, and to stay within emission regulations.
NSP-Minnesota	A.0001574.799	Reliability & Performance	SHC2-Level 2 Mill OH 2021 Spring 15874	(308,968)	2021	Project consists of replacing capital components as needed including but not limited to new journal assemblies, floor segments, classifier blades, and vane wheel.	Sherco Units 1 & 2 each have 7 mills whose performance is tracked through operating data (mill motor amps, coal fineness, etc.) to determine the frequency of overhauls. The major grinding components tend to wear out after about 1.5 million tons of throughput, or every 3-7 years depending upon usage. Maintaining pulverizer performance is essential to maintain boiler reliability, performance, and to stay within emission regulations.
NSP-Minnesota	A.0001574.533	Reliability & Performance	SHC0C Seal Wtr Pump Strainer	(307,443)	2021	Installing a second (redundant) Seal Water Booster Pump (~500-700 GPM) and Strainer.	The seals that use this water are highly dependent on the strainer being in service. With changing pond chemistries, the seal water strainer is taken out of service for cleaning, which requires fire water to be supplied to the seals. Fire water can cause damage to the seals on the pumps, and during times of high water use, wells are drawn above max capacity.
NSP-Minnesota	A.0001574.504	Reliability & Performance	SHC2-U2 Mill OH 2021 Fall	(302,315)	2021	Project consists of replacing capital components as needed including but not limited to new journal assemblies, floor segments, classifier blades, and vane wheel.	Sherco Units 1 & 2 each have 7 mills whose performance is tracked through operating data (mill motor amps, coal fineness, etc.) to determine the frequency of overhauls. The major grinding components tend to wear out after about 1.5 million tons of throughput, or every 3-7 years depending upon usage. Maintaining pulverizer performance is essential to maintain boiler reliability, performance, and to stay within emission regulations.
NSP-Minnesota	A.0001579.078	Reliability & Performance	RIV0C -- Inst Water Panel Auto	(291,484)	2021	Replace the existing manual water chemistry panel with an automated panel.	The existing plant water chemistry panel requires a large number of manual operations to ensure correct chemistry every time any of the units is started-up or if the plant transitions from 2x1 operation to 1x1. In addition, the existing design makes the system difficult to maintain. The existing panel design results in a high possibility of operator error and/or system operations concerns (small manual valve failures, plugged lines, etc.) that could result in damage to the plant equipment (notably the HRSGs).
NSP-Minnesota	A.0001575.164	Reliability & Performance	HBC9C-Replace Seal Steam Superheater	(288,233)	2021	Several heating elements in existing electric seal steam superheater 9STS-HTR-0001 have failed. The project includes the purchase of a new superheater, demolition of the existing superheater and installation of the new superheater.	The existing seal steam superheater was purchased and installed in 2010, after Mitsubishi Power Systems Americas (now Mitsubishi Hitachi Power Systems Americas, the manufacturer of the High Bridge steam turbine) specified that, in order to avoid steam turbine rotor fatigue (cracking) damage, seal steam temperature should be higher than rotor temperature and contain not less than 25F of superheat. In the absence of the seal steam superheater, seal steam was up to 65F cooler than rotor temperature during 2-on-1 operation and up to 124F cooler than rotor temperature during 1-on-1 operation.
NSP-Minnesota	A.0001573.215	Reliability & Performance	BDS6-Install 62 Air Compressor-22767	(286,119)	2021	Installation of a second air compressor and dryer to supply a redundant source of instrument air for Unit 6. Project includes new equipment, electrical, controls, and labor to perform the work. Equipment will be similar to currently existing 61 Air Compressor for maintenance and operational purposes.	This project will install a new air compressor to establish a 2x100% instrument air configuration for Unit 6. This will allow for scheduled maintenance and provide a backup supply to safeguard against any operational issues with the existing air compressor. The new compressor will also be arranged to provide backup instrument air to Unit 5/2 to improve reliability of the instrument air system. The plant changed to 100% instrument air configuration in 2017 after reliability issues associated with wet house air infiltrating the instrument air supply, since the systems are interconnected throughout the building, which increased instrument air demand.
NSP-Minnesota	A.0001572.176	Reliability & Performance	ASK1C Repl Hydrojet PC HF Sens	(284,024)	2021	This project's scope includes the replacement of the existing hydrojet PC and software.	King's hydrojet software and PC are outdated and require replacement. PC issues have caused chronic hydrojet downtime, elevating furnace exit gas temperatures which threatens unit performance and possible derates. Also, upgraded software has the capability to integrate with King's intelligent sootblowing software Powerclean. Additional heat flux sensors will increase the number of cleaning zones, and provide more accurate cleanliness readings. With the recent past and current replacement of major waterwall panel's it is prudent to protect the waterwalls from excessive thermal shock. The upgraded software is designed to adjust spraying speeds and flows to limit the impact of thermal transients.
NSP-Minnesota	A.0001574.734	Reliability & Performance	SHC0C Fire Prot Admin Mapper Bldg	(274,737)	2021	Install fire/smoke detection and alarm in the Sherco Administration and Mapper buildings. Alarm system will connect to the control room to notify them of a fire in the area.	These areas consist of mostly offices and training rooms. They are, however, both attached to the main building and present an exposure to the main building. The cost of a sprinkler system is much higher than anticipated. A smoke/fire detection and alarm system will provide the majority of the benefit that a sprinkler system would but at a cost more in line with the initial estimate.
NSP-Minnesota	A.0001574.741	Reliability & Performance	SHC0C Service H2O Pipe Rplc	(273,051)	2021	Replace heavily corroded service water piping on U1 between floors 4-6.	This will improve reliability. Service water is used for Demin, Fire Protection, and many other unit functions. This pipe is heavily corroded per previous inspections.
NSP-Minnesota	A.0001571.079	Reliability & Performance	ANS3C Rpl U3 Generator Breaker and MOD	(260,935)	2021	Replacement of unit 3 generator breaker and MOD.	Fugi will no longer provide parts or service after 2015.
NSP-Minnesota	A.0001574.731	Reliability & Performance	SHC0C Fuel Oil Pump F.P.	(255,782)	2021	Install automatic sprinkler protection over the fuel oil pumps in the Auxiliary Boiler Building designed for 0.25 GPM/ft2 over a design area of 3,000 ft2 with a 250 GPM hose stream allowance.	There are four fuel oil pumps in this room, which present a fire risk. Since there is no sprinkler protection in this area, such a fire could spread throughout the Administration areas in the Main Building and to the turbine under deck mezzanine area and lower boiler areas, doing damage to the Unit 1 turbine generator and boiler. There is sprinkler protection in the turbine under deck area and a fire could burn out or be manually controlled at this point. However, there could still be enough damage done to affect Unit 1. Therefore, sprinkler protection is recommended.
NSP-Minnesota	A.0001562.500	Reliability & Performance	REW Emergent Fund -Steam prod	(246,477)	2021	This fund covers unexpected equipment failures and discovery issues from overhaul inspections.	Emergent work for unexpected and unplanned equipment failures.
NSP-Minnesota	A.0001565.118	Environmental Compliance	WLM1C Replace U1 Baghouse Bags	(244,527)	2021	- Replace U1 Baghse Bags 2020	Replace U1 Baghse Bags 2020
NSP-Minnesota	A.0001576.006	Renewable & New Generation	GDM0C Generator Replacements 2	(239,716)	2021	GDM0318 - Replace failed generators in GE 1.5 SLE wind turbines.	High operating temperatures in the compact design have caused a small amount of failures in the industry after 5 years of operation.

Company Descr	Project ID	New Grandparent	Project Name	YE Amt	Activity Year	Project Description	Project Justification
NSP-Minnesota	A.0001572.027	Reliability & Performance	ASK1C-Admin Bldg HVAC Replace	(239,412)	2021	Replace the HVAC air handling unit (including cooling coils and heating coils) on 5th Floor with that feeds the 3rd/4th floors (offices, restrooms, break areas, conference rooms).This project also includes the replacement of complete sections of corroded ducting on the 3rd/4th floors.	Mold has been found on walls and ceiling tiles in the 3rd floor restroom. The existing system is original installation (1960s) and has shown signs of corrosion and some leakage, and is believed to be contributing to the mold.
NSP-Minnesota	A.0001571.500	Reliability & Performance	ANS Emergent Fund -Other prod	(239,055)	2021	This fund covers unexpected equipment failures and discovery issues from overhaul inspections.	Emergent work for unexpected and unplanned equipment failures.
NSP-Minnesota	A.0001573.112	Reliability & Performance	BDS2 - Ovhl 22 Circ Water Pump - 23694	(239,048)	2021	Overhaul of No. 22 Condenser Circulating Water Pump. Assumes replacement of complete rotating assembly or replacement of complete stationary assembly, or both. This project will also include improvements to pump outer column structure to reduce pump vibration signature, as was successfully done for the most recent overhaul of the No. 21 condenser circulating water pump. Improving pump vibration results in longer time between pump overhauls.	Condenser circulating water pumps require periodic overhaul, in order to maintain performance. During the warmer half of the year, both 21 and 22 circulating water pumps must be in service, or a unit derate will result.
NSP-Minnesota	A.0001574.738	Reliability & Performance	SHC0 2RSA H Bushng Rplcmnt	(235,273)	2021	Replaced 2 RSA H0, H1, H2 and H3 bushings and oil pumps. Scope of work includes draining, processing and refilling oil in transformer.	Some bushings showed signs of degradation in recent testing. Replacement of all high-side bushings meets capitalization criteria. Oil pumps have never been replaced and also meet capitalization criteria.
NSP-Minnesota	A.0001573.206	Reliability & Performance	BDS0C-Replace CV Positioners	(234,906)	2021	Replacement of existing positioners on 22 existing control valves at the Black Dog Power Plant with upgraded positioner design, which also include actual valve position feedback to the plant control system. Project includes engineering for project management, plant I&C labor to replace the positioners, and plant Electrician labor to pull new wire for those which are needed.□ □ This project also includes any required new Emerson DCS modules, new logic, new HMI screen updates for all digital and analog inputs and outputs required for the new equipment.	A substantial number of control valves at the Black Dog power plant utilize positioners that do not include means to provide actual valve feedback to the plant control system. For the majority of control valves currently at the plant, the control system can only display the requested position only, meaning in the event the valve does not move to the requested position due to a component failure, Operations would not be immediately aware. A mis-positioned valve may not be evident until the operating system is already impacted, this could result in trips or equipment damage. Actual position feedback provides improved operator awareness and effectiveness which is critical as the operations staff has decreased in number, and supports the ongoing efforts to improve Ovation HMI. In addition there are several valve positioners that are obsolete/no longer supported by the manufacturer that need replacement. The newer positioners are more reliable, and this project would address multiple causes of historic trips and runbacks at Black Dog.
NSP-Minnesota	A.0001574.754	Reliability & Performance	SHC1C ID Fan Damper Drives Rplc 18	(230,127)	2021	Replace U1 ID Fan Inlet and Outlet Damper Drives. The Inlet drives would need to be a 4-20mA capable drive the outlet dampers would only need to be a 2 position drive (open and closed).	The Valmet OutPAT is an antiquated method for controlling drives. Having 4-20 mA signal controlled drive would greatly help with finer control for these fans.
NSP-Minnesota	A.0001579.138	Reliability & Performance	RIV10C U10 Comb Dynamics Replace	(225,604)	2021	Install a replacement combustion dynamics system on Unit 10.	The existing combustion dynamics system has been operating since 2009. It will need to be replaced in order to stay ahead of the obsolescence curve. This project would be completed in conjunction with installation of the auto tune system. A new combustion dynamics system tailored to auto tune is required to optimize the auto tune system and insure the reliability of the auto tune system. The Combustion Dynamics Monitoring System provides input to the Operator regarding stability of the CT combustion. If the indication is not available, then it is more likely the Operator would not pick up on combustion abnormalities until it is too late. If the combustion dynamics get out of control resulting in too high of Low, Medium or High Tones OR if the Lean Blow Out conditions are not detected via the combustion dynamics system, AND the unit operation is continued, then complete destruction of the turbine is possible, depending upon the condition and what is causing it.
NSP-Minnesota	A.0001579.139	Reliability & Performance	RIV9C U9 Comb Dynamics Replace	(225,499)	2021	Install a replacement combustion dynamics system on Unit 9.	The existing combustion dynamics system has been operating since 2009. It will need to be replaced in order to stay ahead of the obsolescence curve. This project would be completed in conjunction with installation of the auto tune system. A new combustion dynamics system tailored to auto tune is required to optimize the auto tune system and insure the reliability of the auto tune system. The Combustion Dynamics Monitoring System provides input to the Operator regarding stability of the CT combustion. If the indication is not available, then it is more likely the Operator would not pick up on combustion abnormalities until it is too late. If the combustion dynamics get out of control resulting in too high of Low, Medium or High Tones OR if the Lean Blow Out conditions are not detected via the combustion dynamics system, AND the unit operation is continued, then complete destruction of the turbine is possible, depending upon the condition and what is causing it.
NSP-Minnesota	A.0001574.172	Reliability & Performance	SHCCC 2018 Small Project routi	(215,045)	2021	Labor and materials that are categorized as capital expenditures. Must meet capitalization criteria categories and include material costs greater than $2,500, but total cost less than $50,000.	These are small projects such as valve replacement, motors, etc that have failed during plant operation.
NSP-Minnesota	A.0001702.001	Renewable & New Generation	BS2-G100-Blazing Star II Wind Farm	(210,400)	2021	Construct a 200 MW New Wind Farm in Lincoln County, MN. The wind farm includes 100 V110 and V116 Vestas Turbines at 2.0 MWs each, a collector system, O&M building, access roads, collector substation, and approximately 10 miles of transmission line.	Qualifies for a Federal Production Tax Credit (PTC).
NSP-Minnesota	A.0001565.500	Reliability & Performance	WLM Emergent Fund -Steam prod	(200,074)	2021	This fund covers unexpected equipment failures and discovery issues from overhaul inspections.	Emergent work for unexpected and unplanned equipment failures.
NSP-Minnesota	A.0001704.001	Renewable & New Generation	FBW G100-Freeborn Wind Farm	(200,000)	2021	Construct a 150- 200 MW New Wind Farm in Freeborn County, MN. The wind farm includes 75- 100 V110 and V116 Vestas Turbines at 2.0 MWs each, a collector system, O&M building, access roads, collector substation, and transmission line.	Qualifies for a Federal Production Tax Credit (PTC).
NSP-Minnesota	A.0003000.682	Reliability & Performance	SHCJC Tools and Equip pur	(200,000)	2021	Purchase tools and equipment to support outages, projects and routine maintenance work performed by Special Construction. All tools under $1000 each.	Improve capability and efficiency of daily operations maintenance tasks.
NSP-Minnesota	A.0001573.135	Reliability & Performance	BDS5C HRSG Thermocouple	(194,206)	2021	Installation of additional thermocouples for temperature monitoring in areas of the Unit 5 HRSG which are susceptible to freezing conditions. This includes the necessary modifications to the HRSG casing, installation of additional instrumentation, wiring, conduit, and controls to bring these points into Ovation DCS for monitoring and alarming upon low temperature. This includes two thermocouples in the HP Superheater section near the front of the HRSG and two thermocouples in the LP Preheater section in the back of the HRSG.	The Unit 5 HRSG is equipped with thermocouples throughout the gas side of the HRSG, but there are a few locations which are not very well instrumented that could go undetected in the event of freezing temperatures. These locations are at the front of the HRSG (HP SH 1 near the CT exhaust) and the back of the HRSG (LP Economizer near the stack), where this temperature instrumentation is not present, and where freezing conditions are most likely to occur since you are closest to ambient temperature at those locations. In 2014, Rocky Mountain's Unit 1 IP Evaporator header froze and cracked which caused an extended forced outage for repairs.
NSP-Minnesota	A.0003000.699	Reliability & Performance	SER-SMC-Misc Tools & Equipment	(192,000)	2021	Purchase tools and equipment to support outages, projects and routine maintenance work performed by Special Construction. Included, but not all inclusive: Safety equipment, small tools, shop equipment and specialized tools.	Tool replacements are needed as tools come to end of life and are no longer cost effective to repair. The plants and facilities utilize Special Construction to supplement outages, projects and routine maintenance work at their sites. The sites typically do not have the tools and equipment necessary to complete the work that is performed by Special Construction. The expectation is that our department will bring the necessary resources to complete the work. The tools and equipment will be housed in a central location and rotated from site to site.
NSP-Minnesota	A.0001574.762	Reliability & Performance	SHC1C Rewind BCP Motor 2021	(180,520)	2021	Rewind each boiler-circ-pump one at a time. The need for this project is based on the as-found condition of the 12 BCP after removal in 2015.	Loss of a BCP results in a derate to 90% power. Repairs/replacement typically result in a minimum 5-day outage.
NSP-Minnesota	A.0001565.086	Environmental Compliance	WLM2 -Replace U2 CEMS Analyzers -23754	(178,911)	2021	Procure and install new CEMs analyzers. On the inlet side, replace O2 and SO2 analyzers. On the outlet side, replace CO, NOx and SO2 analyzers. Additionally, this project will procure a new standing rack in CEMs shack for the analyzers and upgrade the HVAC system which has not been replaced in over 10 years.	The CEMs analyzers were all last replaced in 2010. Parts are becoming more difficult to procure to maintain the current analyzers. The current HVAC system in the CEMs shack has not been replaced in over 10 years.
NSP-Minnesota	A.0001565.085	Environmental Compliance	WLM1 -Replace U1 CEMS Analyzers -23753	(178,699)	2021	Procure and install new CEMs analyzers. On the inlet side, replace O2 and SO2 analyzers. On the outlet side, replace CO, NOx and SO2 analyzers. Additionally, this project will procure a new standing rack in CEMs shack for the analyzers and upgrade the HVAC system which has not been replaced in over 10 years.	The CEMs analyzers were all last replaced in 2010. Parts are becoming more difficult to procure to maintain the current analyzers. The current HVAC system in the CEMs shack has not been replaced in over 10 years.
NSP-Minnesota	A.0001574.174	Reliability & Performance	SHCJC 2018 Small Project routi	(172,119)	2021	Labor and materials that are categorized as capital expenditures. Must meet capitalization criteria categories and include material costs greater than $2,500, but total cost less than $50,000.	These are small projects such as valve replacement, motors, etc. that have failed during plant operation.
NSP-Minnesota	A.0001574.800	Environmental Compliance	SHC3-SHC3-Haul Road 2021 19888	(171,395)	2021	SHC3P Haul Road; Overlay 25% of Landfill Haul Road.	Haul road in poor repair causes considerable damage to heavy equipment and repairing it will improve safety.
NSP-Minnesota	A.0001574.419	Reliability & Performance	SHC3C Control Room Roof Repl	(169,724)	2021	Remove the existing roofing materials and install a new roofing system of like kind. The substructure will also be assessed at the time of the tear off . The project would include the roof replacement over the U3 Control room (15,000 SF) and the U3 Transition Room (7100 SF).	The existing roofing system has exceeded its life cycle and is need of replacement. Continual patching and repairing due to the weather and wear over the years is becoming costly to maintain. A new roof will enhance the life of the asset and will bring a 20 year warranty to mitigate the costly repairs. Presently the leakage is a common occurrence when it rains or during springtime snowmelts.
NSP-Minnesota	A.0001575.041	Reliability & Performance	HBC7C U7 Exh Exp Joint	(165,945)	2021	Replace the CT exhaust expansion joint and the insulation material. The expansion joint must replaced when it begins to show signs of degradation such as brittleness and discoloration, and the insulation material will also be replaced at the same time.	The expansion joint has been in service for 5 years and have an expected life of 5 to 8 years. The insulating material used in conjunction with the expansion joint, Fiberfrax, is a potential inhalation hazard. Failure of the expansion joint could release the insulation material and hot exhaust gases into plant.
NSP-Minnesota	A.0001579.077	Reliability & Performance	RIV0C -- DP Mon & Gen Gas Drye	(165,831)	2021	Add a hydrogen dew point temperature monitoring instrument to unit 7 generator. This can be accomplished by replacing existing Gas Dryer with a new gas dryer that has the capability to measure inlet and outlet hydrogen dew point temperature. The replacement gas dryer should have the capability to operate when the unit is on turning gear. Also, the hydrogen dew point temperature monitor will have the capability to send an alarm to the control room.	The Unit 7 generator does not currently have any dew point monitor instrument with alarm indication in the control room. Hydrogen dew point temperature is an indicator of the moisture content in the generator casing hydrogen gas. Moisture is un-desirable for the stator and rotor insulation systems, since it can initiate insulation failure by electrical tracking, and for various steel components in the generator due to corrosion. Hydrogen dew point should be monitored on a continuous basis by a dew point instrument, with an alarm if the dew point rises above this set point.
NSP-Minnesota	A.0001575.042	Reliability & Performance	HBC8C U8Exh Exp Joint	(164,233)	2021	Replace the CT exhaust expansion joint and the insulation material. The expansion joint will be replaced when it begins to show signs of degradation such as brittleness and discoloration. At this time the insulation material will also be replaced.	The expansion joint has been in service for 5 years. These expansion joints have an expected life of 5 to 8 years. Additionally, the insulating material, Fiberfrax, used in conjunction with the expansion joint is listed as a possible cancer hazard by inhalation on the MSDS. Failure of the expansion joint could release the insulation material and hot exhaust gases into plant.

Company Descr	Project ID	New Grandparent	Project Name	YE Amt	Activity Year	Project Description	Project Justification
NSP-Minnesota	A.0003000.697	Reliability & Performance	SER-MMR- Misc Tools & Equip	(155,000)	2021	Miscellaneous tools for plant overhauls	These tools are used for plant overhauls and troubleshooting equipment problems.
NSP-Minnesota	A.0001707.003	Renewable & New Generation	DKR0 Dakota Range Wind TSG 345Kv Line	(154,977)	2021	Construct a 300 MW New Wind Farm in Grant and Codington Counties, South Dakota. The wind farm includes 72- V136 Vestas Turbines rated at 4.2 MWs each, a collector system, O&M building, access roads, and collector substation.	This project qualifies for the Production Tax Credit (PTC) at an 80% level.
NSP-Minnesota	A.0001574.788	Environmental Compliance	SHC1-Upper Field 2nd PS 22098	(154,750)	2021	Add a second power supply onto the Upper field to remove additional Particulate. Current Power Supply is Current Limited and a second Power Supply would indicate how much more particulate removal would be done with not being mA limited. Material $69k, Labor $31k, Contingency $10k, Overheads $11k, Initial Setup $20k	Upper Field isn't utilized to the maximum ability due to being mA limited. Would allow for additional particulate removal and would prove another option the plant as if/when particulate guidelines are tightened.
NSP-Minnesota	A.0001573.180	Reliability & Performance	BDS0C Plt Elec Dist Sys Mods 2021	(152,518)	2021	Modifications are required to the plant electrical distribution system to accommodate the new unit being installed and the retirement of the old Unit 3 and Unit 4 equipment. The activities planned for 2021 are associated with the consolidation of loads off of Electrical Distribution Equipment that will no longer be maintained unto existing U2 distribution gear. Specifics involve decommissioning and removal of relaying associated with the previous distribution arrangement, removal of wire runs replaced by the new distribution arrangement, and re-feeding existing loads to eliminate multi-load single breaker arrangements.	The Black Dog Plant Electrical Distribution system is required to be modified to accommodate both the new unit that is being installed at the site and the retirement of equipment related to the coal units that have been recently shutdown. The shutdown of the coal units has left significant sections of the Unit 2 electrical distribution system in service with very light loading. Replacement of an aging load center and consolidation of those loads will allow the plant to decommission and demo unnecessary internal distribution equipment that has aged and could become a safety concern.
NSP-Minnesota	A.0003000.658	Reliability & Performance	ASK0C- Tool Blanket	(150,000)	2021	ASK0121 - 2021 blanket for miscellaneous tools needed to support plant core operations.	Ensure necessary tools continue to be available to support plant core operations.
NSP-Minnesota	A.0001565.036	Reliability & Performance	WLM0C Inst Station Aux Power S	(147,206)	2021	Station Aux Power Separation	#3 and #4 station aux transformers are fed from the same bus in the 13.8 KV substation. This is a single point failure that has caused us to back feed power through #2 unit in the past when the leads to #3 transformer were lost.
NSP-Minnesota	A.0001574.819	Reliability & Performance	SHC1-U1 TCS HMI Repl-22764	(143,290)	2021	Replace the Unit 1 Turbine Controls System (TCS) Human-Machine Interfaces (HMIs) or computers.	HMIs at this time have reached the end of their useful lifecycle. Critical Computer errors are more likely to occur as the computers age, and replacement components will be difficult to find at this time. Spare parts created can also be used for Unit 2 Turbine Controls.
NSP-Minnesota	A.0001574.790	Reliability & Performance	SHC0-CS1 Gas Bottle Storage 21784	(135,797)	2021	Setup old elevator room to be Calibration Gas Storage for the CEMS equipment. This will include running a heated umbilical from the ground floor up to the 440' CEMS level. Ventilation and gas detection equipment will be required as well for the room.	Lack of room for Calibration gas up in CEMS room, transporting issues of calibration gas up stairs to elevator and moving calibration gas in the elevator.
NSP-Minnesota	A.0001574.750	Reliability & Performance	SHC1C Scrubber Duct Exp Jnts Rplc 2021	(135,335)	2021	Replace the worn Chemflex expansion joints with a Viton belt internal expansion joints, as have already been done on the converted expansion joints. 1) North of 104 Module 2) North of 105 Module 3) North of 111 Module (was planned for 2018, others took priority)	The expansion joints are failing as they are becoming brittle and work around them during outages have caused failures. These must be replaced to maintain unit reliability.
NSP-Minnesota	A.0001573.121	Reliability & Performance	BDS2 - Install DC Seal Oil Pump - 23408	(129,665)	2021	Installation of a new high pressure seal oil pump (~80 psig) and vapor exhauster driven by DC power for Unit 2 steam turbine generator. This project includes the new equipment, piping, electrical, controls, labor, and engineering required to perform the work.	The existing configuration for Unit 2 provides three sources of high pressure seal oil; the AC Seal Oil Pump, the AC Auxiliary Oil Pump, and the Turbine Shaft Driven Pump. However, there is only a single emergency DC Oil Pump which supplies both Lube Oil and Seal Oil upon loss of AC power, and the existing emergency DC Oil Pump is a low pressure supply (~20 psig) which is insufficient to maintain nameplate hydrogen pressure of 45 psig. This presents a significant safety risk in the event that AC power is lost while the unit is offline (and the turbine shaft driven pump is not providing pressure), since there would be no available high pressure supply in this case to prevent hydrogen from escaping the generator. Also, the existing vapor exhausters are driven from AC power so any hydrogen leakage in this scenario is likely to bypass the seals and escape to the turbine floor instead of safely out the hydrogen vent.
NSP-Minnesota	A.0001572.107	Reliability & Performance	ASK1C Inst GRF Damper Drives	(129,266)	2021	Replace the excising inlet damper drives with new damper drives during 2016 outage.	The existing Beck-brand drives do not control well. There are startup issues with control of the existing dampers at low percentage damper flows.
NSP-Minnesota	A.0001576.013	Renewable & New Generation	GDM Eagle Take Permit	(127,066)	2021	This project supports the activities required to coordinate and manage an Eagle Take Permit at the Grand Meadow Wind Farm. The tasks associated with this include: Point Count Surveys, Aerial Nest Survey, Weekly Nest Monitoring, Application Fee, and Consulting Services.	Nesting Eagles were observed in March 2016 on the adjacent Pleasant Valley Wind Farm. Xcel notifiedState and Federal agencies and an Eagle Take Permit is required. The agencies involved are MDNR (Minnesota Department of Natural Resources), USFWS (US Fish and Wildlife Services), and EERA (MN Energy Environmental Review and Analysis).
NSP-Minnesota	A.0001580.009	Renewable & New Generation	CWF1-Transformer Replacements	(125,454)	2021	Replace failed transformer in Vestas V100 wind turbines. Cost includes the crane and labor to remove the transformer and then reinstall it.	Upon failure, the wind turbine can not be run. Operations cost reduction strategy is to accept the risk of these failures as opposed to paying additional for warranty.
NSP-Minnesota	A.0001611.011	Renewable & New Generation	PVW1-Transformer Replacements	(122,493)	2021	Replace failed transformer in Vestas V100 wind turbines. Cost includes the crane and labor to remove the transformer and then reinstall it.	Upon failure, the wind turbine can not be run. Operations cost reduction strategy is to accept the risk of these failures as opposed to paying additional for warranty.
NSP-Minnesota	A.0001574.486	Reliability & Performance	SHC1-U1 Secoal Coal Detectors	(114,646)	2021	Replacement of the legacy Secoal coal seal detectors on the 7 coal feeders supplying coal to the Unit 1 boiler. Part of this project includes the removal and disposal of 7 Nuclear Sources. Costs - $3800 per instrument - $2700 per installation for demolition, installation, and disposal of the nuclear source.	This is legacy equipment for which we can not obtain OEM support or parts. These electronic coal detectors with nuclear sources have been in service for over 38 years, well beyond their design life. These detectors ensure that we maintain the coal seal between the coal mills and the coal silos to prevent any hot gasses and ignition sources from getting into the bunker and causing a fire or explosion. This is critical to prevent a bunker explosion.
NSP-Minnesota	A.0001611.010	Renewable & New Generation	PVW1-Generator Replacements	(114,288)	2021	Replace failed generator in Vestas V100 wind turbines. Cost includes the crane and labor to remove the generator and then reinstall it.	High operating temperatures and a high vibration environment have lead to generator failures in the industry. Upon failure, the wind turbine can not be run. First quarter 2018 operations cost reduction strategy is to accept the risk of these failures as opposed to paying additional for warranty.
NSP-Minnesota	A.0001579.142	Reliability & Performance	RIV10 - Rplc Compressor Bleed Vlv -23334	(111,416)	2021	Replace the #1, #2, #3, and #4 compressor bleed valve and actuator assemblies during the Unit 10 Major Outage. The new air operated valve assemblies that will be installed are an upgraded design and fully compliant with the GE TIL 1416-R1 Compressor Bleed Valve Reliability Upgrades. The new valves are a bolt in replacement, with the only system modification being the installation of inline coalescing air filters on the instrument air supply manifold.	GE recommends replacement/overhaul of the compressor bleed valves and actuators on the Hot Gas Path based interval of 24,000 hrs. The existing valves are original, and by the time the unit reaches its Major Outage the existing valves will have been in service for 48,000 hrs, double the OEM recommendation. The existing valves have experienced operational issues periodically, resulting in failed unit start-ups. In addition, periodic issues have been experienced with valves failing to open during shut down, which could lead to a compressor stall/surge condition. A compressor stall/surge is a very serious event that has the potential to cause significant compressor damage and lead to a costly and lengthy forced outage.
NSP-Minnesota	A.0001573.010	Reliability & Performance	BDS5C Cooling Water Strainer R	(109,435)	2021	Replace the existing auxiliary cooling water self-cleaning strainer with an improved strainer.	The existing Hayward self-cleaning strainer frequently plugs with debris and must be disassembled and manually cleaned approximately twice per year. Additionally, the wedgewire design is not effective at straining fine debris, causing the heat exchangers to frequently plug. The ALF strainer is specifically designed by Alfa Laval to protect heat exchangers in low quality water installations. It would cost about $24,000 per year (about 2 cleanings) to hire a contractor to clean the heat exchanger and $9,000 per year (2 cleanings) to clean and maintain the strainer. Installation of the new strainer is expected to decrease this to 1 cleaning per year. In summer conditions, the constant plugging of the heat exchangers allows the closed cooling temperature to rise above the design temperatures. This has potential for long term damage to equipment.
NSP-Minnesota	A.0001574.302	Reliability & Performance	SHC99-CESP-2021 #2 CC Rotor Asmbl-23363	(103,717)	2021	Change out the rotating hammer assembly with CESP rotor Assembly on Sherco #1 Coal Crusher. Also change out worn / thin cage pieces, and wear plating inside the crusher.	Crusher is worn out and cannot provide a consistent coal fineness to the plant. This in turn effects the efficiency of the plant.
NSP-Minnesota	A.0001574.303	Reliability & Performance	SHC99 -CESP-2021 #4 CC Rotor Asmbl-23366	(103,717)	2021	Change out the rotating hammer assembly with CESP rotor Assembly on Sherco #4 Coal Crusher. Also change out worn / thin cage pieces, and wear plating inside the crusher.	Crusher is worn out and cannot provide a consistent coal fineness to the plant. This in turn effects the efficiency of the plant.
NSP-Minnesota	A.0001574.297	Reliability & Performance	SHC99-CESP-2020 #3 CC Rotor Asmbl-23379	(103,710)	2021	Change out the rotating hammer assembly with CESP rotor Assembly on Sherco #3 Coal Crusher. Also change out worn / thin cage pieces, and wear plating inside the crusher.	Crusher is worn out and cannot provide a consistent coal fineness to the plant. This in turn effects the efficiency of the plant.
NSP-Minnesota	A.0001573.100	Environmental Compliance	BDS0C Dredge Spoils Dewater	(101,923)	2021	This project will involve permanent construction of a containment and dewatering area for sediment recovered from the Minnesota River during dredging operations and material recovered from Black Dog Road after flood waters subside. This includes the necessary berms, underlayment, concrete, drainage, and other components required for the project.	As a result of the closure of the coal yard and ash ponds at the end of 2016, an alternative dredge spoils dewatering and management location will need to be determined. The area will need to be outside the current flood berm area, as this area will be remediated and closed to dredge spoils dewatering based on requirements specified for the implementation of the RAP, as approved by the MPCA VIC program. As part of the CUP for the remediation project, the area immediately west of the main plant entrance was offered as a possible location. Dewatering of dredge spoils is required following mechanical and hydraulic dredging as the excess water must be treated as waste, which is especially important with hydraulic dredging as their is typically a 20:1 ratio in water to sediment. Dredging of the screenhouse intake is performed on a 4 year interval to maintain reliability of the circulating water and cooling water systems which are critical to plant operation.
NSP-Minnesota	A.0001575.168	Reliability & Performance	HBC0 -New Instmnt Air Compressor -23445	(96,697)	2021	Installation of a new (smaller) air compressor and dryer skid on the south side of the main plant building. This compressor would be tailored to precisely match the continuous air needs of the plant, with the (2) existing main compressors transitioning to standby/backup functionality.	The service contract for the existing compressor has expired and was not generally felt to be effective for ensuring reliability. The two existing compressors are also oversized for the continuous air demand at High Bridge and as such they cycle frequently, diminishing the expected usable life of the compressors. An additional, appropriately sized compressor, air receiver, and dryer skid on the south end of the plant would provide more constant air pressure, cycle much less frequently (fewer thermal/pressure cycles) and add storage volume to the system which is also lacking.
NSP-Minnesota	A.0001573.120	Reliability & Performance	BDS2 -Rplc Circ Pump Disch Valves -23271	(96,593)	2021	Replace Unit 2 circulating water pump discharge valves (42") and actuators.	The existing valves were installed in 2002 and no longer seal effectively, which presents hazards to the pumps (could spin backwards and damage/disassemble pump) and personnel during maintenance. The valves have non-serviceable seals molded into the disc and seat that are worn out. The actuators were reused from the previous installation and require frequent adjustment and overhaul due to worn components.

Company Descr	Project ID	New Grandparent	Project Name	YE Amt	Activity Year	Project Description	Project Justification
NSP-Minnesota	A.0001574.347	Reliability & Performance	SHC1C Boiler Ignitor Replaceme	(96,027)	2021	The replacement of 56 ignitor internal components consisting of an air and oil atomization assembly with flexible hoses to be used to connect to the oil and air supply lines, a High Energy Ignition (HEI) solid spark rod with tip, a solidflame rod. This includes the replacement of 56 motor operated valves and flow switches; Eddy Plate oil side ignitors, including ignitor internal components; and56 ignitor horns.	The current ignitor system has reached the end of life due to material failures and unsupported individual components by the OEM. The motor operated air/oil valve is not supported anymore. The igniter horns are badly warped. Supporting infrastructure such as the air and oil lines are failing due to age. The high energy spark plugs and wire have been damage from excessive heat, and the D/P switches are getting difficult to maintain. The replacement system will be the latest ignitor technology from the OEM. Failure of the ignitors to function properly can increase boiler start-up/overhaul durations. Replacement of the boiler ignitors will 1) reduce future O&M costs for ignitor repair and 2) avoid a minimum of two 10 hour outage extensions per year due to ignitor failures.
NSP-Minnesota	A.0001579.144	Reliability & Performance	RIV10 -Rplc Lube Oil Pump -23387	(95,273)	2021	Replace the existing #1 and #2 AC lube oil pumps and motors during the Unit 10 Major. The existing grease lubricated pumps require frequent maintenance and an overhaul every 16k hrs. Pump overhauls do not fit within Hot Gas Path outage windows so they have historically not been completed. An upgraded, forced oil lubricated 30k hr interval pump is available that offers increased reliability and longevity. It is expected that this upgraded pump design will operate reliably between Major Outage intervals, at which time pump overhauls would be completed.	The existing pumps are of the design that has been known within the industry to cause issues. One of the pumps is original and overdue for an overhaul. 7FA gas turbines do not have shaft driven oil pumps, so lubricating oil for the turbine and generator bearings is supplied from either of the two 100% capacity AC lube oil pumps. One pump is always running unless the unit is in a maintenance outage, so the pumps accumulate operating hours even while the unit is offline in reserve shut down. In November 2016, the #1 AC lube oil pump on Unit 10 failed during operation. The damage to the pump was extensive and a forced outage was required to make repairs.
NSP-Minnesota	A.0001562.134	Reliability & Performance	REW1C Repl Chutes U1 and Refract	(89,561)	2021	Replace all 4X wind swept spouts and front wall refractory for the Unit 1 Boiler.	After approximately 5 years of service life the structural integrity of the spouts can cause tramp air to be pulled into the boiler resulting in increased CO levels. In addition, holes in the spouts allow fire to exit the boiler when furnace draft goes positive creating a safety and fire hazard for the plant.
NSP-Minnesota	A.0001574.673	Reliability & Performance	SHC3C 1st Floor HVAC PLC Replace	(87,630)	2021	Replace the PLC, remote panels, damper actuators and other instruments as needed. This HVAC system supplies all of the transition building from the 1st floor maintenance offices all the way up to the I&C shop. A significant portion of the cost is associated with upgrading ancillary equipment such as damper drives and duct heater controllers which are obsolete and need upgrades or repairs to work with the new PLC. Temporary heating and or cooling may be required depending on when the major work is performed.	The existing equipment is obsolete and repairs are becoming difficult or not possible. This equipment controls the HVAC in the Unit 3 office areas. Should a larger failure occur this project will have to be performed as an emergent project at a greater cost.
NSP-Minnesota	A.0001574.468	Reliability & Performance	SHC3C Secoal Detector repl	(86,086)	2021	Replacement of the legacy Secoal coal seal detectors on the 10 coal feeders supplying coal to the Unit 3 boiler. Part of this project includes the removal and disposal of 10 Nuclear Sources.	This is legacy equipment for which we can not obtain OEM support or parts. These electronic coal detectors with nuclear sources have been in service for over 28 years, well beyond their design life. These detectors ensure that we maintain the coal seal between the coal mills and the coal silos to prevent any hot gasses and ignition sources from getting into the bunker and causing a fire or explosion. This is critical to prevent a bunker explosion.
NSP-Minnesota	A.0001574.732	Reliability & Performance	SHC0C U1 2 Computer Room F.P.	(70,843)	2021	Provide an automatic suppression system in each of these computer rooms.	These computer rooms are critical to the operation of the units, and the unit in question would be shut down if the units computer room were lost. These rooms currently have no suppression systems, and they are separated from adjacent operating center and relay rooms by non-fire rated construction. This total area covers about 10,000 square feet. Automatic sprinklers or a clean agent gaseous suppression system could be installed. The Loss Expectancy associated with this condition is estimated at $10,000,000. The estimated cost to complete is $70,000 if sprinklers are installed.
NSP-Minnesota	A.0001573.019	Reliability & Performance	BDS5C 21 Lighting Transformer	(70,458)	2021	Replace the existing 21 Lighting Transformer.	The 21 Lighting Transformer provides power to the Unit 5/2 Lighting Bus. The existing transformer has been in service since the original Black Dog Unit 2 was installed. It is reaching the end of its expected life. If this transformer were to fail the plant could potentially lose power to CEMS and other redundancy on Unit 52. The other transformers of this vintage at Black Dog have been replaced.
NSP-Minnesota	A.0001571.085	Reliability & Performance	ANS4C Replace Unit 4 Battery	(70,406)	2021	Replace all UPS batteries in Unit 4.	Battery testing shows end of life is close
NSP-Minnesota	A.0003000.214	Reliability & Performance	C100C PMO Tool Blanket-New	(70,000)	2021	Replace toolboxes, chain hoists, misc tools, and test equipment	Improve work force efficiency and safety. Improve testing capabilities.
NSP-Minnesota	A.0001574.300	Environmental Compliance	SHC99 - Rplc RCD DS Pipe 2021 - 23442	(66,297)	2021	Replace sections of the Dust Suppression water line in the RCD building. This is a 6" pipe. Replace 20' feet or more.	This is an environmental compliance matter; we are permitted to run dust suppression when we are dumping trains. This run of piping has MIC corrosion and there are a lot of 'Patches' all over this pipe.
NSP-Minnesota	A.0001574.173	Reliability & Performance	SHC3C Emergent work	(66,179)	2021	This fund covers unexpected equipment failures and discovery issues from overhaul inspections.	Emergent work for unexpected and unplanned equipment failures.
NSP-Minnesota	A.0001579.089	Reliability & Performance	RIV0C -- Auto Sprklr Prot Oil	(65,648)	2021	Provide and install automatic sprinkler protection in the Unit 7 Oil Storage Room designed to deliver 0.30 gpm/sq. ft. over the area of the room with a 500 gpm hose stream allowance.	This room is approximately 30 ft. x 30 ft. with solid brick walls and concrete floor, roof, and supports. The room contains an 8000 gal. rest lube oil steel tank, two 3000 gal. No. 2 fuel oil steel tanks (used for starting Unit 6 and 7 boilers), one 450 gal. used oil steel tank, and seven 120 gal. steel tanks. These seven tanks all contain oil except for two. One has kerosene and the other a solvent. The room has an 18 in. deep containment pit with a capacity of 10,000 gal., and there is a manual water spray system protecting the room. In the event of a fire, it can not be counted on that the manual system will be activated. In such an event, a fire could rupture of the other tanks and spread outside the room into the plant. If sprinkler protection were installed in the room, such a fire would likely be controlled to the room and not involve any other tanks other than the one of origination.
NSP-Minnesota	A.0001573.118	Reliability & Performance	BDS0 -#52 Cooling Wtr Instrument -23361	(65,229)	2021	Installation of additional instrumentation on the Unit 5/2 Cooling Water system (river water side) to monitor operating parameters and facilitate condition based maintenance. Instruments to include bearing seal water flow and pressure transmitters, pump vibration monitoring, pump motor amps and speed, pump discharge pressure transmitters, strainer d/p transmitter, and heat exchanger d/p transmitters.	The Unit 5/2 Cooling Water system has limited feedback into the plant DCS control system so it is difficult to monitor operating performance and identify issues or maintenance needs. There have been several events throughout the equipment life which have resulted in outages, equipment damage, and increased maintenance costs. Both pumps failed in the summer of 2004 causing an extended outage, and there have been more recent issues (2015+) with pumps failing (broken shaft) with no indication of issues, pumps rotating backwards from leaking check valves, pump wear from inadequate bearing supply flow, strainer and heat exchangers plugging up with no indication, etc. Improving the instrumentation will improve the reliability of this equipment and prevent future issues.
NSP-Minnesota	A.0001559.115	Reliability & Performance	BLL8-Replace u8 battery	(60,174)	2021	BLL0221 Replace TAB 58-8 OPzS 800 - 58 cells	The battery string is approaching its end of design life and testing indicates that its health is trending with design. Battery installed 2004 with a design life of 15-years.
NSP-Minnesota	A.0003000.679	Reliability & Performance	RIV0C-Tool Blanket	(60,000)	2021	RIV0121 - Miscellaneous tools and equipment. All individual tools to be >$1000 and meet definitions for general plant equipment.	Improve capability and efficiency of daily operations maintenance tasks.
NSP-Minnesota	A.0001579.091	Reliability & Performance	RIV0C Inst Flange Guards Lube	(59,532)	2021	Install spray guards, shields, barriers, or spray hoods on pressurized lube oil and seal oil equipment for Units 7 to deflect potential high pressure sprays of oil. Such equipment would include: pumps, flanged or screwed fittings, filters, gauges, rubber hoses, sight glasses, valves, etc.	Oil fires in power plants generally occur as a result of an oil leak. These leaks generally take the form of a simple spill, a three dimensional spill, or an oil spray from a leaking/broken flange, fitting, etc. An oil spray fire is extremely difficult to control, but flange guards can greatly help the potential control of such a fire by deflecting the oil spray down. This can potentially keep the oil spray from an ignition source and, if ignited, can keep the fire localized to a smaller area giving the suppression systems a better chance to control the fire.
NSP-Minnesota	A.0001573.203	Reliability & Performance	BDS5C-Repl U5 Fuel Gas Heater CV	(58,099)	2021	Replace the Unit 5 Fuel Gas Heater Feedwater Control Valve (1", 1500#) and actuator with a severe duty control valve. Project includes engineering, craft labor, materials, and other costs to support the project.	HP Feedwater pressure drop across this control valve reduces from approximately 2,000 psig boiler feed pump discharge pressure to approximately 100 psig. Thie existing control valve is not up to the duty. The existing control valve must be disassembled, inspected, and cleaned annually, to avoid control valve sticking and other problems experienced. The new control valve would be a true severe duty control valve and provide more reliable service without requiring ongoing maintenance and valve issues associated with the current design. This valve is critical for maintaining Unit 5 fuel gas temperature, which causes unit runbacks and trips if not within control.
NSP-Minnesota	A.0001579.123	Reliability & Performance	RIV7-Turbine Under Deck Draina	(56,272)	2021	Improve the drainage systems in the under deck areas by conducting the following: 1.Replace the solid metal covers over the trench drain system with grated covers that would allow an oil spill to flow into the drainage system. 2.Evaluate the drainage systems on the lower level of the under deck areas as to what the drainage capacity is in flow rate (gpm) and holding size (gallons).	In the event of a lube oil fire, it is important that the oil and sprinkler water discharge can be drained away or held in place to keep the fire from spreading to other areas and to better enable the protection systems in place to control the fire. There is a rather extensive drainage system in place in the lower level of the under deck areas, but there are solid metal covers over the trenches that would make it difficult for an entire spill to make it into the trenches. Also, the capacity of this system is unknown.
NSP-Minnesota	A.0003000.577	Reliability & Performance	SER0C MMR Video Probe 2021	(55,002)	2021	Replace borescope video probe.	Replace non-destructive examination inspection equipment with up to date technology. 2 Video probes are replaced on an 8-year cycle, 1 every 4 years.
NSP-Minnesota	A.0001575.046	Reliability & Performance	HBC8C U8 CT Servo Replace 2	(54,520)	2021	Replace/rebuild servo valves on 8 CT	The servos are necessary for controlling bypass valve, IGVs and fuel gas to the combustion turbine. It is essential the servos be maintained.
NSP-Minnesota	A.0003000.583	Reliability & Performance	SER0C PMO DAS Upgrade 2021	(51,000)	2021	Upgrade existing hardware and software to more user friendly and current versions.	Existing hardware and software was purchased in the early 2000s and will be obsolete and possibly inoperable due to computer upgrades.
NSP-Minnesota	A.0001574.666	Reliability & Performance	SHC3C CT Vibration System	(50,307)	2021	Connect the two Bentley vibration systems to the plant computer to allow for trending and real time display of equipment condition.	The original project did not connect the equipment to the plant computer. Thus current readings and trending functions are not available.
NSP-Minnesota	A.0003000.669	Reliability & Performance	HBC0C HB CC Tool Blanket	(50,000)	2021	Tool blanket to purchase tools more than $1000 each.	Tools needed to adequately perform jobs safely. Existing tools can break or a new tool can do a task better.
NSP-Minnesota	A.0001573.204	Reliability & Performance	BDS2C-Install Cond Vac Trip Manifold	(49,315)	2021	Install a Pressure Status Manifold and redundant level transmitters to implement the condenser pressure trip at Black Dog Unit 2. This project includes any required new Emerson DCS modules, logic, HMI screens for all digital and analog inputs and outputs for the new equipment. Also this project includes all electrical wiring as required.	The condenser vacuum trip is a critical trip for plant equipment protection. The installation of a Pressure Status Manifold (PSM) including a 3 transmitter and 2/3 transmitter logic set-up would ensure this critical trip is implemented in a reliable and fault-tolerant manner.
NSP-Minnesota	A.0001579.073	Reliability & Performance	RIV0C -- Replace 61 Battery	(42,923)	2021	Replace Riverside 61 Battery	Station batteries have a limited operational life, this battery is expected to reach its end of life around 2016. This battery is a non-NERC PRC-004 battery but provides back-up power to emergency lighting on the Unit 7 side of the Riverside Power Plant.
NSP-Minnesota	A.0001559.500	Reliability & Performance	BLL Emergent Fund -Other prod	(40,317)	2021	This fund covers unexpected equipment failures and discovery issues from overhaul inspections.	Emergent work for unexpected and unplanned equipment failures.
NSP-Minnesota	A.0003000.661	Reliability & Performance	BDS0C Tool Blanket	(40,315)	2021	BDS0121 - This funding provides for new or replacement tools and equipment for the plant.	The addition and replacement of tools and equipment is necessary to maintain the productivity of the operating and maintenance personnel.
NSP-Minnesota	A.0001571.073	Reliability & Performance	ANS0C Replace Admin Battery	(40,205)	2021	Replace all UPS batteries in Admin Building.	Battery testing shows batteries are getting to the end of life.

Company Descr	Project ID	New Grandparent	Project Name	YE Amt	Activity Year	Project Description	Project Justification
NSP-Minnesota	A.0003000.708	Reliability & Performance	C100C MTR-Replaced Failed Equip 21	(36,000)	2021	CHM-Replaced Failed Equip This project will purchase test equipment for motors, generators, and/or control systems to replace existing equipment that has failed or is no longer supported by the manufacturer.	The Technical Resources & Compliance group supports the plants by performing tests to determine the condition of equipment and to diagnose emergent equipment problems. Functioning test equipment is required to perform these tests expeditiously and effectively.
NSP-Minnesota	A.0003000.685	Reliability & Performance	WLM0C Tools & Equipment B	(29,997)	2021	Replace toolboxes, chain hoists, misc tools, and test equipment.	Improve work force efficiency and safety. Improve testing capabilities.
NSP-Minnesota	A.0001561.500	Reliability & Performance	IVH Emergent Fund -Other prod	(21,000)	2021	This fund covers unexpected equipment failures and discovery issues from overhaul inspections.	Emergent work for unexpected and unplanned equipment failures.
NSP-Minnesota	A.0003000.672	Reliability & Performance	IVH0C Misc tools and Equip	(20,000)	2021	IVH0121 - Replace toolboxes, chain hoists, misc tools, and test equipment.	Improve work force efficiency and safety.
NSP-Minnesota	A.0003000.657	Reliability & Performance	ANS0C Tools and Equip Ca	(20,000)	2021	ANS0121 - Replace toolboxes, chain hoists, misc tools, and test equipment ($20k)	Improve work force efficiency and safety. Upgrade and replace old equipment.
NSP-Minnesota	A.0003000.659	Reliability & Performance	BLL0C Tools Blanket	(20,000)	2021	Replace toolboxes, chain hoists, misc tools, and test equipment	Improve work force efficiency and safety. Improve testing capabilities.
NSP-Minnesota	A.0003000.676	Renewable & New Generation	NBLCo Misc Tools and Equi	(20,000)	2021	Purchase specialty tools, chain hoists, and test equipment.	Required to maintain the wind farm and improve work force efficiency and safety.
NSP-Minnesota	A.0003000.696	Reliability & Performance	SER-RTC-Misc Tools & Equipment	(20,000)	2021	RIV0221 - Replace machinist tools and equipment as needed for continued operation.	Many of the machinist tools equipment are non repairable or out dated. New and replacement equipment will need to be purchased to provide up to date training and for safety reasons.
NSP-Minnesota	A.0003000.703	Reliability & Performance	C100C CSC Tank Ladder and Platform	(20,000)	2021	Adding a ladder and working platform on top of a 10,000 mineral oil storage tank.	From a safety standpoint, using an attached ladder and platform-railings provides a safer and easier option than a person tied-off using a JLG basket. Required maintenance and annual calibrations of level instrumentation on the 10,000 mineral oil storage tank are required on a periodic basis. Having the ladder and platform installed will make the tasks quicker and more efficient and safer.
NSP-Minnesota	A.0001574.269	Reliability & Performance	SHC2C Emergent Projects	(19,056)	2021	This fund covers unexpected equipment failures and discovery issues from overhaul inspections.	Emergent work for unexpected and unplanned equipment failures.
NSP-Minnesota	A.0001574.268	Reliability & Performance	SHC1C Emergent Projects	(18,335)	2021	This fund covers unexpected equipment failures and discovery issues from overhaul inspections.	Emergent work for unexpected and unplanned equipment failures.
NSP-Minnesota	A.0001574.252	Reliability & Performance	SHC99 Emergent work	(16,489)	2021	This fund covers unexpected equipment failures and discovery issues from overhaul inspections.	Emergent work for unexpected and unplanned equipment failures.
NSP-Minnesota	A.0003000.671	Reliability & Performance	HNIC0 Misc Tools and Equ	(15,000)	2021	HNI0121 - Blanket for miscellaneous tools. These tools will be used for day to day operation and in preparation for the turbine overhauls.	Necessary for continued upkeep of operating facilities.
NSP-Minnesota	A.0003000.680	Reliability & Performance	REW0C Tool Blanket	(15,000)	2021	This project will be used to purchase capital maintenance tools for the 2021 calendar year. Such equipment may include scaffolding, specialized electrical instruments, machining equipment, welding machines, etc.	This project will allow for the site to have on-hand the appropriate tools required for plant personnel to perform their work tasks efficiently and safely. Having the appropriate tools and equipment makes for a safer work environment and reduces the risk of potential industrial safety incidents. Staying current with electrical diagnostic equipment enables personnel to troubleshoot plant equipment more quickly and easily.
NSP-Minnesota	A.0003000.730	Reliability & Performance	C100-PMO - Tool Blanket 2021	(13,692)	2021	Miscellaneous tools and equipment for the Performance Testing and Analysis group.	As the PTA group takes on various tests, there may be a need for some specialty equipment. Additionally, there may be some equipment failure which will create the need to replace that equipment.
NSP-Minnesota	A.0003000.667	Renewable & New Generation	GDM0C Grand Mead Cap Tool	(10,000)	2021	GDM0121 - Purchase specialty tools, chain hoists, and test equipment.	Required to maintain the wind farm and improve work force efficiency and safety.
NSP-Minnesota	A.0003000.128	Renewable & New Generation	CWF Tools & Misc Equipment	(9,999)	2021	Purchase specialty tools, chain hoists, and test equipment.	Required to maintain the wind farm and improve work force efficiency and safety.
NSP-Minnesota	A.0003000.662	Renewable & New Generation	BRDR Small Tools Equip	(9,999)	2021	Purchase specialty tools, chain hoists, and test equipment.	Required to maintain the wind farm and improve work force efficiency and safety.
NSP-Minnesota	A.0003000.678	Renewable & New Generation	PLV Tools Equip	(9,999)	2021	Purchase specialty tools, chain hoists, and test equipment.	Required to maintain the wind farm and improve work force efficiency and safety.
NSP-Minnesota	A.0001574.733	Reliability & Performance	SHC0C Electric & Electronic Room FP	(8,523)	2021	From 2014 All Risk Loss Prevention Report for Sherco, Recommendation 06-23: Install smoke detection in the following areas (to be monitored by the Main Control Room or other 24/7 occupied area): * Main secondary unit substation room (ground floor) * Main 4,160 volt switchgear room (mezzanine level) for Unit 1 and 2 * Unit 1 and 2, 480-volt SUS room * Unit 1 and 2 Relay Rooms * All of the Inverter Rooms * Unit 1 and 2 Electrostatic Precipitator switchgear rooms * All of the battery rooms	The most likely problem in the listed areas is an electrical fault, which will often generate smoke. Smoke detection in these areas can provide an early warning of a problem and allow action to be taken prior to significant damage occurring. Reference NFPA 850, Section 7.8.4 and 7.8.5. The Loss Expectancy associated with this condition is estimated at $2,000,000. The estimated cost to complete is $10,000.
NSP-Minnesota	A.0003000.492	Reliability & Performance	SER-CSC-Floor Scale Replace	(4,000)	2021	Replace existing floor scale	Floor scale - Our existing floor scale was purchased in 2001 and has an estimated operating life of 8 years. This operational life may be extended by proper care and maintenance; however, the life span may be degraded by continued, sustained use with heavy loads and corrosive materials. The HWSF floor scale endures both conditions which may shorten the cost-effective operational lifespan and accelerated failure. Once the scale has become degraded, it may display an incorrect weight and require repair/calibration more frequently. Confidence in the floor scale is essential for the exact measuring of weights for both the VSQG and PCB program. Without accurate weighing abilities, customers will lose trust with our programs as they will not be able to have assurance that they are being billed an honest rate. The scale was inspected early in 2011. The scale still appears to be in good working order and was certified. We are postponing this replacement until 2017.
NSP-Minnesota	A.0001576.018	Renewable & New Generation	GDM - Battery	(18,927,797)	2022	NSP Wind Battery Energy Storage Project. Install an approximately 10MW/40MWhr battery energy storage system in or near an existing wind farm collection or interconnecting substation. System may include batteries, inverters, transformers, enclosures/buildings, and control system to allow for remote operation and monitoring.	Install Battery Storage System at a NSP Wind Farm to provide storage of generation from wind farms. We are expecting MISO to add the ability for energy storage systems to participate in the market per FERC 841. We will be able to utilize the system to gain design and operational knowledge to facilitate future energy storage systems that will support grid resiliency.
NSP-Minnesota	A.0001573.224	Reliability & Performance	BDS5 - Ovhl U5 Hot Gas Path - 22403	(8,821,219)	2022	Parts and labor to perform a Hot Gas Path overhaul tentatively scheduled for the 2028 time frame. Parts purchased include one full set of CI parts (support housings, pilot nozzles, combustor baskets, transitions, and transition seals) and one full set of turbine parts (ring segments, vanes, and blades for turbine rows 1 - 3).	Per current parts agreement, scheduled outages must occur within 10% of 24,000 advertised parts life. Historical operating data shows that an HGP overhaul will be required every 5 - 6 years depending on how the unit is dispatched. This is the next HGP overhaul following the Major Inspection which is scheduled for approximately 2023. Parts replacement is required to maintain unit reliability and avoid catastrophic equipment damage and extensive outage time and repair costs.
NSP-Minnesota	A.0001571.090	Reliability & Performance	ANS4 - U4 Hot Gas Path - 10341	(5,249,861)	2022	Hot gas path inspection and replacement for U4 at Angus Anson. The project includes replacement of the following standard hot gas path parts per the PSM parts contract; transitions, liners, liner end caps, fuel nozzle assemblies, stage 1 buckets/nozzles/shroud blocks, stage 2 buckets/nozzles/shroud blocks. The project also includes replacing the R0 (1st stage) compressor blades to mitigate a design issue with the OEM blades. The exhaust frame flex seals will be replaced with a set of Inconnel seals.	The HGP inspection is required at 24,000 operating hours or 900 starts per the OEM and the PSM parts contract.
NSP-Minnesota	A.0001574.115	Environmental Compliance	SHC3C U3 Repl FABRIC FILTER BA	(4,526,246)	2022	SHC1417 - Current set of bags were installed starting in 2009. Typical life is 7 to 9 years. Replace approx 33% of the bags each year. For each compartment, 378 bags will be replaced, thimbles as required, and the walls will be blasted and coated with an anti-corrosion coating.	Compliance with Plant Air Quality Permit.
NSP-Minnesota	A.0001573.169	Reliability & Performance	BDS0C Reverse Osmosis 2nd Pass	(2,867,355)	2022	Installation of a new 100 GPM (outlet) water treatment system. This new system will be located in the basement of Unit 2 - located just north of the existing vacuum pumps. This project includes new equipment, piping, wiring, instrumentation, conduit, controls, and associated auxiliary equipment (softener, pre-filtration, chemical feed, EDI, CIP skid, etc). The new equipment will be operated by an Allen Bradley PLC (with HMI screen at the equipment skid). The system will have the ability to be remote controlled by the Ovation DCS in the control room. There is no DCS operator screen at the equipment skid. The existing demineralizing equipment will be retired in place and neutralized.	This system will allow the for retirement of the existing Demineralizer equipment. This is similar to the setup at High Bridge, Riverside, King, Wilmarth, and Red Wing. EPRI recommends HRSG makeup water quality with conductivity < 0.100 microsiemens and silica < 10 ppb. The existing single pass RO cannot meet these standards and typically produces marginal quality water which can have values for the stated attributes 5 - 10 times greater than these recommended values. Unit 6 requires additional water for operation and evaporative cooling. The existing system cannot provide water to both Unit 5/2 and Unit 6 at peak needs. This results in degraded generation cycle water chemistry which requires excessive blowdown which affects unit efficiency, makeup water costs, chemical costs, process water costs, and significantly affects the reliability of the unit. The marginal performance of the existing RO system also prevents retirement of the existing demineralizer system which is 1960s vintage and past its end of life and requires significant operational and maintenance costs and labor resources. The new system will finally allow for retirement of the demineralizer equipment while providing better water quality and increased equipment redundancy. Retirement of the No. 1 demineralizer will also improve plant safety by significantly reducing the inventory of hazardous chemicals on site. Installation of a second RO system and retirement of the existing Demineralizer equipment is recommended by the Xcel Energy Chemistry Resources department.
NSP-Minnesota	A.0001573.226	Reliability & Performance	BDS0 -BlackDog Rd Erosion Wall -23299	(2,718,798)	2022	Installation of sheet pile wall or alternative means of correcting and preventing erosion between Black Dog Road and the Minnesota River between Lyndale Gates and the main plant entrance. It is estimated that approximately 600 linear feet of river wall will be required, subject to final engineering and design performed during the project.	There are several locations along Black Dog Road which have eroded significantly from the Minnesota River. The situation requires permanent repair to ensure safe travel into and out of the generating station. A temporary solution to mitigate the rate of erosion was implemented in 2018 / 2019 but it is expected that a more permanent solution will be required in the next 5 years. This project is scheduled to be performed in 2021 or later to reduce the impact to the ongoing site demolition and remediation projects which require significant truck traffic into the site.
NSP-Minnesota	A.0001579.072	Reliability & Performance	RIV0C -- Replace Water Treamentment System	(2,404,532)	2022	Design, permit, fabricate, and install one new Reverse Osmosis (RO) Water Treatment System located In the approximate area of the existing equipment so that a new building and related infrastructure is not required. This is a scope reduction to the original project which included relocation of the new equipment to a new building which would require additional infrastructure such as electrical switchgear and additional piping, control wiring, HVAC fire protection, etc. That project was estimated at 3.7 million dollars, and would be too expensive to justify in Sharps.	The present plant water treatment systems are a significant Operations and Maintenance burden. As plant staff is adjusted (reduced) to planned permanent levels there will not be resources available to devote to high maintenance ancillary (non-core) plant equipment.

Company Descr	Project ID	New Grandparent	Project Name	YE Amt	Activity Year	Project Description	Project Justification
NSP-Minnesota	A.0001561.030	Reliability & Performance	IVH3C Turbine Controls	(2,280,010)	2022	Replace the existing obsolete GE Fanuc turbine controls and integrated balance of plant controls with a modern control system including new microprocessors, HMI's, monitors, historian, EMS-SCADA interface, network switches, dual redundant network, data links, etc. The new turbine control system is planned to be similar to sister Wheaton Units 1-4. The new controls will include overspeed integration including 4 active speed probes similar to Wheaton. The project also includes modifying the fuel oil controls with position feedback. This project includes upgrading the vibration monitoring with Bently Nevada equipment rather than the equipment provided by Emerson as was done for the Wheaton plant. For transmission system requirements, new controls will be installed 2 units at a time, thereby maintaining 4 units available for operation.	The existing control system is obsolete and not supported by the manufacturer. Spare parts are difficult to find and costly to procure when located. The NSP fleet control systems are being standardized on Emerson Ovation to improve operations, maintainability, reliability, and availability.
NSP-Minnesota	A.0001573.212	Reliability & Performance	BDS2C-Replace U2 Turbine L-0 Blades	(2,090,841)	2022	This project would entail the full replacement of the last row of LP turbine blading (L-0) in Unit 2. This activity should be performed during a major turbine overhaul when the unit is disassembled for inspection. This work will require rotor removal, and it should be sent to a qualified repair facility for machining and NDE, as well as high-speed balancing.	The current L-0 blades were installed in 1987 and at the time of the next major steam turbine overhaul, will have operated for 30+ years. These blades typically have a life expectancy of between 20-40 years, or 160,000 - 320,000 EOH, depending on operating conditions. This unit is more susceptible to water droplet erosion because of the lower main steam temperature than design, especially during winter months. Cycling duty will also decrease life expectancy by increasing fatigue and thermal stresses on the turbine, possibly requiring replacement earlier in the life expectancy range. Recent inspections on these blades have shown evidence of more rapid moisture erosion than would be expected with this operating history, which may warrant replacement during the next major overhaul. Failure of these blades would result in a significant unplanned outage to repair or replace.
NSP-Minnesota	A.0001566.168	Renewable & New Generation	NBL0C Gearbox Replacements	(1,995,518)	2022	Replace failed gearboxes. Cost includes the crane and labor to remove the rotor, gearbox, and main shaft, and then reinstall the components.	Gearboxes fail with planetary section damage and need to be replaced.
NSP-Minnesota	A.0001559.048	Reliability & Performance	BLL8C-CESP GSU 171-227 MVA 18-115kV	(1,869,180)	2022	The revised scope it to replace the two existing RO's installed in 2000 and 2011 with two new RO's for a 2 pass system, or one two pass RO. The location of the new equipment is to be in the same or general area of the existing equipment to make use of the existing electrical and piping infrastructure - including location in an existing building. The new location can also utilize the Ovation system control cabinet - intertie that was originally installed to support the retired demineralizer system, but never used. The new system is sized for 1 x 90GPM nominal. 1st pass RO, 2nd pass RO, Electrodeionization (EDI) Skid, Clean-In-Place (CIP), Mixed Bed Polisher, and Chemical Feed systems. The new system will remove CO2 with either a membrane separator system, or a caustic feed system. The new system will be operated from a PLC to allow for future vendor interface. The only function from the maint control room is start/stop capability.	Lead time on these transformers can range from 12-18 months. We consumed our spare from the retirement of Black Dog Unit 4 when a fault occurred in the Angus Anson 4 transformer. Having the transformer on hand greatly reduces the potential down time of a generating asset. The transformers for these units are equivalent to one another re MVA, voltage and bushing arrangement.
NSP-Minnesota	A.0001579.500	Reliability & Performance	RIV Emergent Fund -Other prod	(1,863,059)	2022	This fund covers unexpected equipment failures and discovery issues from overhaul inspections.	Emergent work for unexpected and unplanned equipment failures.
NSP-Minnesota	A.0001573.182	Reliability & Performance	BDS2C U2 Turning Gear Replace	(1,778,024)	2022	This project includes complete replacement of the 1950's vintage turning gear assembly for Unit 2 Steam Turbine / Generator. This includes removal of the existing turning gear assembly and motor and replacement with a better design more suitable for cycling operation and in new condition. Project includes all necessary labor (company and contractor), materials, equipment, controls, and additional costs to perform the work.	The turning gear for Unit 2 Steam Turbine is 60+ years old and is nearing end of life. The turning gear was not designed for cycling operation and excessive turning gear hours (4000 - 6000 hours per year) and has been increasingly difficult to maintain since the conversion to combined cycle operation in 2002. Turning gear is a critical component as it is required to operate continuously when the unit is offline to keep the unit available to commercial operations by preventing the rotor from bowing or sagging while idle. Furthermore, even a short duration off turning gear while the unit is hot could result in excessive bowing which would require several days forced outage to cool the unit down before it can be put back on gear. In December 2012, the turning gear failed to engage which attributed to a high vibration event during unit startup which resulted in a forced outage totaling 77 days, 500,000 lost MW-hrs, and approximately $2,000,000 repair costs. Since then, the turning gear assembly has had other significant issues including failures to disengage during startup, high amps causing turning gear motor trips, locked components preventing rotation, excessive noise and vibration, and oil leaks. The turning gear assembly has been overhauled on an accelerated frequency every 2 - 3 years to maintain equipment reliability at an estimated average cost of $85,000 with no significant improvement to unit operation.
NSP-Minnesota	A.0001559.006	Reliability & Performance	BLLC7 U7 Exhaust Silencer Repl	(1,537,841)	2022	Replace silencer on Unit 7 CT exhaust stack.	The panels are used to reduce the Db's coming out the stack of the CT. The panels are melting and breaking up. They are made with a stainless steel that cannot withstand the higher temperature of a GE 7FA Ct. (They were designed for a GE 7FE class CT that runs cooler exhaust temperatures.)
NSP-Minnesota	A.0001591.007	Reliability & Performance	-12186 ANS4C U4 Repl Mark V Cn	(1,403,272)	2022	There is now removal activities associated with this project. The new install cost is estimated at 2.35 million and removal at $175,000 for a total new installation estimated cost of 2.55 million, or a reduction of approximately 1.2 million from the original scope and estimate.	System is no longer supported by GE. Parts are obsolete. Running on Windows 2000. Installed at plant in 2004. (These were 2001 CT's.)
NSP-Minnesota	A.0001575.500	Reliability & Performance	HBR Emergent Fund -Other prod	(1,384,550)	2022	This fund covers unexpected equipment failures and discovery issues from overhaul inspections.	Emergent work for unexpected and unplanned equipment failures.
NSP-Minnesota	A.0001573.070	Reliability & Performance	BDS5C U52 Ovation System Evergreen	(1,209,593)	2022	This project is to replace the Black Dog Unit 5/2 Ovation System Hardware and Software.	The existing Black Dog Unit 5/2 Ovation System Hardware and Software is scheduled to be installed in 2015. As established by the Xcel Technical Resources Controls expert, in order to maintain the plants ahead of the obsolescence curve it is strongly recommended that the plants plan for replacement of Ovation Hardware/Software on a 5 year cycle. There is a Xcel North Fleet goal/expectation that all units utilizing Ovation Systems be at similar hardware/software revisions.
NSP-Minnesota	A.0001576.006	Renewable & New Generation	GDM0C Generator Replacements 2	(998,153)	2022	Replace failed generator in GE 1.5 SLE wind turbines. Cost includes the crane and labor to remove the generator and then reinstall it.	High operating temperatures in the compact design have caused a small amount of failures in the industry after 5 years of operation.
NSP-Minnesota	A.0001573.500	Reliability & Performance	BDS Emergent Fund -Other prod	(968,111)	2022	This fund covers unexpected equipment failures and discovery issues from overhaul inspections.	Emergent work for unexpected and unplanned equipment failures.
NSP-Minnesota	A.0001573.057	Reliability & Performance	BDS0C 480V Load Center	(948,622)	2022	Low voltage load centers 101, 102 and 103 are in need of replacement due to age and parts availability. They are over 40 yrs old. This project has four main goals: (1) disassemble and remove the existing SUS 101, 102 and the attached 11/12LT Load Center, then purchase and replace with a new 480VAC (101, 102) load center with a TIE breaker and a new 11/12 208V lighting load center. NOTE: Depending on the size of the new switch gear, a new location within the plant would need to determined with the plant. (2) replace all incoming and if required any outgoing cables from the existing 101, 102, 11LTG, and 12LTG transformers. Install as required new cable trays, conduits and junction boxes for short out going load cables. Also install any new area lighting as required. (3) The third goal is to purchase a new remote drop Emerson DCS equipment, including modules, and commissioning and programming services for communication and control of the load centers. And then install and commission the new load centers which will allow remote auto control from the main operators' control room. (4) purchase and install a high resistance ground system (HRG) for the new 480VAC load center gear. Alarm communication through the DCS. This project is to be coordinated with the timing of the Spring of 2019 outage.	Failure of load center 102 would result in loss of power to the screen house for an extended period, requiring shutdown of all units. It would also result in loss of power to battery charger #11. Loss of load center 101 would result in loss of power to battery charger #12 and air compressor #5. Loss of load center 103 would result in loss of power to auxiliary transformer 31 and 41 cooling fans and the alternate power supply to GSU 4 transformer cooling fans.
NSP-Minnesota	A.0001574.474	Reliability & Performance	SHCJC Dust Collector replacement	(943,210)	2022	SHC0322 - Replacement chutes, conveyors motors and structures.	Existing equipment has reached end of life with consistent failures and repetitive maintenance.
NSP-Minnesota	A.0001571.011	Reliability & Performance	ANSC0 Replace U4 Silencer	(926,541)	2022	ANS0613 - Replace Unit 4 CT Silencer. The panels are used to reduce the Db's coming out the stack of the CT	The panels are melting and breaking up. The are made with a stainless steel that cannot withstand the higher temperature of a GE 7FA Ct. They were designed for a GE 7FE class CT that runs at lower temps.
NSP-Minnesota	A.0001572.227	Environmental Compliance	ASK1C-316b Permit	(893,346)	2022	Project to acquire the NPDES permit that is needed to operate the plant. This would include the costs of the initial fish studies required by the EPA 316(b) regulation and the MPCA negotiations to acquire the permit.	Mandated by EPA 316b regulation and the plant NPDES permit.
NSP-Minnesota	A.0001591.003	Reliability & Performance	-17052 ANS2C Repl U2 gen break	(863,609)	2022	Replacement of unit 2 generator breaker and MOD.	Fuji has not provided parts or service since 2015.

Company Descr	Project ID	New Grandparent	Project Name	YE Amt	Activity Year	Project Description	Project Justification
NSP-Minnesota	A.0001573.056	Reliability & Performance	BDS2C U2 LP Steam to Crossover	(778,385)	2022	Installation of new piping to route the existing LP Steam supply to the crossover pipe. This includes materials and labor for new 10" piping, insulation, valves, drip legs, instrumentation, electrical, and controls to complete the project.	The existing configuration of the LP Steam system supplies steam to Unit 2 DA for deaeration purposes and supplies steam to row 32 of the HP turbine for injection into the steam turbine for power generation. The row 32 admission line connects to a re-purposed extraction nozzle but there have been historical issues and concerns with admitting LP Steam to the HP turbine in that location. During the 2010 turbine overhaul, it was discovered that the row 32 blades had experienced plastic deformation and other damage which required the entire row of blades to be replaced at that time. At that time, Siemens performed an internal study and recommended that injection into the extraction line be discontinued. Since then, the plant has operated mostly with the LP Steam admission system out of service because it is believed that this system was the primary cause of the damage. The plant is pursuing a study in 2014 from the OEM to determine the best route for admitting the additional LP steam, and this project is one of the two most likely recommendations. This project would re-route the LP Steam supply to the LP Crossover pipe to restore approximately 3 - 4 MWs to the unit which are currently being lost because the admission system is out of service.
NSP-Minnesota	A.0001611.009	Renewable & New Generation	PVW0-Pleasant Valley Gearbox Replacement	(770,234)	2022	Replace failed gearboxes. Cost includes the crane and labor to remove the rotor, gearbox, and main shaft, and then reinstall the components.	Gearboxes fail with planetary section damage and need to be replaced.
NSP-Minnesota	A.0001576.005	Renewable & New Generation	GDM0C Gearbox Replacements 201	(696,470)	2022	Replace failed gearboxes in GE 1.5 SLE wind turbines. Cost includes the crane and labor to remove the rotor, gearbox, and main shaft, and then reinstall the components.	Gearboxes fail with planetary section damage and need to be replaced.
NSP-Minnesota	A.0001565.111	Reliability & Performance	WLM0C Replace U0 Scalping Conveyor	(694,935)	2022	Replace Scalping Conveyor. This includes pans, chain, gears, etc.	Complete conveyor was last replaced in 2005 and the chain was last replaced in 2009 on O M. The conveyor used to be on a 5 year replacement schedule but that schedule has been extended due to the chain replacements happening between complete replacements. By 2012 the chain will be three years old and links will be breaking due to the chain stretching out.
NSP-Minnesota	A.0001723.004	Reliability & Performance	MEC3 - Turbine Valves - 23664	(648,857)	2022	Replace Unit 3 MEC Steam Turbine Valves	Unit 3 MEC Steam Turbine Valves
NSP-Minnesota	A.0001579.083	Reliability & Performance	RIV0C --Aux boiler Controls Upgrade	(645,971)	2022	Upgrade the Riverside Auxiliary Boiler Controls.	The Auxiliary Boiler Control System has configuration/programming issues with the original controls logic that makes the burner controls very unstable at low load operation. This instability results in excess CO emissions and is one of the reasons the boiler has to be operated at a higher load to maintain emissions compliance. Due to the nature of the controls logic configuration, only the OEM would be able to make the necessary changes to the software. Due to legal issues with Terms and Conditions, Xcel Energy cannot do business with the OEM, Coen. □ □ Upgrading the controls would allow a VFD for the FD fan to be incorporated into the Aux Boiler Control System. This will result in heat rate improvements during the operation of the Aux Boiler, as it will improve emissions at lower loads, resulting in improved turndown capability. The current practice at Riverside is to run the Aux Boiler at a higher load than is necessary for the building heating system and frazil ice system to maintain emissions compliance. This is accomplished by venting steam out of the roof, which results in a waste of natural gas and water. Upgrading the controls will also ensure that the system does not fall behind the obsolescence curve. There is difficulty with older systems in procuring replacement parts, finding good field service technicians, and meeting up to date cyber asset security requirements. It may make sense to move the controls to the existing plant Ovation platform. The existing system was installed in 2009.
NSP-Minnesota	A.0001579.069	Reliability & Performance	RIV0C -- Instrument Air Sys Rep	(632,248)	2022	Replace the existing plant instrument air compressors with a system that either requires limited plant Operations/Maintenance resources or is intended to be maintained by external service providers.	The present plant air compressors are aging and are an increasingly large Operations and Maintenance burden. The poor reliability of these units may result in simultaneous unavailability of multiple units, possibly resulting in failure of the plant air system. As plant staffing is reduced to planned permanent levels there will not be in-house resources available to devote to high maintenance ancillary (non-core) plant equipment. The existing system capacity is also limited on the CT side of the plant.
NSP-Minnesota	A.0001566.169	Renewable & New Generation	NBL0-Generator Replacement 2022	(554,416)	2022	Replace failed generator in GE 1.5 SLE wind turbines. Cost includes the crane and labor to remove the generator and then reinstall it.	High operating temperatures in the compact design have caused a small amount of failures in the industry after 5 years of operation.
NSP-Minnesota	A.0001571.082	Reliability & Performance	ANS4C U4-Ex 2100 E -Excitation Sys Rpl	(538,141)	2022	Replace U4 Excitation System Controls with reliable, non-obsolete equipment.	The ANS U4 Excitation Systems Controls are nearing end of useful life. It is necessary to upgrade in order to ensure reliable operation and parts availability.
NSP-Minnesota	A.0001580.007	Renewable & New Generation	CWF0-Courtenay Gearbox Replacement	(524,018)	2022	Replace failed gearboxes. Cost includes the crane and labor to remove the rotor, gearbox, and main shaft, and then reinstall the components.	Gearboxes fail with planetary section damage and need to be replaced.
NSP-Minnesota	A.0001562.138	Reliability & Performance	REW0C Replace Scalping Conveyor	(513,323)	2022	Replace the Scalping Conveyor	Existing conveyor is at end of life with frequesnt failures and maintenance
NSP-Minnesota	A.0001575.169	Reliability & Performance	HBC0 - Boiler Feed Pump CESP - 23730	(511,762)	2022	Purchase of a rotating spare boiler feed pump for use during the overhauls of in-service pumps	Currently, one boiler feed pump is needed to operate the unit to 100% load. The second pump is on standby mode to protect the HRSG water components if the first pump would trip at any time. □ The OEM has indicated that an overhaul of one pump would take six to eight weeks. Our normal outage lengths are 10 days. To send out a pump during an outage, we would either have to risk the units operability in a trip event or to extend the outage to the six to eight weeks.□ This spare pump would allow one operating pump to be removed during the shorter time outage period and replaced with the new (or spare) pump.
NSP-Minnesota	A.0001572.214	Reliability & Performance	ASK1C AQCS Battery Replacement	(481,344)	2022	Replace 125V AQCS station batteries. There are 60 total cells in this array.	These batteries are associated with NERC requirements, and are showing signs of deterioration.
NSP-Minnesota	A.0001572.232	Reliability & Performance	ASK1C-TurboToc PLC Upgrade	(475,358)	2022	Replace Allen Bradley Control System. Upgrade the following PLC hardware on both (two) panels:□ 1. MicroLogix compact PLC to ControLogix compact PLC□ 2. Implement the following PLC program changes:□ 3. Port PLC program to new platform□ □ Add/Renew the following hardware:□ 1. Add communication hardware and wiring for tie in to PLC controls network to allow unattended program backups.	Projected year of replacement due to obsolescence.
NSP-Minnesota	A.0001571.081	Reliability & Performance	ANS4C U4-LCI Controls Replacement	(460,020)	2022	Replace U4 LCI System Controls with reliable, non-obsolete equipment.	The ANS U4 LCI Systems Controls are nearing end of useful life. It is necessary to upgrade in order to ensure reliable operation and parts availability.
NSP-Minnesota	A.0001565.114	Environmental Compliance	WLM0C Landfill Cell 7 and 6 Cap	(459,420)	2022	Landfill Cell 7/6 Cap	Required by permit
NSP-Minnesota	A.0001574.180	Reliability & Performance	SHC1C 2022 Small Project Routi	(456,328)	2022	Labor and materials that are categorized as capital expenditures. Must meet capitalization criteria categories and include material costs greater than $2,500, but total cost less than $50,000.	These are small projects such as valve replacement, motors, etc that have failed during plant operation.
NSP-Minnesota	A.0001562.155	Reliability & Performance	REW2-Replace Bus 21 Switchgear	(455,806)	2022	1949 vintage Bus 21 live-front style switchgear needs to be replaced. Also, because of the age and type of the equipment, all new breaker panels will need to be redesigned to fit the pre-existing space. In addition the 13.8 kV to 480 V transformer and bus 11 to bus 21 tiebreaker would be replaced to have a larger capacity to allow ID fan operation.	Bus 21 Switchgear is a live front design, where if the front door is open the electrician or operator is exposed to parts that are energized. When racking breakers, the operator is not shielded from an arc flash if one occurs, creating an extremely hazardous situation. Due to safety hazards, manufacturers no longer construct these types of switchgear. This was a recommendation from the life extension study conducted by E&C, TR&C, and Excel Engineering.
NSP-Minnesota	A.0001562.156	Reliability & Performance	REW1-Replace Bus 11 Switchgear	(455,030)	2022	1949 vintage Bus 11 live-front style switchgear needs to be replaced. Also, because of the age and type of the equipment, all new breaker panels will need to be redesigned to fit the pre-existing space. In addition the 13.8 kV to 480 V transformer and bus 11 to bus 21 tiebreaker would be replaced to have a larger capacity to allow ID fan operation.	Bus 11 Switchgear is a live front design, where if the front door is open the electrician or operator is exposed to parts that are energized. When racking breakers the operator is not shielded from an arc flash if one occurs, this makes it an extremely hazardous process. Due to safety hazards involved with these, manufacturers no longer construct these types of switchgear. This was a recommendation from the life extension study conducted by E&C, TR&C, and Excel Engineering.
NSP-Minnesota	A.0001574.198	Reliability & Performance	SHCCC 2022 Emergent Work	(445,489)	2022	This fund covers unexpected equipment failures and discovery issues from overhaul inspections.	Emergent work for unexpected and unplanned equipment failures.
NSP-Minnesota	A.0001572.233	Reliability & Performance	ASK99C-Transfer House 1 Control System	(442,396)	2022	Replace current Allen Bradley control system with Ovation DCS, and add the following hardware:□ 1. Ovation Controls to replace all Allen Bradley hardware currently in place□ □ Implement the following program changes:□ 1. Port PLC program to Ovation platform	Existing control system is problematic and a source of issues for yard operations. It is also expected that by this year the existing control system would need to be replaced due to obsolescence.
NSP-Minnesota	A.0001572.234	Reliability & Performance	ASK99C-Transfer House 2 Control System	(442,396)	2022	Replace current Allen Bradley control system with Ovation DCS, and add the following hardware:□ 1. Ovation Controls to replace all Allen Bradley hardware currently in place□ □ Implement the following program changes:□ 1. Port PLC program to Ovation platform	Existing control system is problematic and a source of issues for yard operations. It is also expected that by this year the existing control system would need to be replaced due to obsolescence.
NSP-Minnesota	A.0001574.304	Reliability & Performance	SHC2 -Turb Ctrl Vlv Internals 2022-22721	(436,051)	2022	Moved to Start 2021 per Alex Fortman ~ HK 8.27.2018□ Empty Shell - Moved outside Budget Window per Roger Schluessel ~ HK 4.9.2018□ □ Replace main turbine control valve internals including, but not limited to stems, balance chambers, plugs, and seats.	The valve internals have been subject to damage due to excessive wear and tear due to frequent unit cycling and more frequent economic outages. There are four control valves, all of which experience significant degradation. The work description is intended for all four control valves. The control valves are critical safety devices used to prevent turbine overspeed after a unit trip and are also responsible for regulating steam admission to the turbine. Their mechanical integrity is essential to safe and reliable operation of the turbine.
NSP-Minnesota	A.0001572.500	Reliability & Performance	ASK Emergent Fund -Steam prod	(429,843)	2022	This fund covers unexpected equipment failures and discovery issues from overhaul inspections.	Emergent work for unexpected and unplanned equipment failures.

Company Descr	Project ID	New Grandparent	Project Name	YE Amt	Activity Year	Project Description	Project Justification
NSP-Minnesota	A.0001702.011	Renewable & New Generation	BS2 - Blazing Star2 PCMM - 23573	(424,540)	2022	To better understand the potential impacts to birds and bats, Xcel Energy executes a post-construction mortality monitoring (PCMM) study using methods developed in conjunction with U.S. Fish and Wildlife Service and Minnesota Department of Natural Resources as part of a Bird and Bat Conservation Strategy (BBCS).	The BBCS called for conducting a post-construction mortality monitoring study with the primary objectives of providing a summary of documented fatalities, presenting estimates of searcher efficiency and carcass persistence, and calculating fatality rates adjusted for bias during the study. The secondary objective was to monitor all turbines specifically for eagle and other large bird fatalities.
NSP-Minnesota	A.0001704.009	Renewable & New Generation	FBW - Freeborn PCMM - 23575	(424,540)	2022	To better understand the potential impacts to birds and bats, Xcel Energy executes a post-construction□ mortality monitoring (PCMM) study using methods developed in conjunction with U.S. Fish and Wildlife□ Service and Minnesota Department of Natural Resources as part of a Bird and Bat Conservation□ Strategy (BBCS).	The BBCS called for conducting a post-construction mortality monitoring study with the primary□ objectives of providing a summary of documented fatalities, presenting estimates of searcher efficiency□ and carcass persistence, and calculating fatality rates adjusted for bias during the study. The secondary□ objective was to monitor all turbines specifically for eagle and other large bird fatalities.
NSP-Minnesota	A.0001574.190	Reliability & Performance	SHC3C 2022 Small Project Routi	(406,781)	2022	Labor and materials that are categorized as capital expenditures. Must meet capitalization criteria categories and include material costs greater than $2,500, but total cost less than $50,000.	These are small projects such as valve replacement, motors, etc that have failed during plant operation.
NSP-Minnesota	A.0001562.154	Reliability & Performance	REW0-Replace Duct Scrubber Controls	(403,715)	2022	Replace Duct Scrubber Allen Bradley Controls to combine the baghouse and scrubber controls to a single processor for each unit to simplify operation and improve physical layout. This project should be completed in conjunction with the REW0-Replace Baghouse Controls project as they go hand-in-hand.	These Allen Bradley controls are obsolete and parts availability is becoming more and more rare. It is unknown exactly when in the next several years these controls will fail beyond the point of repair, when that does occur it will require an immediate estimated 16 week replacement.
NSP-Minnesota	A.0001561.015	Reliability & Performance	IVH5C U5-6 UG Cable Replacemen	(381,924)	2022	IVH0417 - Replace dated direct buried cable on units 5-6. This will include control cables between the control room and the units, the cables from the aux transformers and support equipment, this includes both 480 and 4-kV.□ □ This project would install new cabling in conduits or raceways to segregate voltages and facilitate ease of future replacement.□ □ The insulation of the cables is failing due to age.	Due to the insulation type and advanced age of the original construction cables failures are likely. In fact there have been events in the last 12-18 months in which units were unavailable due to grounds on the 480-V systems. Additionally the sister units to Inver Hills at the Wheaton WI facility suffered a insulation failure on buried cable that resulted in energizing low voltage control cables that initiated a fire in a control cabinet in the plant control room.
NSP-Minnesota	A.0001565.037	Reliability & Performance	WLM1C Replace U1 Rear Wall	(376,538)	2022	WLM0416 - U1 Rear Wall Replacement	Rear wall was last replaced in 1997 and rotated 180 degrees in 2007 to gain 10 more years. There have been wall failures at Wilmarth in the past. By replacing the wall we greatly reduce the chance of another failure.
NSP-Minnesota	A.0001565.042	Reliability & Performance	WLM2C Replace U2 Rear Wall	(376,538)	2022	WLM0417 - U2 Rear Wall Replacement	Back wall was installed in 1996. The wall was 180 degree rotated in 2006 to extend life for 10 years, until 2016. The wall tubes are cladded with inconel 625 overlay that wears and/or is corroded off over time. There have been wall failures in the past. To avoid future failures the wall needs to be replaced.
NSP-Minnesota	A.0001561.029	Reliability & Performance	IVH3C Gas Valve Ctrl Repl	(374,045)	2022	Replace the existing obsolete gas control logic, gas control valves, wiring, and pressure switches on Units 3 & 4. This project is planned to be run in parallel with the turbine control replacement project because the software and microprocessor hardware for turbine control, gas valve control and fuel oil valve control is one integrated whole.□ □ Due to transmission system requirements the new gas control valves will be installed 2 units at a time; thereby maintaining 4 units available for concurrent operation.□ □ The new control valves are slightly narrower and a bit longer than the existing valve per initial vendor drawings. Per field measurements we expect that the new valves will fit in the same location with minor piping modifications. We do not expect to require gas valve cabinets and other major modifications.□ □ This is a 2 year project starting in 2019 and ending in 2020.	The servomotors that operate the gas control valves (GCV) are obsolete. They are controlled by obsolete Pacific-Scientific controllers. This control scheme has not proven to be very reliable over the years with numerous unit outages due to component failure and electrical/control/mechanical issues with gas operation. In addition these components are very difficult to troubleshoot and maintain in calibration.□ □ The existing control system is obsolete and not supported by the manufacturer. Spare parts are difficult to find and costly to procure when located. The NSP fleet control systems are being standardized on Emerson Ovation to improve operations, maintainability, reliability, and availability.
NSP-Minnesota	A.0001574.195	Reliability & Performance	SHC2C 2022 Small Project Routi	(365,283)	2022	Labor and materials that are categorized as capital expenditures. Must meet capitalization criteria categories and include material costs greater than $2,500, but total cost less than $50,000.	These are small projects such as valve replacement, motors, etc that have failed during plant operation.
NSP-Minnesota	A.0001565.077	Environmental Compliance	WLM0C Slaker PLC Replacement	(358,524)	2022	Slaker PLC Replacement	Slaker is one of the last systems at Wilmarth using IFIX. Project is to replace early 1990's PLCs and move to Delta V for the DCS as most of the rest of the plant already has done. Slaker is used to produce slurry, the PLCs/controls are used to control SO2 emissions.
NSP-Minnesota	A.0001573.223	Reliability & Performance	BDS2 -Rplc Turbine Valve Internal -23318	(356,911)	2022	Replacement of the Unit 2 steam turbine valve internals (two stop valves, six control valves) during the Fall 2022 major steam turbine overhaul. This includes replacement of the stems, plugs, bushings, and other internal parts which are considered capital and other associated costs to perform the work. The valve actuators will be sent off-site for rebuild under O&M funds.	The unit 2 steam turbine valves are overhauled every 4 - 6 years per OEM, company, and insurance requirements to maintain unit safety and reliability. These valves are critical for unit operation since they control the steam flow admitted to the turbine and perform unit overspeed protection. These valves were last overhauled in Fall 2016 and are scheduled for the Fall 2022 overhaul under contract with GE. It is recommended that the valve internals are replaced under a planned project due to past experience with repairs and extensive lead time for the parts if found to be damaged. Any parts which are inspected and found to be in reusable condition will be repaired under O&M funds and placed into inventory as spares.
NSP-Minnesota	A.0001574.493	Reliability & Performance	SHC1C Mill OH 2022 Fall	(356,911)	2022	Includes replacement of worn ceramic surfaces, wear liners, classifier vane blade replacements, air inlet vane replacement, RTV, roll to ring adjustment, hardwire weld overlay on floor, replace mill rolls, replace hardox wall liners, replace outlet valve discs, replace door springs, all external repairs, classifier replacement, inverted cone replacement, pyrite area and pyrite hopper repairs, and replacement of pyrite supply valve and jet pump/piping.	Unit 1 has 7 mills whose performance is tracked through operating data (mill motor amps, coal fineness, etc.) to determine the frequency of Level 1, Level 2, and Level 3 overhauls. Typically there are 2-3 Level 2 overhauls per year.
NSP-Minnesota	A.0001574.526	Reliability & Performance	SHC3C Mill OH 2022 Spring	(355,443)	2022	Includes replacement of worn ceramic surfaces, wear liners, classifier vane blade replacements, air inlet vane replacement, RTV, roll to ring adjustment, hardwire weld overlay on Floor, replace mill rolls, replace hardox wall liners, replace outlet valve discs, replace door springs, all external repairs, classifier replacement, inverted cone replacement, pyrite area and pyrite hopper repairs, and replacement of pyrite supply valve and jet pump/piping.	Unit 3 has 7 coal mills whose performance is tracked though operating data (mill motor amps, coal fineness, etc.) to determine the frequency of Level 1, Level 2, and Level 3 overhauls. Typically there are 2-3 Level 2 overhauls per year.
NSP-Minnesota	A.0001573.187	Reliability & Performance	BDS2C Redundant Aux Oil Pump	(353,011)	2022	Installation of a second Aux Oil Pump to provide redundancy in the event of an Aux Oil Pump or Motor failure. This project includes installation of the pump, associated piping and valves, instrumentation, controls, and engineering to perform the project. The pump will be tied into the turbine controls and be controlled in automatic / standby operation in the event of failure of the other pump. The pump will be installed with an AC/DC motor and will provide an emergency source (DC supply) of high pressure oil to the Seal Oil system in the event of a pump failure or power outage while the unit is offline.	The existing Aux Oil Pump is a single point of failure with the current lube oil configuration; if this pump were to fail the unit would not be available until the repairs were performed. This pump is required to provide suction to the turbine driven lube oil pump, so without this pump the unit could not be started. Black Dog 5/2 is a cycling unit which experiences 50 - 100 starts per year, so this is a critical component. Also, this pump will provide additional redundancy to the generator seal oil system, which is required to be pressurized at all times hydrogen is within the generator.
NSP-Minnesota	A.0001574.525	Reliability & Performance	SHC3C Mill OH 2022 Fall	(347,777)	2022	Includes replacement of worn ceramic surfaces, wear liners, classifier vane blade replacements, air inlet vane replacement, RTV, roll to ring adjustment, hardwire weld overlay on Floor, replace mill rolls, replace hardox wall liners, replace outlet valve discs, replace door springs, all external repairs, classifier replacement, inverted cone replacement, pyrite area and pyrite hopper repairs, and replacement of pyrite supply valve and jet pump/piping.	Unit 3 has 7 coal mills whose performance is tracked though operating data (mill motor amps, coal fineness, etc.) to determine the frequency of Level 1, Level 2, and Level 3 overhauls. Typically there are 2-3 Level 2 overhauls per year.
NSP-Minnesota	A.0001580.008	Renewable & New Generation	CWF1-Generator Rplacments	(338,903)	2022	Replace failed generator in Vestas V100 wind turbines. Cost includes the crane and labor to remove the generator and then reinstall it.	High operating temperatures and a high vibration environment have lead to generator failures in the□ industry. Upon failure, the wind turbine can not be run. First quarter 2018 operations cost reduction□ strategy is to accept the risk of these failures as opposed to paying additional for warranty.
NSP-Minnesota	A.0001574.810	Reliability & Performance	SHC3-CESP Turb Control Valves 22604	(324,570)	2022	This project is for the purchase of one SET of spare main turbine control valve assemblies for Unit 3 to use as rotating spares. One set consists of four valves. These valves would be identical to the original GE design. This would be a materials project only. Company would purchase four complete assemblies for Unit 3 to keep on site as CESP and used as rotating spares.	Having a spare set of main turbine control valves would drastically reduce outage duration and O&M costs. The valves could be removed and the steam chest re-fitted with the CESP valves in about a week. Due to shipping times and repair times, it is not uncommon for the main turbine control valve work to become the critical path of an outage. Typically a valve outage can last up to four weeks depending on how much work needs to be done to the control valves. The removed valves would then be sent offsite for repairs at the discretion of the plant during non-peak rates shop time and be back to site and put in stock well in advance of the next valve overhaul. They would also be on site in stock in the event of a forced outage due to a control valve failure. These control valves are currently overhauled every 3 years.
NSP-Minnesota	A.0001573.123	Reliability & Performance	BDS0 - Install U3 Turbine Floor - 23359	(317,038)	2022	Construction of a load bearing concrete floor in the area left over from Unit 3 steam turbine / generator demolition scheduled for year 2021. Project includes materials, labor, engineering, and project management to perform the work. This project is scheduled to be performed before the Fall 2022 overhaul which currently includes U2 STG major overhaul and U5 HGP overhaul to have additional floor space for the outage.	Following the Unit 3 steam turbine / generator demolition in 2021 there will be a large opening in the turbine floor which either requires permanent handrail to be installed or a permanent floor to be installed. Installation of additional floor space is preferred to provide valuable equipment laydown areas during overhaul activities. During previous overhauls some equipment had to be stored outdoors which is not recommended due to corrosion and FME concerns with outdoor storage. Construction of additional floor space in this location is ideal since it is located between Unit 5/2 and newly constructed Unit 6 and will provide a good laydown space for all three units, reducing outage costs and duration, and preventing outdoor storage of exposed equipment and associated concerns.
NSP-Minnesota	A.0001565.500	Reliability & Performance	WLM Emergent Fund -Steam prod	(314,799)	2022	This fund covers unexpected equipment failures and discovery issues from overhaul inspections.	Emergent work for unexpected and unplanned equipment failures.

Company Descr	Project ID	New Grandparent	Project Name	YE Amt	Activity Year	Project Description	Project Justification
NSP-Minnesota	A.0001574.491	Reliability & Performance	SHC1C Mill 2022 Spring	(309,183)	2022	Includes replacement of worn ceramic surfaces, wear liners, classifier vane blade replacements, air inlet vane replacement, RTV, roll to ring adjustment, hardwire weld overlay on floor, replace mill rolls, replace hardox wall liners, replace outlet valve discs, replace door springs, all external repairs, classifier replacement, inverted cone replacement, pyrite area and pyrite hopper repairs, and replacement of pyrite supply valve and jet pump/piping.	Unit 1 has 7 mills whose performance is tracked through operating data (mill motor amps, coal fineness, etc.) to determine the frequency of Level 1, Level 2, and Level 3 overhauls. Typically there are 2-3 Level 2 overhauls per year.
NSP-Minnesota	A.0001574.802	Reliability & Performance	SHC2-Level 2 Mill OH 2022 Spring 15910	(309,183)	2022	Includes replacement of worn ceramic surfaces, wear liners, classifier vane blade replacements, air inlet vane replacement, RTV, roll to ring adjustment, hardwire weld overlay on floor, replace mill rolls, replace hardox wall liners, replace outlet valve discs, replace door springs, all external repairs, classifier replacement, inverted cone replacement, pyrite area and pyrite hopper repairs, and replacement of pyrite supply valve and jet pump/piping.	Unit 2 has 7 mills whose performance is tracked through operating data (mill motor amps, coal fineness, etc.) to determine the frequency of Level 1, Level 2, and Level 3 overhauls. Typically there are 2-3 Level 2 overhauls per year.
NSP-Minnesota	A.0001579.064	Reliability & Performance	RIV7C 61 & 62 Transformers Rep	(305,921)	2022	61 and 62 Transformers are original equipment and manufactured in 1986. These 2 transformers were not replaced during the MERP project when Riverside was converted from coal to natural gas. Project involves replacing these two dry type transformers.	The existing transformers are 1000kVA and do not have cooling fans installed. The transformers do not allow for much additional capacity. Transformers have an expected life expectancy of 30-40 years. These transformers were manufactured in 1986 and exceeded 30 years of life in 2016.
NSP-Minnesota	A.0001562.149	Reliability & Performance	REW1C-REW1 - Replace U1 Superheater	(303,173)	2022	This project would replace all 37 pendants (all 592 tubes) in Unit 1 superheater.	NDE inspections indicate extensive wall thinning in the area identified for replacement. Tube leaks occur frequently which increases lost burn revenue and increases safety risk. History shows a 5 year replacement cycle is ideal to minimize O&M expenditures and forced outages.
NSP-Minnesota	A.0001562.135	Environmental Compliance	REW0C Repl Baghouse Controls	(302,775)	2022	Replace Baghouse Allen Bradley Controls to combine the baghouse and scrubber controls to a single processor for each unit for simplification and improved physical layout. This project should be completed in conjunction with the REW0-Replace Duct Scrubber Controls project as they go hand-in-hand.	These Allen Bradley controls are obsolete and parts are becoming less and less available. It is unknown exactly when in the next several years these controls will fail beyond the point of repair. When that event does occur, it will require an immediate forced outage that the company estimates will last 16 weeks.
NSP-Minnesota	A.0001562.007	Reliability & Performance	REW0613-Condenser Retube	(301,967)	2022	This project will return the condenser to original design by replacing the Unit 1 Condenser tubes with Cupro Nickel tubes.	Retubing U1 condenser to the original Cupro Nickel tubes will increase heat transfer rate and standardize the units. Stainless steel tubes are currently installed in Unit 1 Condenser. When stainless steel tubes were placed in the condenser the design heat transfer rate of the condenser was affected resulting in a 1.5MW loss.
NSP-Minnesota	A.0003000.682	Reliability & Performance	SHCJC Tools and Equip pur	(296,000)	2022	SHC0122 - Miscellaneous tools and equipment as listed. All individual tools to be >$1000 and meet definitions for general plant equipment. Total budget is defined as joint common, but individual tools are defined with the associated JDE child purchase work order. AA $30,000 High Speed Recorder $30,000 Hg CEMS calibration/standard $80,000	Improve capability and efficiency of daily operations maintenance tasks.
NSP-Minnesota	A.0001562.500	Reliability & Performance	REW Emergent Fund -Steam prod	(295,872)	2022	This fund covers unexpected equipment failures and discovery issues from overhaul inspections.	Emergent work for unexpected and unplanned equipment failures.
NSP-Minnesota	A.0001572.251	Environmental Compliance	ASK1-11&12 Travel Water Screen - 23631	(276,344)	2022	Rebuild Complete Rotating Assembly for King Plant #11 & #12 Traveling Water Screens. Complete Rotating Assembly rebuild includes: Head shaft Assembly (torque tube), Foot Shaft Assembly, Bearings, Chain, Chain Guides, Basket Plates, Hardware, etc.	Rebuild Complete Rotating Assembly for Traveling Water Screens required every 5 years to maintain reliability. Permit required for plant operation. #11 & #12 Traveling Water Screens last rebuilt in spring 2017.
NSP-Minnesota	A.0001571.500	Reliability & Performance	ANS Emergent Fund -Other prod	(274,665)	2022	This fund covers unexpected equipment failures and discovery issues from overhaul inspections.	Emergent work for unexpected and unplanned equipment failures.
NSP-Minnesota	A.0001565.117	Reliability & Performance	WLM1C Replace U1 Gratebed 2018	(260,941)	2022	WLM0518 - Replace U1 gratebed	Bars and chain were replaced in 2008 to prolong life without having to replace entire conveyor. Previous frequency of complete change out was every 5 years. Since bars and chain were replaced in 2008 we were able to extend life by another 5 years until a complete replacement.
NSP-Minnesota	A.0001565.124	Environmental Compliance	WLM2C Replace U2 Baghouse Bag	(252,461)	2022	Replace six modules (1260 total) of baghouse bags.	Permit required to meet opacity standards. Bags are on a four year frequency to be changed out. The bags were on a six plus year changeout in the past but it was determined that changing out the bags more frequently saves on material loss on boiler tubes. It has been determined that after four years the bags begin to blind/plug and no longer allow enough air flow to operate the units at their full potential. Because of the plugged bags the air flow through the unit is decreased causing a high differential pressure reducing load capability and allowing the flue gas to consume more of the tube material throughout the boiler.
NSP-Minnesota	A.0001562.039	Environmental Compliance	REW0 - EPA 316b-Svc Water Pumps - 23725	(250,068)	2022	Two new redundant 75hp Screen House service water pumps will be installed to ensure an adequate flow of water through the screen house and to the plant. The main functionality of these pumps will be to aid in the correct flow of water through the traveling screens to maximize their effectiveness & ensure EPA 316b compliance.	This is a mandated environmental project by the MPCA to ensure we are compliant with EPA regulation 316(b) of the Clean Water Act. Section 316(b) requires that National Pollutant Discharge Elimination System permits be obtained by any facility that contains a cooling water intake structure to ensure that the engineering design of the structure minimizes harmful impacts on the environment.
NSP-Minnesota	A.0001572.236	Environmental Compliance	ASK1C-Econ Outlet Exp Joint	(247,170)	2022	Replace economizer outlet flue gas expansion joint with fabric expansion joint on the north side. The existing joint is 27-1/2' x 21-1/2' in area. The joint was last replaced during the MERP project in 2007 and has torn during normal operation.□ □ The south expansion will be replaced during Spring 2014 outage.	Replace Economizer Outlet fabric expansion joint. There are holes starting to form in this existing joint. As the boiler fouls between spring overhaul cleanings, this joint temperature can be limiting on load. Leakage thru this expansion joint affects O2 sensors and emission controls (primarily the NOx analyzer).□ Reference existing Maximo WO #5201473.
NSP-Minnesota	A.0001574.172	Reliability & Performance	SHCCC 2022 Small Project routi	(229,590)	2022	Labor and materials that are categorized as capital expenditures. Must meet capitalization criteria categories and include material costs greater than $2,500, but total cost less than $50,000.	These are small projects such as valve replacement, motors, etc. that have failed during plant operation.
NSP-Minnesota	A.0001573.117	Reliability & Performance	BDS2C Water Induction Monitor	(218,697)	2022	Installation of a water induction monitoring system to alert operations if the Unit 2 steam turbine experiences water induction. This includes instrumentation, wiring, conduit, and associated controls work to implement the system for one HP steam and two LP steam turbine drain connections.	The Unit 2 steam turbine does not currently have any water induction detection equipment. Improper operation of steam turbine drains and other issues can cause water induction which can lead to distortion and misalignment of the turbine casing, increasing the risk of rubs, damaged bearings or seals, water induced erosion, or similar issues. Water induction detection systems are standard with current steam turbine technology.
NSP-Minnesota	A.0001579.016	Reliability & Performance	RIV7C-U7 Turbine Roof Replace	(215,579)	2022	Replace roof over Unit 7 Steam Turbine.	Roof is showing increasing signs of leakage as evident by accumulating puddles on the turbine floor. Puddles present tripping hazards, and leakage is debilitating to roof's integrity.
NSP-Minnesota	A.0001573.186	Reliability & Performance	BDS2C Redundant LO Vapor Extractor	(212,069)	2022	Replace the existing 60 year old U2 lube oil vapor extractor with a dual 100% redundant vapor extractor system. This will consist of dual motors and blowers with an in-tank separator and connections with isolation capabilities to existing oil tank, exhaust and water drain lines. The extractor system will be tied into the turbine controls and be controlled in automatic / standby operation in the event of failure of the other extractor.	The existing vapor extractor is 60 years old and wearing out, a single point of failure with the current lube oil configuration; if this extractor were to fail the unit would not be available until the repairs were performed. Failure of the vapor extractor could cause our lube oil to leak at the bearings which would saturate the insulation and could cause a fire and significant turbine damage and pose a personnel safety hazard. Replacement parts are no longer available, OEM & and outage contractors in 2010 and 2016 have suggested replacement.
NSP-Minnesota	A.0001565.068	Environmental Compliance	WLM1C U1 Replace Baghouse Wiri	(207,146)	2022	Replace Baghouse control, instrumentation, and power wiring.	Baghouse wiring has decayed due to heat and vibration. We have had opacity exceedances in past years (2-3-09, 11-24-13, and 6-6-14) and boiler run backs that are traced back to faulty wiring. The wiring design is not optimal (neutrals pig tailed together for example) which has caused maintenance issues when there is repair work required.
NSP-Minnesota	A.0001565.069	Environmental Compliance	WLM2C U2 Replace Baghouse Wiri	(207,146)	2022	Replace Baghouse control, instrumentation, and power wiring.	Baghouse wiring has decayed due to heat and vibration. We have had opacity exceedances in past years (2-3-09, 11-24-13, and 6-6-14) and boiler run backs that are traced back to faulty wiring. The wiring design is not optimal (neutrals pig tailed together for example) which has caused maintenance issues when there is repair work required.
NSP-Minnesota	A.0001574.682	Reliability & Performance	SHCJC 3, 4 Xshr Fdr Floor Resto	(198,814)	2022	The floor is not designed for constant washdowns. The floor used to be grating that was open. Then the grating was capped with metal sheeting and the bottom was sprayed with partical insulation. The insulation, grating and sheeting has become packed with moisture and coal over the years, and is never completely cleaned or dried out. The floor needs to be redesigned for water washdown, and the structural members need to be repaired or replaced.	Safety - After 30 years of washing the floor has gone unchecked for corrosion. The structural integrity of this floor is weakened and this needs to be addressed.
NSP-Minnesota	A.0003000.699	Reliability & Performance	SER-SMC-Misc Tools & Equipment	(192,000)	2022	Purchase tools and equipment to support outages, projects and routine maintenance work performed by Special Construction. Included, but not all inclusive: Safety equipment, small tools, shop equipment and specialized tools.	Tool replacements are needed as tools come to end of life and are no longer cost effective to repair.□ □ The plants and facilities utilize Special Construction to supplement outages, projects and routine maintenance work at their sites. The sites typically do not have the tools and equipment necessary to complete the work that is performed by Special Construction. The expectation is that our department will bring the necessary resources to complete the work. The tools and equipment will be housed in a central location and rotated from site to site.
NSP-Minnesota	A.0001574.174	Reliability & Performance	SHCJC 2022 Small Project routi	(183,681)	2022	Labor and materials that are categorized as capital expenditures. Must meet capitalization criteria categories and include material costs greater than $2,500, but total cost less than $50,000.	These are small projects such as valve replacement, motors, etc that have failed during plant operation.
NSP-Minnesota	A.0001574.801	Reliability & Performance	SHC3-Landfl Mtnc Grg Lim Rcv HVAC PLC	(183,668)	2022	Replace the Lime Receiving HVAC, and the Landfill Maintenance Garage HVAC PLC systems.	These PLC's are unsupported SquareD systems. Troubleshooting these devices are very difficult, and can take a lot of time due to cryptic, outdated error codes. The hardware is also unsupported, so buying new components is impossible. We are forced to keep used inventory on-site in case failures occur.
NSP-Minnesota	A.0001562.139	Reliability & Performance	REW2C Repl U2 Trvlg Gate Bed	(176,275)	2022	Replace the complete grate bed (includes grate bars, rails, and sprockets) during the February 2020 overhaul. This is on a 5 year replacement schedule. Material would be ordered in 2019 for installation in early 2020.	Current grates have holes, and the rails and sprockets are showing severe wear. As the grates wear out they jam more frequently. This immediately stops the throughput of RDF and 50% of the time causes a shut-down of the boiler to repair for 1-2 days. From an environmental standpoint, the excess holes in the grating affect the boiler airflowand combustion, which results in higher CO emissions.
NSP-Minnesota	A.0001574.537	Environmental Compliance	SHC3C-Limestone RR track	(173,397)	2022	Replace Limestone RR track bed. New Ties and Ballast are needed. This will go from East side of Limestone building all the way north to the last crossing. The track on sides of the Limestone Building and continuing north 670' were identified for a 2013 project; however, the work was not completed. This project would pick the 2013 proposed project back up and add approximately 2500' of track in order to repair the entire length of the Limestone track.	Safety, Plant personal can possibly be injured if we derail a train. Contractors have the potential to get injured while re-railing the train as well.□ RR failure can cause delays in Limestone deliveries. This can lead to higher prices to ship by truck, or derate on U3 if limestone trains are delayed. The existing track is over 25 years old and is becoming more susceptible to failure due to worn/rotten ties and poor drainage.
NSP-Minnesota	A.0001574.803	Environmental Compliance	SHC3-Haul Road 2022 15792	(171,402)	2022	Overlay 25% of Landfill Haul Road.	Haul road in poor repair is a major safety hazard and causes considerable damage to heavy equipment.

Company Descr	Project ID	New Grandparent	Project Name	YE Amt	Activity Year	Project Description	Project Justification
NSP-Minnesota	A.0001562.136	Reliability & Performance	REW0C C9 Internal Repl	(168,923)	2022	C9 Conveyor Internals - Replace internals such as flights, chain, sprockets, idlers, and hardware.	Valves leak and need replacing of the internals.
NSP-Minnesota	A.0001573.225	Reliability & Performance	BDS5 - Rplc U5 Duct Burner PLC - 23400	(165,197)	2022	Replacement of existing U5 duct burner PLC controls with new Emerson Ovation controls. Project includes necessary equipment, instrumentation, wiring, conduit, labor, and engineering to perform the work.	The existing U5 duct burner PLC controls are 2002 vintage and nearing end of life. There have been times where the duct burners have tripped and a fault code is not displayed on the PLC, indicating a PLC hardware issue was the cause. This most recently occurred in July 2018 and nearly caused Unit 5/2 to trip on high drum level from the load swing after the duct burners tripped. The existing duct burner PLC does not have a data historian so troubleshooting efforts are limited. If not replaced, the duct burner PLC will become an increasing reliability risk. Replacing with Emerson Ovation DCS controls will result in more reliable operation with easier troubleshooting and maintenance, and the ability to more seamlessly integrate duct burner controls into AGC operation per marketing request.
NSP-Minnesota	A.0001573.128	Reliability & Performance	BDS5C CT Expansion Joint	(161,771)	2022	Perform complete replacement of Unit 5 Combustion Turbine Exhaust Expansion Joint. This includes labor and materials to perform a full replacement of the expansion joint.	The combustion turbine exhaust expansion joint is a critical component subject to severe duty. If the joint should fail, 1100F exhaust gases would escape the combustion turbine exhaust into the plant. The original expansion joint furnished with the combustion turbine in 2002 required replacement in December 2003. The first replacement expansion joint was of better quality than the original, and was replaced in 2012 when the Siemens single piece exhaust was installed. This current expansion joint may need to be replaced during the Hot Gas Path Inspection, currently scheduled for 2018.
NSP-Minnesota	A.0001574.200	Reliability & Performance	SHC1C #13 Boiler FeedPump Over	(159,236)	2022	Overhaul Boiler Feed Pump Estimates: $100,000- Pump $3,000- Potential seal face renewal $6,000- Electrical $65,000- Maintenance $174,000- Total	Pump overhauls should be done on a 9 year interval.
NSP-Minnesota	A.0001574.687	Reliability & Performance	SHCJC 3A Gate to 4A-B Upgrade	(157,096)	2022	Upgrade 3A to 4A/B diverter gate to a splitter gate. Design needs to eliminate coal build up around the gate inside the chute work. This will involve upgrading the housing/chute work section, gate, and actuator.	Safety: the proposed expenditure would eliminate the need for employees to have to blow, pry, chip, and clean out the gate to remove clogged-up coal. Redundancy: the proposed expenditure would eliminate the need to run the redundant path to help with blending. Blending: the proposed expenditure would allow running of more coal to the 4 belts because there would be 2 paths to supply coal to.
NSP-Minnesota	A.0003000.658	Reliability & Performance	ASK0C- Tool Blanket	(150,000)	2022	Tool blanket for 2022 for miscellaneous tools needed to support plant core operations.	Ensure necessary tools continue to be available to support plant core operations.
NSP-Minnesota	A.0001562.051	Reliability & Performance	REW1C REPLACE U1 TRAVELING GRA	(141,706)	2022	REW1315 - Replace the complete grate bed (includes grate bars, rails, and sprockets) during the February 2016 overhaul. This is on a 5 year replacement schedule. Material would be ordered in 2015 for installation in early 2016.	Current grates have holes, and the rails and sprockets are showing severe wear. As the grates wear out they jam more frequently. This immediately stops the throughput of RDF and 50% of the time causes a shut-down of the boiler to repair for 1-2 days. From an environmental standpoint, the excess holes in the grating effect the boiler airflow and combustion, which results in higher CO emissions.
NSP-Minnesota	A.0001565.120	Reliability & Performance	WLM1C Replace U1 B11 Screw Auger 21	(140,567)	2022	Replace U1 B11 Screw Auger 21	Replace U1 B11 Screw Auger 21
NSP-Minnesota	A.0001574.306	Reliability & Performance	SHC99-CESP 2022 #1 CC Rotor Asmbl-23370	(132,287)	2022	Change out the rotating hammer assembly with CESP rotor Assembly on Sherco #1 Coal Crusher. Also change out worn / thin cage pieces, and wear plating inside the crusher.	Crusher is worn out and cannot provide a consistent coal fineness to the plant. This in turn effects the efficiency of the burning of the coal in the plant.
NSP-Minnesota	A.0001565.059	Reliability & Performance	WLM2-Replace U2 B21 Screw Auge	(131,066)	2022	Replace U2 B21 Screw Auger 19	Replace U2 B21 Screw Auger 19
NSP-Minnesota	A.0001565.123	Reliability & Performance	WLM2C Replace U2 B22 Screw Auger 20	(130,570)	2022	Replace U2 B22 Screw Auger 20	Replace U2 B22 Screw Auger 20
NSP-Minnesota	A.0001580.009	Renewable & New Generation	CWF1-Transformer Replacements	(123,559)	2022	Replace failed transformer in Vestas V100 wind turbines. Cost includes the crane and labor to remove the transformer and then reinstall it.	Upon failure, the wind turbine can not be run. First quarter 2018 operations cost reduction strategy is to accept the risk of these failures as opposed to paying additional for warranty.
NSP-Minnesota	A.0001611.011	Renewable & New Generation	PVW1-Transformer Replacements	(123,237)	2022	Replace failed transformer in Vestas V100 wind turbines. Cost includes the crane and labor to remove the generator and then reinstall it.	Upon failure, the wind turbine cannot be run. First quarter 2018 operations cost reduction strategy is to accept the risk of these failures as opposed to paying additional for warranty.
NSP-Minnesota	A.0001611.010	Renewable & New Generation	PVW1-Generator Replacements	(113,185)	2022	Replace failed generator in Vestas V100 wind turbines. Cost includes the crane and labor to remove the generator and then reinstall it.	High operating temperatures and a high vibration environment have led to generator failures in the industry. Upon failure, the wind turbine can not be run. First quarter 2018 operations cost reduction strategy is to accept the risk of these failures as opposed to paying additional for warranty.
NSP-Minnesota	A.0001574.463	Reliability & Performance	SHC3-U3 Stock Fdr Speed repl	(103,352)	2022	Replace the original feeder speed controls for 8 of the 10 Stock coal feeders on Unit 3. Two feeders have already had their speed controls replaced several years ago. They were our pilot tests for the Stock Feeder control conversion. The remaining 8 feeder controls have been in-service since 1987.	Legacy equipment that is not supported anymore by Stock Feeder Corp. We are currently using the parts from the Unit 1 feeders after they were upgraded in 2012.
NSP-Minnesota	A.0003000.698	Reliability & Performance	SER-CHM-Misc Tools-MN	(101,900)	2022	Purchase of Miscellaneous Tools/Laboratory Instrumentation	These tools are used for analysis of water to monitor and control corrosion and scaling in power plants and to comply with monitoring requirements for NPDES and Solid Waste Permits. Chemistry Resources functions as a non-profit in-house general laboratory for Xcel Energy. It provides analyses for mandatory regulatory monitoring programs and for operational and maintenance activities in the plants. All of its tools are used throughout Energy Supply's Minnesota fleet as well as backup support for Denver and Amarillo labs. Outside contractors have profit margins built into their costs to purchase tools. Plants have overhead budgets to purchase tools. Chemistry Resources has neither. Our only means of obtaining the tools necessary to perform the work is through the plants or capital. Having tools for the central Chemistry Resources lab is more cost effective than having identical sets of tools at each plant.
NSP-Minnesota	A.0001573.207	Reliability & Performance	BDS2C-Install Lube Oil Trip Manifold	(89,624)	2022	Install a Pressure Status Manifold and redundant pressure transmitters to implement the lube oil pressure Turbine trip at Black Dog Unit 2. This project includes all Emerson DCS hardware and software and logic and HMI screen updates for the new equipment, instruments, and any digital and analog Inputs and Outputs accordingly. This project also includes all wiring and power protection for the new equipment.	The lube oil pressure trip is a critical trip for plant equipment protection. The installation of a Pressure Status Manifold (PMS) including a three transmitter and 2/3 transmitter logic configuration would ensure this critical trip is implemented in a reliable and fault-tolerant manner. The current lube oil pressure trips are 1 out of 1 logic, meaning a single component failure could result in a spurious trip or the loss of the automatic trip function.
NSP-Minnesota	A.0003000.697	Reliability & Performance	SER-MMR- Misc Tools & Equip	(86,630)	2022	Miscellaneous tools for plant overhauls	These tools are used for plant overhauls and troubleshooting equipment problems.
NSP-Minnesota	A.0001574.305	Environmental Compliance	SHC0-Rplc DS Pmp House Pipe vlv'22-23438	(85,858)	2022	Replace piping and valving in the Dust Suppression pump house by the recycle basin. Inspect piping for holes and thinning, and confer with Ops re problem valves.	Environmental - DS water is used for majority of dust control in the coal yard. Piping is corroded and valving is reported to not be working properly.
NSP-Minnesota	A.0001562.116	Reliability & Performance	REW2C REPLACE U2 FUEL CHUTES 2	(85,608)	2022	New chutes for unit 2 and refractory	New chutes for unit 2 and refractory
NSP-Minnesota	A.0001579.115	Environmental Compliance	RIV0-U0 Install CEMS power red	(79,328)	2022	This project will install a redundant power feed to the Continuous Emissions Monitoring System (CEMS) and install a local UPS source to the main computer.	The Continuous Emissions Monitoring System (CEMS) is required to operate reliably for environmental monitoring and reporting and to reduce unit emissions. It was discovered during an environmental vulnerability assessment that one major vulnerability is that the CEMS system has only one power source with very short and limited backup power.
NSP-Minnesota	A.0001579.135	Reliability & Performance	RIV0C 62 Battery Replace	(77,535)	2022	Replace Riverside 62 Battery	Station batteries have a limited operational life. This battery is expected to reach its end of life around 2023.
NSP-Minnesota	A.0001574.358	Reliability & Performance	SHC1C North Blr Bldg Roof Repl	(75,487)	2022	Removal of the existing roofing system and install a new roofing system over the Level 10 North boiler building for unit 1 (6000 sf), the Level 10 North boiler building over unit 2, (5200 SF), the Conveyor bridge connecting unit 1 and 2 (2700 SF), and the scrubber building bridge connecting unit 1 and 2 (2700 SF). The infrastructure will be assessed at the time of the tear off and removal of the existing system.	The roofing systems are past their normal life cycle and are leaking as a result of rain and snow melting. The maintenance costs are increasing each year. A new roofing system will reduce/eliminate leaks and will include a 20 yr warranty.
NSP-Minnesota	A.0001574.769	Reliability & Performance	SHC3C CR HVAC PLC 2nd Flr Replace	(69,984)	2022	Replace the PLC, remote panels, damper actuators and other instruments as needed. Work could be done during an outage or in spring or fall moderate temperatures.	The existing equipment is obsolete and repairs are becoming difficult or not possible. Higher temperatures could have an adverse effect on control room equipment.
NSP-Minnesota	A.0001573.221	Reliability & Performance	BDS2 -Ovhl #21 Cndnsr Vcm Pump - 23675	(69,297)	2022	Overhaul the Unit 2 No. 21 Condenser Vacuum Pump. Disassemble the pump, inspect, replace components as necessary. Condenser vacuum pumps have been in service since 2015, and this overhaul will be the first done on the pump. This project assumes that the complete rotating assembly, or the complete stationary assembly, or both, will be replaced.	The Unit 2 condenser liquid ring vacuum pumps require periodic overhaul. The overhaul could be capital if either the complete rotating assembly, or the complete stationary assembly, or both, require replacement. Unit 2 has two 100% redundant condenser vacuum pumps, but both are used during startups, to remove larger volumes of air from the steam side of the condenser. Without both pumps in service, Unit 2 startups will take longer.
NSP-Minnesota	A.0001573.222	Reliability & Performance	BDS2 - Ovhl #22 Cndnsr Vcm Pump - 23676	(69,297)	2022	Overhaul the Unit 2 No. 22 Condenser Vacuum Pump. Disassemble the pump, inspect, replace components as necessary.	The Unit 2 condenser liquid ring vacuum pumps require periodic overhaul. The overhaul could be capital if either the complete rotating assembly, or the complete stationary assembly, or both, require replacement. Unit 2 has two 100% redundant condenser vacuum pumps, but both are used during startups, to remove larger volumes of air from the steam side of the condenser. Without both pumps in service, Unit 2 startups will take longer.
NSP-Minnesota	A.0001573.227	Reliability & Performance	BDS0 -Process Net Virtualization -23559	(69,173)	2022	Purchase and install hardware/software for a virtualized server environment that can be used to host the Black Dog Process Network services once the existing hardware/software reaches end of useful life.	The One Metro Plant upgrade plan for the various process network systems at the plant (System One, Annunciator System, SKF, etc.) consists in large part of a move to a virtualized server environment. Moving to a virtualized environment provides benefits in the areas of hardware independence/flexibility, lower costs (lower number of server class machines needed), ease of maintenance/management, fully functional backup capabilities, and disaster recovery. (Note: Initial estimated cost is based on a 2018 proposal from the One Metro Plant Controls Engineer.)

Company Descr	Project ID	New Grandparent	Project Name	YE Amt	Activity Year	Project Description	Project Justification
NSP-Minnesota	A.0001579.017	Reliability & Performance	RIV7C-71 UPS Battery Replaceme	(68,679)	2022	Replace 71 UPS back up batteries	Batteries provide backup power for generator and breaker DC controls and alarms. Battery capacity test to be performed in 2015 - this will provide insight into criticality of battery replacement.
NSP-Minnesota	A.0001574.805	Reliability & Performance	SHC0-Coal conveyor F.P. 20631	(63,980)	2022	Recommended for replacement from All Risk Loss Prevention Report for Sherco, Recommendation SHC P 06-11.	Currently, these conveyors are sprinkler protected except for the enclosed portions indicated above. If a fire occurs on these conveyors inside the enclosures, there would be no sprinkler protection to control it until the fire exited the enclosure, which would result in greater damage than would otherwise occur. Therefore, this protection should be installed. Reference NFPA 850, Section 7.4. The Loss Expectancy associated with this condition is estimated at $5,000,000. The estimated cost to complete is $75,000.
NSP-Minnesota	A.0001579.087	Reliability & Performance	RIV0C --Replace 60 EWS Battery	(61,924)	2022	Replace Riverside 60 EWS Station Battery	Station Batteries have a limited operational life, this battery is expected to reach it's end of life around 2019.
NSP-Minnesota	A.0003000.679	Reliability & Performance	RIV0C-Tool Blanket	(60,000)	2022	Miscellaneous tools and equipment as needed for continued maintenance of the Riverside plant. This may include small tool replacements, electrical tools, maintenance and shop equipment, and Instrumentation / Controls tools.	Improved maintenance, improvements, and operation of the plant. Tool replacements are done when needed or broken.
NSP-Minnesota	A.0003000.578	Reliability & Performance	SER0C MMR Video Probe 2022	(55,000)	2022	MMR-Replace Video Probe iPLEX	MMR-Replace Video Probe iPLEX
NSP-Minnesota	A.0001574.688	Reliability & Performance	SHCJC Rpl #1 RR Track	(50,076)	2022	Replace rail and ties along the straight away by the pocket. There are spots with very heavy wear. Most of this track is original to the plant. Replace rail to ribbon rail 115# rail on #1 track. This project will replace 3000 lineal feet of track (6000 feet of rail). Redo ties as needed, fill dress and tamp ballast as needed. The work scope starts the end of the new ribbon rail just north of the overpass road and going north 3000 feet. Plan to reuse frogs, switches and ballast.	Safety: worn tracks can cause a train to derail and hurt personnel and/or equipment.
NSP-Minnesota	A.0001574.731	Reliability & Performance	SHC0C Fuel Oil Pump F.P.	(50,000)	2022	From 2014 All Risk Loss Prevention Report for Sherco, Recommendation 06-15: Install automatic sprinkler protection over the fuel oil pumps in the Auxiliary Boiler Building designed for 0.25 GPM/ft2 over a design area of 3,000 ft2 with a 250 GPM hose stream allowance.	There are four fuel oil pumps in this room. Two of them supply the Auxiliary Boiler and are seldom used. The other two supply fuel oil to the Unit 1 and 2 boilers for ignition and are used in the coal mill starting process. If a leak should occur around these pumps, there is the potential for the leak to become ignited starting a fire. Since there is no sprinkler protection in this area, such a fire could spread throughout the Administration areas destroying this portion of the Main Building. It could also spread outside the room to the turbine under deck mezzanine area and lower boiler areas, doing damage to the Unit 1 turbine generator and boiler. There is sprinkler protection in the turbine under deck area and, although there are no sprinklers in the boiler area and combustibles are limited, so a fire could burn out or be manually controlled at this point. However, there could still be enough damage done to affect Unit 1. Therefore, sprinkler protection is recommended. Reference NFPA 850, Section 7.3.9. The Loss Expectancy associated with this condition is estimated at $40,000,000. The estimated cost to complete is $300,000.
NSP-Minnesota	A.0003000.669	Reliability & Performance	HBC0C HB CC Tool Blanket	(50,000)	2022	Tool blanket to purchase tools more than $1000 each.	Tools needed to adequately perform jobs safely. Existing tools can break or a new tool can do a task better.
NSP-Minnesota	A.0001573.228	Reliability & Performance	BDS0 -Rplc Fire Protection Header -23560	(47,375)	2022	Replace the main 10" Fire Protection header on the West Side of the Turbine Deck.	There have been multiple holes in the fire protection piping that have required patching. The piping is thinning in a never of places. There are also solids (clam shells, etc.) that are apparently entrained in the line that cause issues with the operation of the valves in the line. (Note: Initial Estimate is based on a 2017 estimate from Xcel Special Construction)
NSP-Minnesota	A.0003000.661	Reliability & Performance	BDS0C Tool Blanket	(42,852)	2022	This funding provides for new or replacement tools and equipment for the plant.	The addition and replacement of tools and equipment is necessary to maintain the productivity of the operating and maintenance personnel.
NSP-Minnesota	A.0001565.065	Reliability & Performance	WLM1C C7 & C8 VFD	(42,348)	2022	Install Variable Frequency Drives on the new C7 & C8 conveyors. Per a discussion with plant personnel on 1-29-15, this project will also cover the installation of new VFDs on the plant C3 and C4 conveyors. Our station electricians have received material quotes at $7000 per VFD and about 200 man-hours in labor to install VFDs on all four conveyors. An additional project, WLM-17290, that was created to facilitate installation of new VFDs on C3 and C4 has been cancelled as a result	Install drives to slow down the new conveyors, saving wear and future O&M costs.
NSP-Minnesota	A.0001573.102	Reliability & Performance	BDS0C Office Area Heaters	(41,997)	2022	Install (2) 360,000 BtuH electric boilers for heating hot water loops while plant steam is not in operation. There are (2) separate hot water loops for the area. One loop serves the baseboard radiation, the other serves the hot water coil in the air handler rooftop unit.	The current HVAC in the Engr/Supt office is dependent on the chiller system in the warmer months and depends on the Plant steam heat in the colder months. Due to Units 3&4 retiring, the heating units to be installed will be electric boilers that will operate when the plant steam is not operating during shoulder months of the year.
NSP-Minnesota	A.0001575.171	Reliability & Performance	HBC0 - Rmv & Rplc BFP Spare YR1 -23731	(40,944)	2022	Supervision, labor, and consumables to remove boiler feed pump and install the rotating CESP pump in its place.	Boiler feed pumps are severe duty critical plant equipment. Periodical overhauls are required. Two pumps are currently showing indications of thrust bearing degradation.
NSP-Minnesota	A.0003000.567	Reliability & Performance	SER0C MMR Alloy Analyzer 2022	(38,000)	2022	MMR-Replace Alloy Analyzer 2022	MMR-Replace Alloy Analyzer 2022
NSP-Minnesota	A.0001573.219	Reliability & Performance	BDS0 - Ovhl #51 Closed CW Pump - 23677	(33,908)	2022	Overhaul the No. 51 Closed Cooling Water Pump. This will be the first overhaul of the pump since it was put in service during the Repowering Project in 2002. The CCW pumps are horizontal single stage pumps, and there are two 100% redundant pumps. Assumes that the complete rotating assembly or the complete stationary assembly, or both, will require replacement.	There are two 100% redundant CCW pumps. Should one fail, there would be no redundancy for the operation of the Units 5&2 combined cycle unit.
NSP-Minnesota	A.0001573.220	Reliability & Performance	BDS0 - Ovhl #52 Closed CW Pump - 23678	(33,908)	2022	Overhaul the No. 52 Closed Cooling Water Pump. This will be the first overhaul of the pump since it was put in service during the Repowering Project in 2002. The CCW pumps are horizontal single stage pumps, and there are two 100% redundant pumps. Assumes that the complete rotating assembly or the complete stationary assembly, or both, will require replacement.	There are two 100% redundant CCW pumps. Should one fail, there would be no redundancy for the operation of the Units 5&2 combined cycle unit.
NSP-Minnesota	A.0003000.571	Reliability & Performance	SER0C MMR St Microscope 2022	(33,000)	2022	MMR-ReplaceStereo microscope 2022	MMR-ReplaceStereo microscope 2022
NSP-Minnesota	A.0003000.707	Reliability & Performance	C100C CSC Aerosol Can Crusher	(32,180)	2022	Replace existing aerosol can crusher.	Aerosol can crusher - our operating experience with three previous aerosol can crushers indicate that they last three years. The existing crusher was installed in 2003. The manufacturer of the current crusher believes the service life under our operating conditions should be at least 5 years; that is two years longer than our experience with other designs. Crushers have complex linkages and controls and closedtolerances which become more problematic as the equipment ages, resulting in improper cycling of the equipment, jams, and miss cycles of the hydraulic ram causing equipment damage. Environmental conditions for this equipment are relatively harsh with paint spray, wedged can parts, and high hydraulic forces. Once the machine becomes excessively worn, repairs become frequent and out of service times longer. Because of the relatively high payback from operating the aerosol can crusher and the storage limits for flammable liquids at the HWSF when the equipment becomes inoperative it is very important to repair or replace quickly. Because of recent changes in the facility's processes the life of this equipment has been extended. As of early 2011, the current can crusher is working better than previous models and is expected to last into 2016. Consequently, I believe replacement for the existing can crusher can be extended until 2016.
NSP-Minnesota	A.0001559.108	Reliability & Performance	BLL0C 78 LV BKR Buy - 2021	(31,331)	2022	Buy 2 replacement breakers for the Units 7/8 480-V switchgear.	The protective relays on the existing breakers are no longer supported by the OEM. Relay failure requires new breaker. Additionally, the cost to refurbish breakers at about the 15-yr point costs about 75% of buying new and doesn't address the relay issue above.
NSP-Minnesota	A.0001579.073	Reliability & Performance	RIV0C -- Replace 61 Battery	(30,538)	2022	Replace Riverside 61 Battery	Station batteries have a limited operational life. This battery was expected to reach its end of life around 2016. This battery is a non-NERC PRC-004 battery but provides back-up power to emergency lighting on the Unit 7 side of the Riverside Power Plant.
NSP-Minnesota	A.0001559.500	Reliability & Performance	BLL Emergent Fund -Other prod	(29,973)	2022	This fund covers unexpected equipment failures and discovery issues from overhaul inspections.	Emergent work for unexpected and unplanned equipment failures.
NSP-Minnesota	A.0001561.500	Reliability & Performance	IVH Emergent Fund -Other prod	(25,086)	2022	This fund covers unexpected equipment failures and discovery issues from overhaul inspections.	Emergent work for unexpected and unplanned equipment failures.
NSP-Minnesota	A.0003000.214	Reliability & Performance	C100C PMO Tool Blanket-New	(25,000)	2022	Purchase thermocouple calibration oven and SPRTs to support thermocouple calibration.	This will replace existing equipment that will be getting old and inoperable.
NSP-Minnesota	A.0003000.563	Reliability & Performance	SER0C CSC Drum Packer Crusher	(21,000)	2022	Replace existing drum packer/crusher.	The existing drum packer/crusher was purchased in 1987 and has been in service since the inception of the Hazardous Waste Storage Facility. It is used primarily for crushing metal 55-gallon drums (and occasionally other sizes) and for compacting empty containers inside of 55-gallon drums, which significantly reduce waste volume (e.g., PCB contaminated drums can be crushed and palletized to reduce storage space & transport space, in turn reducing transportation costs). Minor repairs have been made to the lever that controls the up and down motion. Eventually, it is anticipated that this unit will fail due to the age of the equipment. The exact service life of this piece of equipment is unknown, but has been estimated to be 15 years. The existing crusher does not have the ability to crush overpack drums. It also has removable plates to go from packing of materials to crushing of drums. The plates are held in place by 3 bolts. Handling and positioning of the plates presents both lifting and other ergonomic concerns. The existing model can also operate with the front door open, which presents additional safety concerns. New models have the capability of crushing overpacks (85-gal capacity drums). An emergency stop button shuts off all power at a touch. A safety interlock automatically shuts off the hydraulic power when the door is not completely closed. A universal head can be used for either compacting or crushing eliminating the step of removing one of the plates. A piercer on this plate vents closed drums through the squeeze head.
NSP-Minnesota	A.0003000.657	Reliability & Performance	ANS0C Tools and Equip Ca	(20,000)	2022	ANS0122 - Replace toolboxes, chain hoists, misc tools, and test equipment ($20k)	Improve work force efficiency and safety. Upgrade and replace old equipment.

Company Descr	Project ID	New Grandparent	Project Name	YE Amt	Activity Year	Project Description	Project Justification
NSP-Minnesota	A.0003000.672	Reliability & Performance	IVH0C Misc tools and Equip	(20,000)	2022	Replace toolboxes, chain hoists, misc tools, and test equipment	Improve work force efficiency and safety.
NSP-Minnesota	A.0003000.676	Renewable & New Generation	NBLCo Misc Tools and Equi	(20,000)	2022	Purchase specialty tools, chain hoists, and test equipment.	Required to maintain the wind farm and improve work force efficiency and safety.
NSP-Minnesota	A.0003000.659	Reliability & Performance	BLL0C Tools Blanket	(20,000)	2022	Replace toolboxes, chain hoists, misc tools, and test equipment ($20k)	Improve work force efficiency and safety. Improve testing capabilities.
NSP-Minnesota	A.0003000.696	Reliability & Performance	SER-RTC-Misc Tools & Equipment	(19,998)	2022	Miscellaneous tools and equipment for the Riverside Training Center.	Many of the machinist tools and equipment are non repairable or out dated. To provide up to date training and also for safety reasons the equipment needs to be replaced.
NSP-Minnesota	A.0003000.568	Reliability & Performance	SER0C MMR Digital System 2022	(18,000)	2022	MMR-microscope digital system 2022	MMR-microscope digital system 2022
NSP-Minnesota	A.0003000.671	Reliability & Performance	HNIC0 Misc Tools and Equ	(15,000)	2022	Blanket for miscellaneous tools. These tools will be used for day to day operation and in preparation for the turbine overhauls.	Necessary for continued upkeep of operating facilities.
NSP-Minnesota	A.0003000.680	Reliability & Performance	REW0C Tool Blanket	(15,000)	2022	This project will be used to purchase capital maintenance tools for the 2022 calendar year. Such equipment may include scaffolding, specialized electrical instruments, machining equipment, welding machines, etc.	This project will allow for the site to have on-hand the appropriate tools required for plant personnel to efficiently and safely perform their work tasks. Having the appropriate tools & equipment makes for a safer work environment and reduces the risk of potential industrial safety incidents. Staying current with electrical diagnostic equipment makes for quicker and more accurate troubleshooting of plant equipment.
NSP-Minnesota	A.0001579.089	Reliability & Performance	RIV0C -- Auto Sprklr Prot Oil	(13,000)	2022	Provide and install automatic sprinkler protection in the Unit 7 Oil Storage Room designed to deliver 0.30 gpm/sq. ft. over the area of the room with a 500 gpm hose stream allowance.	This room is approximately 30 ft. x 30 ft. with solid brick walls and concrete floor, roof, and supports. The room contains an 8000 gal. rest lube oil steel tank, two 3000 gal. No. 2 fuel oil steel tanks (used for starting Unit 6 and 7 boilers), one 450 gal. used oil steel tank, and seven 120 gal. steel tanks. Five of these seven tanks contain oil. One has kerosene and the other an unknown solvent. The room has an 18 in. deep containment pit with a capacity of 10,000 gal., and there is a manual water spray system protecting the room. In the event of a fire, it can not be counted on that the manual system will be activated. In such an event, a fire would likely result in the rupture of those tanks not involved that would provide additional fuel to the fire and then spread outside the room into the plant. This room is on the lower level and, although there are some fire barriers on the lower level, such a fire could spread over a wide area causing extensive damage to the facility and equipment. If sprinkler protection were installed in the room, such a fire would likely be controlled to the room and not involve any other tanks other than the one of origination. With the combined cycle conversion project, the two fuel oil tanks will likely be emptied or removed, which would improve the situation, but not correct it. Therefore, automatic sprinkler protection should be installed. The Loss Expectancy associated with this condition is estimated at $1,000,000.
NSP-Minnesota	A.0001591.004	Reliability & Performance	-17478 ANS0C BOP Evrgren Ctrl	(10,000)	2022	This project is to upgrade for Units 2, 3, and Balance of Plant for Unit 4 Evergreen System Upgrade.	Existing controls will be obsolete during this current budget cycle
NSP-Minnesota	A.0003000.128	Renewable & New Generation	CWF Tools & Misc Equipment	(9,999)	2022	Purchase specialty tools, chain hoists, and test equipment.	Required to maintain the wind farm and improve work force efficiency and safety.
NSP-Minnesota	A.0003000.662	Renewable & New Generation	BRDR Small Tools Equip	(9,999)	2022	Purchase specialty tools, chain hoists, and test equipment.	Required to maintain the wind farm and improve work force efficiency and safety.
NSP-Minnesota	A.0003000.667	Renewable & New Generation	GDM0C Grand Mead Cap Tool	(9,999)	2022	Purchase specialty tools, chain hoists, and test equipment.	Required to maintain the wind farm and improve work force efficiency and safety.
NSP-Minnesota	A.0003000.678	Renewable & New Generation	PLV Tools Equip	(9,999)	2022	Purchase specialty tools, chain hoists, and test equipment.	Required to maintain the wind farm and improve work force efficiency and safety.
NSP-Minnesota	A.0001574.666	Reliability & Performance	SHC3C CT Vibration System	(9,834)	2022	Connect the two Bentley vibration systems to the plant computer to allow for trending and real time display of equipment condition.	The original project did not connect the equipment to the plant computer. Thus current readings and trending functions are not available and the units provide minimal value.
NSP-Minnesota	A.0003000.564	Reliability & Performance	SER0C CSC Rolloff Container 1	(8,000)	2022	CSC-Replace Rolloff Container 1: replace the first existing roll-off container.	CSC-Replace Rolloff Container 1 The Hazardous Waste Storage Facility (HWSF) has two roll-off containers. One container is always on site for loading of industrial wastes and the other is storage at the transportation company's location. When the on-site roll-off is full, the empty roll-off is delivered and the full one is picked up. This method allows for the continuous ability to dispose of industrial wastes. The new roll-off would be cable and hook hoist compatible (currently the roll-off is only cable hoist compatible). This would allow for greater flexibility in transporting the roll-off as Xcel Energy trucking or other vendors could also transport it. Without replacing the first roll-off container, we would be limited to cable hoist trucks to swap out the roll-off containers as one roll-off would be hook compatible and the second one would not.
NSP-Minnesota	A.0003000.565	Reliability & Performance	SER0C CSC Rolloff Container 2	(8,000)	2022	CSC-Replace Rolloff Container 2: replace the second existing roll-off container.	CSC-Replace Rolloff Container 2 The Hazardous Waste Storage Facility (HWSF) has two roll-off containers. One container is always on site for loading of industrial wastes and the other is storage at the transportation company's location. When the on-site roll-off is full, the empty roll-off is delivered and the full one is picked up. This method allows for the continuous ability to dispose of industrial wastes. The new roll-off would be cable and hook hoist compatible (currently the roll-off is only cable hoist compatible). This would allow for greater flexibility in transporting the roll-off as Xcel Energy trucking or other vendors could also transport it. Without replacing the second roll-off container, we would be limited to cable hoist trucks to swap out the roll-off containers as one roll-off would be hook compatible and the second one would not.
NSP-Minnesota	A.0001574.173	Reliability & Performance	SHC3C Emergent work	(7,177)	2022	This fund covers unexpected equipment failures and discovery issues from overhaul inspections.	Emergent work for unexpected and unplanned equipment failures.
NSP-Minnesota	A.0001574.738	Reliability & Performance	SHC0 2RSA H Bushng Rplcmnt	(6,128)	2022	Replace 2 RSA H0, H1, H2 and H3 bushings and oil pumps. Work scope includes draining, processing, and refilling oil in transformer.	Bushings were electrically tested in 2015. Some showed signs of degradation. Oil pumps have never been replaced.
NSP-Minnesota	A.0001565.036	Reliability & Performance	WLM0C Inst Station Aux Power S	(5,732)	2022	Station Aux Power Separation	#3 and #4 station aux transformers are fed from the same bus in the 13.8 KV substation. This is a single point failure that has caused us to back feed power through #2 unit in the past when the leads to #3 transformer were lost.
NSP-Minnesota	A.0001574.269	Reliability & Performance	SHC2C Emergent Projects	(2,066)	2022	This fund covers unexpected equipment failures and discovery issues from overhaul inspections.	Emergent work for unexpected and unplanned equipment failures.
NSP-Minnesota	A.0001574.268	Reliability & Performance	SHC1C Emergent Projects	(1,988)	2022	This fund covers unexpected equipment failures and discovery issues from overhaul inspections.	Emergent work for unexpected and unplanned equipment failures.
NSP-Minnesota	A.0001574.252	Reliability & Performance	SHC99 Emergent work	(1,788)	2022	This fund covers unexpected equipment failures and discovery issues from overhaul inspections.	Emergent work for unexpected and unplanned equipment failures.
NSP-Minnesota	A.0001574.733	Reliability & Performance	SHC0C Electric & Electronic Room FP	(1,666)	2022	From 2014 All Risk Loss Prevention Report for Sherco, Recommendation 06-23: Install smoke detection monitored by the Main Control Room or other 24/7 occupied area in the following areas: Main secondary unit substation room (ground floor) Main 4,160 volt switchgear room (mezzanine level) for Unit 1 and 2 Unit 1 and 2, 480-volt SUS room Unit 1 and 2 Relay Rooms All of the Inverter Rooms Unit 1 and 2 Electrostatic Precipitator switchgear rooms All of the battery rooms	The most likely problem in this type of electrical equipment area is an electrical fault, which will often result in smoke being generated. Smoke detection in these areas can provide an early warning of a problem and allow action to be taken prior to significant damage occurring. Reference NFPA 850, Section 7.8.4 and 7.8.5. The Loss Expectancy associated with this condition is estimated at $2,000,000. The estimated cost to complete is $10,000.
NSP-Minnesota	A.0001574.673	Reliability & Performance	SHC3C 1st Floor HVAC PLC Replace	(1,475)	2022	Replace the PLC, remote panels, damper actuators and other instruments as needed. This HVAC system supplies all of the transition building from the 1st floor maintenance offices all the way up to the I&C shop. A significant portion of the cost is associated with upgrading ancillary equipment such as damper drives and duct heater controllers which are obsolete and need upgrades or repairs to work with the new PLC. Temporary heating and or cooling may be required depending on when the major work is performed.	The existing equipment is obsolete and repairs are becoming difficult or not possible. This equipment controls the HVAC in the Unit 3 office areas. Should a larger failure occur this project will have to be performed as an emergent project at a greater cost.
NSP-Minnesota	A.0001707.001	Renewable & New Generation	DKR0 Dakota Range Wind Turbines	7,156,496	2022	Construct a 300 MW New Wind Farm in Grant and Codington Counties, South Dakota. The wind farm includes 72- V136 Vestas Turbines rated at 4.2 MWs each, a collector system, O&M building, access roads, and collector substation.	This project qualifies for the Production Tax Credit (PTC) at an 80% level.

Energy Supply

Quality Assurance Manual

Revision: 2.0
Effective Date: 9-25-2018

Quality Assurance Manual Description of Changes

Section	Description	Page	Date	Comments
Various	Change E&C to Energy Supply	Multi	3/10/11	
1.0	Included Business Areas in purpose statement	3		
3.0	Requirements (3.0) deleted; compliance with the specified requirements shall be the responsibility of personnel assigned to perform the work.	3	4/18/11	
3.0	Corrected spelling; Feasibility, and Deaerator	6	4/18/11	
3.0	Identified Business Area activities	6	3/10/11	
3.0	In ESO section replaced “Overhaul Activities” with “Maintenance Activities”	6	4/18/11	
3.0	First bullet deleted Lab Analysis/Lab QA Program	7	4/18/11	
3.1	Included FERC/NERC Reliability Standards, including Critical Infrastructure Protection (CIP)	10	3/14/11	
3.1	Move “FERC/NERC Reliability Standards, including Critical Infrastructure Protection (CIP)” to a bullet on page 11 under : Energy Supply personnel shall identify and document inputs as applicable:	10	4/18/11	
3.4.1	Added; Has the Critical Infrastructure Protection Tier level of exposure for Cyber Security been evaluated?	14	3/14/11	
3.7	Added; Cyber Security Tier Level evaluation	16	3/14/11	
3.0	Changed EDS to Energy Supply document control	23	3/15/11	
3.0 Para 9	Added; A list shall be maintained to identify current and applicable revisions of controlled documents. The list is available for use by affected responsible personnel. (EEC7.995??)	23	3/15/11	
3.3	Under Bid evaluation criteria added another bullet: “Supplier’s safety and health performance as outlined in Xcel Energy’s Contractor Safety program.”	27	4/18/11	
3.1	Changed “Energy Supply Engineering” to “Energy Supply”	31	4/18/11	
Various begin at 3.3	Changed Sr. QA Representative to Quality Assurance Representative	34	3/15/11	
3.1	Changed “Energy Supply Engineering” to “Energy Supply”	40	4/18/11	
3.0	¶ 4&7 Change “Capital Projects Records Management Policy” to “Energy Supply Records Management Policy”	55	4/18/11	
1.0	Need to Add Audit Services?	57	3/15/11	
3.4	Added; The audit results shall be documented by the audit team and reviewed by the Energy Supply Vice President, Business Areas.	58	3/15/11	
3.5	Added; Quality Assurance Lead Auditor	58	3/15/11	

Quality Assurance Manual Description of Changes

3.3	Any conditions that require prompt action shall be reported to the QA Manager and/or ESO Manager	58	4/18/11	
4.46	Added; definition of Quality Assurance Representative – individual(s) that perform quality, oversight, inspection, and/or observation functions that either reside in the Quality Assurance department or as designated by a Energy Supply Business Area.	63	3/15/11	
Various	Changed Production Resources to Technical Services	Multi	8/8/11	
2.0	Removed reference to specific Business Area work activities and replaced with reference to Business Area policies.	6	8/22/11	
Triennial review	Whole Document 1.0	Reviewed for self-audit. No Changes needed.	2-4-14	Triennial review
Section 1.0	Bi-ennnial Review Changed Specific Business Areas to BA under ES VP	3 and 6	9/25/2018	
Section/Criteria VII	Section VII sub 3.2 deleted supplier pre-qualification requirements	26	9/25/2018	
Section 3.2	Added term “May”	40	9/25/2018	
Section 3.0	Changed responsibilities for inspection of M&TE	43	9/25/2018	
Section 3.0	Added event assessment to corrective actions. Deleted corrective action effectiveness	52	9/25/2018	
Section 3.0	Deleted reference to capital projects records	55	9/25/2018	
Criteria XVIII	Total rewrite of “Audits” section to reflect current practices.	57	9/25/2018	
Appendix A	Revised Audit Definition	61	9/26/2018	
Appendix A	Revised Organization definition	65	9/26/2018	
Appendix A	Revised audit definition	69	9/26/2018	

Xcel Energy	XES 2.620 _P01
Energy Supply Policy System	**Revision: 2.0**
TITLE: *Quality Assurance Manual*	

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QUALITY ASSURANCE MANUAL

SECTION I

ORGANIZATION

1.0 PURPOSE
To describe the means by which the authority and duties of Xcel Energy, Energy Supply personnel are established for performing specified activities that have an affect on quality. The Quality Assurance Criteria defined in this manual apply to the Energy Supply Business Areas under the direction of the Senior Vice President, Energy Supply . These Business Areas are referred to as Energy Supply throughout the Quality Manual.

2.0 POLICY
The organizational structure, functional responsibilities, authority, and lines of communication for activities affecting quality are documented in Energy Supply detailed procedures that implement this quality manual.

3.0 REQUIREMENTS
Detailed procedures shall be established to define the responsibilities and describe the activities that implement the requirements for accomplishing quality work referred to herein as specified requirements. The basic organizational structure of Xcel Energy, Energy Supply is identified in Xcel Energy Human Resources Peoplesoft® Website Data Base.

Personnel shall be assigned responsibility for establishing the Quality Assurance Program and for verifying that activities affecting quality are being correctly performed.

Energy Supply personnel shall have sufficient authority, access to work areas, and the organizational freedom to:

- identify non-compliance with specified requirements
- initiate, recommend, or provide solutions to identified problems through designated channels of responsibility and authority,
- verify implementation of solutions,
- assure measures are in place so that further processing, delivery, installation, or use is controlled until proper disposition of a nonconformance, deficiency, or unsatisfactory condition has occurred,
- have direct access to responsible management at a level where appropriate action can be obtained,
- report to a management level that can ensure the authority and organizational freedom to accomplish the required duties and be sufficiently independent from cost and schedule considerations, and
- have the authority to take the appropriate action to address Quality Issues up to and including the issuing of a “stop work order”.

Compliance with specified requirements shall be verified by personnel not directly responsible for performing the work.

Responsibility for control of further processing, delivery, installation, or operation of nonconforming items shall be defined.

External and internal interfaces between organizations, and changes to them, shall be defined as needed to achieve compliance with specified requirements.

QUALITY ASSURANCE MANUAL

SECTION II

QUALITY ASSURANCE PROGRAM

Xcel Energy	XES 2.620 _P01
Energy Supply Policy System	**Revision: 2.0**
TITLE: *Quality Assurance Manual*	

1.0 PURPOSE
To describe the means by which the Energy Supply Quality Assurance Program is planned, implemented, and maintained.

2.0 POLICY
The Energy Supply Quality Assurance Program satisfies, as a minimum, the requirements set forth in the Xcel Energy Supply policies and guidelines, including the industry standards, codes, and statutes that govern the work.

3.0 REQUIREMENTS
Energy Supply shall establish a Quality Assurance Program which complies with the requirements of the standards and codes Energy Supply has committed to while taking into consideration the technical aspects of the activities that effect quality.

The Energy Supply's Quality Assurance Program applies to the activities conducted by the Business Area individual departments and are contained in each Business Area Quality Program Policy regardless of location

Energy Supply's Quality Assurance Program shall provide for indoctrination and training of personnel performing activities affecting quality as necessary to assure that suitable proficiency is achieved and maintained.

If applicable, activities affecting quality shall be accomplished under suitably controlled conditions. Controlled conditions include the use of appropriate equipment; suitable environmental conditions for accomplishing the activity, such as adequate cleanness; and assurance that all prerequisites for the given activity have been satisfied.

Energy Supply will regularly review the status and adequacy of its Quality Assurance Program. This review shall be documented (e.g., in a Memorandum) and will include all applicable site locations.

Management of those organizations implementing and/or participating in the Quality Assurance Program shall regularly review the status and adequacy of that part of the Quality Assurance Program that they are executing.

3.1 Quality Assurance Program Content
The quality attributes of Energy Supply's Quality Assurance Program are addressed in the **sections** of the Quality Assurance Manual as described below. Lower tiered documents provide more details for implementation of these activities.

Xcel Energy	XES 2.620 _P01
Energy Supply Policy System	**Revision: 2.0**
TITLE: *Quality Assurance Manual*	

QUALITY ASSURANCE MANUAL

SECTION III

DESIGN CONTROL

Xcel Energy		XES 2.620 _P01
Energy Supply Policy System		**Revision: 2.0**
TITLE:	*Quality Assurance Manual*	

1.0 PURPOSE
To describe the means by which Energy Supply assures that the requirements for materials, structures, systems, products and components are correctly translated into calculations, specifications, drawings, procedures, and instructions.

2.0 POLICY
Engineering and design activities are carried out in a planned, correct, controlled and orderly manner to ensure:

- Applicable quality standards are specified and included in design documents.
- Deviations from applicable standards are controlled.
- Materials, parts, equipment, and processes essential to the functional requirements of the materials, structures, components, products, and systems are reviewed for suitability of applications.
- Interfaces of participating internal and external organizations are identified, controlled and coordinated for the review, approval, release, distribution, and revision of design documents.
- Adequacies of designs are checked and verified by design review, alternate calculation methods, certified computer codes, and/or suitable test programs.
- Design verifications are performed by individuals independent of those who performed the original design.
- Design changes are subject to the same controls as the original documents.
- Design documents include traceability of quality assurance requirements and design bases.

3.0 REQUIREMENTS
Processes shall be established to ensure that the applicable design basis and regulatory requirements are properly defined, reviewed and documented.

3.1 Design Inputs
Design inputs are used to establish the boundaries and/or criteria for designing a system, structure or component. In order to ensure the selection of design information is appropriate for the system, structure or component, Energy Supply personnel shall:

- Ensure that all design inputs are properly identified and documented;
- The selection of inputs are approved by the appropriate discipline organization;
- The level of detail specified is sufficient to permit consistent decision making, design verification and the evaluation of design changes;
- Ensure that changes to approved design inputs are controlled, identified, documented, reviewed and approved.

Energy Supply personnel shall identify and document inputs as applicable:

- FERC/NERC Reliability Standards, including Critical Infrastructure Protection (CIP)
- Applicable industry codes and standards (IEEE, ANSI, ASME) including revision, date or addenda.
- Regulatory agency or plant operations requirements.
- Environmental conditions (pressure, temperature, moisture, corrosiveness)
- Basic function of structures, systems, components.
- Performance requirements (input, output, ratings, operating life, capacity).
- Design conditions (pressure, temperature, fluid, chemistry, voltage).
- Loads (seismic, wind, thermal, dynamic).
- Interface requirements (functional, physical).
- Quality assurance standards and acceptance criteria for inspections and tests.
- Mechanical requirements (vibration, stress, shock, reactions).
- Structural requirements (foundations, supports).
- Hydraulic requirements (pump net suction head, allowable pressure drops, fluid
- velocities).
- Chemistry requirements (sampling limitation/criteria).
- Electrical requirements (source voltage, amperage, frequency).
- Operational requirements under various conditions, such as plant startup, normal plant operation, plant shutdown, special or infrequent operation, as required by plant operations.
- Instrumentation and Control requirements including indicating instruments, controls, and alarms required for operation, testing, and maintenance. Other requirements, such as the type of instrument, installed spares, range of measurement, and location of indication should also be included as appropriate.
- Calibration and test equipment requirements.
- Material requirements (capability, insulation, protection, corrosion resistance).
- Layout and arrangement requirements.
- Accessibility (installation, operation, repair, maintenance, inspection).
- Failure effect requirements (events, accidents must withstand).
- Test requirements.
- Personnel requirements.
- Human factors.
- Security requirements (access, administration).
- Redundancy and diversity requirements.
- Fire protection/resistance requirements.
- Personnel safety requirements.
- Handling, storage and shipping requirements.

Energy Supply shall also review, and approve for use, the design inputs from clients, suppliers and other interface external organizations involved with design activities.

Provide design inputs for use by other external organizations involved. Identify, get approval of, document, and control changes from specified design inputs including specified codes and standard; and document reasons for the change.

3.2 Design Process

A process or processes shall be established to permit the design of systems, structures and components or modification to these items, to be completed to the detail necessary to be complete and correct and such that will permit verification that the design meets the requirements.

All quality standards shall be identified and documented and changes from these standards shall be identified, controlled, reviewed, approved and documented.

Design methods, materials, parts, equipment and processes that are essential to the function of the systems, structures and components shall be selected and reviewed for suitability of application.

Applicable information derived from experience, as documented in reports, etc., shall be made available to all individuals. Use of these documents shall be traceable to the design input in sufficient detail to permit verification.

3.3 Design Analysis

3.3.1 All design analyses shall be:

- Documented in a planned, organized and controlled manner;
- Legible and organized in a manner that permits reproduction, filing and retrieval;
- Document the purpose, method of analysis, assumptions, design inputs and references, such that the adequacy of the analysis can be verified without recourse to the originator; and
- Identified by subject, preparer, reviewer and date or some other manner that permits retrieval.

3.3.2 Engineering analysis software may be utilized for analysis without individual verification provided:

- The software has been verified such that the software code produces correct results for defined parameters; and
- It can be demonstrated that the software code has produced a valid solution to a similar application.

3.3.3 Engineering analysis software shall be controlled such that changes are documented and approved by authorized personnel. Changes to previously verified engineering analysis software shall be verified including potential effects on the verification completed in paragraph 3.3.2.

3.3.4 Documentation of the design analysis shall include:

- Definition of the objective;
- Definition of the design inputs and their sources;
- The results of any literature searches or applicable background information;
- Identification of assumptions and indication of those that require verification;
- Identification of any engineering analysis software including the program name, revision identification, inputs, outputs evidence of or reference to the analysis verification; and
- Review and approval.

3.4 Design Verification

The design verification shall be performed by individual(s) that are trained and qualified, other than those that completed the original design. The originator's supervisor may perform the verification provided the supervisor did not provide any input to the design considerations, did not establish any of the design inputs used or they are the only individual qualified and trained to complete the verification.

Design verifications shall be performed prior to releasing the design for procurement, manufacture, construction or release to another organization as input to other design activities except in those situations where insufficient data exists. For those identified exceptions, the unverified portion shall be identified and controlled, but the verification shall be completed prior to relying upon the system, structure or component to function. The design verification shall document:

- The method of verification used, and
- The individual who performed the verification

Processes shall be established to verify the adequacy of a design using one or more of the following:

- Design reviews;
- Alternate calculations; or
- Qualification tests

3.4.1 Design Reviews

Design reviews are critical reviews to provide assurance that the final design is correct and will function as designed. The following shall be addressed as necessary:

- Are the design inputs correct?
- Are the assumptions reasonable and have they been adequately described?
- Was the appropriate design method used?
- Have the design inputs been incorporated into the design correctly?
- Is the design output reasonable compared to the design input?
- Are the necessary design input and verification requirements for interfacing organizations specified in the design documents?
- Has the Critical Infrastructure Protection Tier level of exposure for Cyber Security been evaluated?

3.4.2 Alternate Calculations

Alternate calculations may be performed, as applicable, to verify correctness of original calculations or analysis. If an alternate calculation is completed the following shall be completed:

- All findings/methods used to provide results consistent with the original must be documented; and
- Assumptions, input data, code and other calculation methods used are reviewed to determine if appropriate.

3.4.3 Extent of Design Verification

Ensure that the extent of design verifications are consistent with:

- Importance of item
- Uniqueness of item
- Complexity of design
- Degree of standardization
- State-of-the-art
- Similarity to proved designs

If changes to a previously verified design are made, design verification shall be performed for the changes, including evaluation of the effects of those changes on the overall design and any engineering analysis performed that establishes the design basis.

3.5 Change Control

Changes to final designs, field changes, modifications to operating facilities and nonconforming items shall be justified and subject to measures commensurate with those applied to the original design. These measures shall include the following:

- Assurance that the design analysis for the system, structure or component is still valid;
- Assurance that the impact of change is carefully considered, reasons and actions documented, and change information is transmitted to affected organizations;
- Assurance that the design change is controlled in a manner commensurate with its significance and essentially in the same manner as the original design; and
- Assurance that design change, including items changed as a result of independent design verification, is reviewed and approved by the same organization or group originally responsible for the design.

3.6 Interface Control

Design interface shall be identified and controlled and the design efforts coordinated among the participating departments as follows:

- Identify and document interfaces between organizations (internal and external) performing work affecting quality of design. Include organizations and groups providing criteria, designs, specifications, technical direction, and technical information.
- Define and document responsibilities and authorities for work to be performed by each organization, group, or individual in a manner to be identifiable to the corresponding design activity.
- Establish and document responsibilities for preparation, review, approval, distribution, and revision of documents involving design interfaces.
- Provide resolution for problems in design technical interfaces referred for resolution.
- Establish systematic methods for communicating design information between interfacing design organizations (internal and external).
- Ensure that documents identify positions and titles of key personnel, and responsibilities for decision making, problem resolution, and providing and reviewing information as appropriate.
- Establish procedures to control the flow of design information between internal and external organizations, and include:
- Documenting transmittal and receipt of design information.
- Identifying the status of design information transmittal (e.g., incomplete, reviewed, approved, further evaluation needed).
- Promptly confirming orally transmitted information by controlled documents.
- Transmitting design interface information to affected organizations.
- Traceability (through documentation) of sources of information and information flow through the design process to the final identifiable design document.

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TITLE: *Quality Assurance Manual*	

3.7 Documentation and Records
Documentation and records that provide objective evidence that the design and verification were performed shall be collected, stored and maintained in accordance with Section XVII, Quality Assurance Records, of the QA Manual.

The documentation shall include (as applicable), but not limited to the following:

- Final design documents;
- Drawings;
- Specifications;
- Revisions to the original design documents;
- Documentation that identifies import steps completed during the design process;
- Sources of design inputs.
- Cyber Security Tier Level evaluation

QUALITY ASSURANCE MANUAL

SECTION IV

PROCUREMENT DOCUMENT CONTROL

Xcel Energy	XES 2.620 _P01
Energy Supply Policy System	**Revision: 2.0**
TITLE: *Quality Assurance Manual*	

1.0 PURPOSE
To describe the means by which Energy Supply assures that applicable quality, technical and regulatory requirements are translated into procurement documents issued by Energy Supply to suppliers for hardware, software, or services (referred to as items) required in the performance of any work for plant operations that could have an affect on quality.

2.0 POLICY
Preparation, review and approval of procurement documents for quality related items shall be controlled in a manner to ensure compliance with this QA Manual and plant operations requirements.

3.0 REQUIREMENTS
3.1 Procurement documents shall as applicable:

- Specify the scope of work to be performed or product to be furnished by the supplier.
- Specify applicable codes, standards, technical and quality assurance requirements.
- Specify performance and/or acceptance requirements or criteria.
- Specify documentation and QA records requirements.
- Specify design requirements.
- Specify software requirements.
- Specify inspection and test requirements.
- Specify controls to be applied between purchaser and supplier.
- Provide for access to the supplier's facilities for inspection or audit.
- Require the supplier to report and approve dispositions of non-conformances.
- Require identification of spare and replacement parts and QA related data required for ordering such parts.
- To the extent necessary, requirements for Suppliers to identify and submit a Quality Assurance Program under their ownership.

3.2 Procurement documents and changes to them shall be reviewed by personnel who have access to pertinent information and who are familiar with and understand the requirements involved. Reviews shall be conducted:

- To check that documents transmitted to the supplier include appropriate provisions that will ensure getting products or services meeting specified requirements.
- To provide objective evidence of accomplishment of such review prior to issue of a purchase order or contract.
- To ensure that changes made during negotiations are included in the procurement documents prior to award, that requirements of 3.1 are met, that additional or modified input criteria are identified, and that exceptions or changes requested by the supplier are analyzed for effect on the intent of the procurement or quality of the item or service to be supplied.

3.3 Procurement document changes shall be subject to the same degree of control as provided in the preparation and issue of the original documents.

3.4 Detailed instructions for procurement document control in compliance with the above requirements shall be provided in one or more implementing procedures as required.

3.5 Proposals are reviewed and issued by personnel that are familiar with the requirements of the Plant operations request for proposal and the QA requirements for performance of the specified task.

3.6 In the case of unique and/or critical components, Energy Supply may choose to review Supplier purchase orders:

- To ensure that the requirements of the technical specifications have been clearly and completely communicated to the sub-supplier.
- To ensure that any changes made during the negotiation of the contract are included in the purchase order.
- To ensure the Terms and Conditions of the purchase order are acceptable.
- To ensure the QA requirements are in agreement with the Energy Supply QA Program.

QUALITY ASSURANCE MANUAL

SECTION V

INSTRUCTIONS, PROCEDURES, AND DRAWINGS

Xcel Energy	XES 2.620 _P01
Energy Supply Policy System	**Revision: 2.0**
TITLE: *Quality Assurance Manual*	

1.0 PURPOSE
To specify the documents within the Energy Supply Quality Assurance Program that are used to prescribe the activities affecting quality and to describe their format, content, and origin.

2.0 POLICY
Instructions, procedures and drawings shall be established to:

- Document the activities affecting quality and are available at the point of use;
- Ensure that consistent, reliable and repeatable results are established for repetitive activities;
- Implement the quality assurance requirements of Energy Supply purchase orders;
- Include quantitative and qualitative acceptance criteria for use in verifying that selected and specified activities have been accomplished satisfactorily and specific characteristics have been achieved.

Instructions and procedures are prepared, reviewed, approved, issued, and controlled in accordance with Section VI of this Quality Assurance Manual.

3.0 REQUIREMENTS
Establish procedures and processes for planned and controlled preparation, review, and issue of written instructions, procedures and drawings.
Instructions, procedures and drawings shall be prepared as required by the specified activity (i.e., construction, rebuild, installation, testing, etc.).

Identify clearly in the written documents the scope of work involved and provide adequate descriptions of the activities in a manner understandable at the user level.

Assure that documents include quantitative acceptance criteria (i.e., dimensions, tolerances, operating limits, etc.), as necessary.

Assure that documents include qualitative acceptance criteria (i.e., workmanship standards and samples, descriptive explanation of operating characteristics, description of conditions that can be visually judged, etc.), as necessary.

QUALITY ASSURANCE MANUAL

SECTION VI

DOCUMENT CONTROL

1.0 PURPOSE
To describe the means by which documents specifying quality requirements or prescribing activities affecting quality (such as instructions, procedures, and drawings), and changes to them, are processed.

2.0 POLICY
Preparation, review and issue of Energy Supply control documents and drawings shall be controlled in accordance with this QA Manual and applicable secondary document control policies and procedures.

3.0 REQUIREMENTS
Documents required to complete a contract shall be controlled in accordance Capital Projects and Energy Supply procedures.

Key personnel and Management shall review all applicable Energy Supply controlled documents for technical adequacy and QA for impact on the QA Program. Also, the documents are reviewed to ensure the requirements of the codes and standards and Capital project Policies committed to by this QA Manual are addressed.

The project preparer, Quality Assurance and Senior Management prior to issue, shall sign applicable Energy Supply controlled Manuals and Procedures. If applicable, a technical review will also be included in this signature process.

The same organization or functional groups that processed the original unless this responsibility is specifically authorized and delegated to other qualified organizations or functional groups shall process changes to a document. Reviewing organizations shall have access to pertinent background information.

Minor changes to documents will be handled by lower tier procedures.

The control of Plant operations provided control documents will be handled by lower tier procedures.

Obsolete documents shall be controlled in a positive manner to prevent inadvertent use.

Applicable documents shall be available at the location where the work involved is to be performed, prior to commencing the work.

A list shall be maintained to identify current and applicable revisions of controlled documents. The list is available for use by affected responsible personnel.

As a minimum, controlled documents include:

- Energy Supply Quality Assurance Manual, Program Manuals, Procedures, Instructions and all related forms.
- Specifications, drawings, system descriptions, and instruction manuals developed by Energy Supply for Energy Supply and others.
- Energy Supply documents, generated as a result of Regional Planning Committee decisions.
- Computer programs and documents which are used in design or quality programs.

QUALITY ASSURANCE MANUAL

SECTION VII

CONTROL OF PURCHASED ITEMS AND SERVICES

Xcel Energy	XES 2.620 _P01
Energy Supply Policy System	**Revision: 2.0**
TITLE: *Quality Assurance Manual*	

1.0 PURPOSE
To describe the means by which Energy Supply provides assurance and documentary evidence that procured items and services conform to the requirements of this Manual and plant operations specified requirements.

2.0 POLICY
Suppliers are evaluated prior to award of contracts to determine their capability to provide acceptable items and services and have an acceptable Quality Assurance Program implemented appropriate to the items and services involved. Items include hardware, software, and services.

Evaluation surveys are planned and documented.

After contract award, the supplier's performance is evaluated by planned audits, surveillance, and inspection, as appropriate to the item or services, to verify compliance with quality requirements.

The results are documented.

Procurement quality assurance/quality control activities are performed in accordance with written procedures or instructions. Unique plant operations requirements are included.

Supplier furnished items and services are examined upon receipt to verify compliance with contract requirements, including identification, certification and documentation.

Sub-tier contracting activities by Energy Supply suppliers are monitored to ensure that applicable quality requirements are being passed on and enforced.

3.0 REQUIREMENTS

3.1 Procurement Planning
Planning shall be accomplished as early as practical and no later than at the start of the procurement activities that are required to be controlled and shall include:

- Procurement document preparation, review, and change control.
- Selection of procurement sources.
- Bid evaluation and award.
- Control of supplier performance.
- Verification activities including surveillance, inspection, or auditing.
- Control of non-conformances.
- Corrective action.
- Acceptance of item or service.
- Quality Assurance records.

3.2 Supplier Selection
Suppliers shall be selected based on evaluation of their capability to provide items or services in compliance with the requirements of the procurement prior to contract award.

The supplier’s technical and quality capabilities shall be determined by evaluation of the supplier’s qualifications, experience, references, facilities, personnel, and Quality Assurance Program. The evaluation and the results of the evaluation shall be documented. Evaluation should include:

- Evaluation of the supplier’s history for supplying identical or similar items or services, which were, found satisfactory and reflect current history.
- Supplier’s current quality records supported by documented qualitative and quantitative information, which can be objectively evaluated.

3.3 Bid Evaluation
Evaluation of bids from suppliers shall determine the extent to which the supplier conforms to the procurement documents. Evaluation shall be performed by assigned individuals who shall evaluate the following as applicable to the procurement:
- The general feasibility of the Supplier's design to meet the requirements of the Scope of Work.
- The evaluated cost of the initial purchase and the cost to own and operate and maintain the system over the life of the system.
- Reliability and security of operation.
- Uniformity, convenience and flexibility of man/machine interface.
- Supplier's experience, personnel, production capability, and past performance.
- Delivery schedule.
- Supplier's understanding of and responsiveness to the Scope of Work requirements as evidenced by its proposal and other presentations.
- The overall quality of work offered by the Supplier.
- Exceptions to specified requirements or conditions.
- Supplier’s safety and health performance as outlined in Xcel Energy’s Contractor Safety program.

Prior to award of the contract, commitments shall be obtained from the supplier to resolve any unacceptable quality conditions resulting from the bid evaluation.

3.4 Supplier Performance Evaluation
A means of interfacing with the supplier and verifying the supplier's performance shall be established as deemed necessary and may include the following:

- Understanding on the provisions and specifications of the procurement documents;
- Obtaining the supplier's provisions for planning and the processes to be used in fulfilling the procurement requirements;
- Reviewing the supplier's documents generated or processed during performance of activities that fulfill the procurement requirements;
- Identifying and processing change information;
- Establishing a means of exchanging documentation and information;
- Establishing the extent of source surveillance or inspection activities.
- Verification activities shall be conducted as early as practical. Verification activities shall not relieve the supplier of responsibility for verifying the achievement of quality and conformance to the specified requirements.

The importance, complexity, and quantity of the item or service and the supplier's quality performance shall be considered in determining the extent of verification activities.

Verification activities shall be accomplished by qualified personnel assigned to check, audit, or witness the activities of the supplier during performance of the work.

Verification activities shall be documented including inspections, audits, receiving inspections, non-conformances, dispositions, waivers, and corrective actions.

3.5 Control of Supplier Generated Documents
Supplier generated documents shall be controlled, handled, approved, and submitted in compliance with procurement documents.

Technical, inspection, and test data with documented evaluation of compliance with acceptance criteria shall be obtained.

3.6 Control of Changes in Items or Services
Provisions shall be made to ensure that changes made in procurement documents are controlled, documented, and implemented.

3.7 Acceptance of Item or Service
The means by which supplier furnished items or services are acceptable shall be established as required for each procurement.

Prior to delivery for acceptance, the supplier shall be required to verify that the item or service being furnished complies with the procurement documents.

Depending on the applicable codes, regulations, or contract requirements, documentary evidence of compliance with procurement documents may be required, such as:

- A Certificate of Conformance which shall include as appropriate:
  - Identification of the purchased item or service
  - The specific procurement requirements met
  - Changes, waivers, or deviations that were approved
  - Procurement requirements not met
  - Signature of person described in the supplier's quality program as
  - responsible for this function

- Source verification performed at appropriate intervals and documented.
- Receiving inspection, as necessary, to verify conformance to specified requirements with consideration given to prior verification activities and audits.
- Post-installation testing may be used provided the test requirements and acceptance documentation are mutually acceptable to Energy Supply and the supplier.

Where the procurement activity is for services only, any one or all of the following methods are valid for acceptance of the service to be provided:

a. Technical verification of documents produced;
b. Surveillance and/or an audit of the activity;
c. Review of objective evidence for conformance to the procurement documents.

3.8 Control of Supplier Non-conformances
A method to identify, track and disposition non-conformances shall be established that includes the following:
a. Identification of the nonconforming condition
b. Evaluation of the nonconforming condition;
c. Disposition and technical justification of the nonconformance;
d. Disposition of the supplier nonconformance disposition;
e. Verification of the implemented disposition;
f. Maintenance of records of completed non-conformances.

QUALITY ASSURANCE MANUAL

SECTION VIII

IDENTIFICATION OF MATERIALS, PARTS AND COMPONENTS

Xcel Energy	XES 2.620 _P01
Energy Supply Policy System	**Revision: 2.0**
TITLE: *Quality Assurance Manual*	

1.0 PURPOSE
To describe the means by which Energy Supply assures the required identity of procured materials, parts and components.

2.0 POLICY
Personnel responsible for procurement of materials, parts and components are responsible to assure that contractual identification requirements are accurately passed down to Energy Supply suppliers via purchasing documents.

After contract award, supplier's performance is evaluated by planned audits, surveillance and inspection as appropriate to the product, to verify compliance with identification requirements. Results shall be documented.

3.0 REQUIREMENTS

3.1 Energy Supply shall:
Approve the necessary identification requirements as part of the request for quotation to the supplier.

3.2 As part of the identification requirements, the following must be considered in the initial planning stages:

- The necessity for traceability of sub-components into the final item supplied.
- Manufacturing and assembly documentation must be traceable to the sub and final components.
- The manufacturing and assembly documentation must reference the drawings, specifications, purchase order, manufacturing and inspection documents, deviation reports, physical and chemical mill test reports when applicable.
- The location and the method of identification must be legible and not affect the function or quality of the parts being produced.
- Suppliers' manufacturing, inspection and assembly reports must document verification of correct identification prior to release for assembly, fabrication or shipping.
- Items having limited calendar or operating life or cycles shall be identified and controlled to preclude use of items whose shelf life or operating life has expired.

3.3 The Quality Assurance Representative shall as appropriate:

- Review the specifications for conformance with contract requirements and approve if acceptable.
- Upon awarding of the contract to Energy Supply, and subsequent purchase orders issued to suppliers, incorporate the necessary portion of the plan into the related Quality Program checklists.

Checklists shall contain:

- Results of acceptance of Certified Material Test Reports or Certification of Compliance.
- Signature or stamp of individual accepting the results and date of Acceptance.
- Criteria for acceptance with a range of values.
- Document number and revision of test or inspection procedure.
- Signature or stamp and date of activities witnessed.

QUALITY ASSURANCE MANUAL

SECTION IX

CONTROL OF SPECIAL PROCESSES

Xcel Energy	XES 2.620 _P01
Energy Supply Policy System	**Revision: 2.0**
TITLE: *Quality Assurance Manual*	

1.0 PURPOSE
To describe the means by which Energy Supply provides the necessary controls of special processes.

2.0 POLICY
Energy Supply personnel shall assure control of special processes such as heat-treating, nondestructive testing and welding whenever they are used in conjunction with supplying components under contract via the use of suppliers. The above listed processes are not exclusive but only typical examples. Special new processes in various stages of development and must also be controlled.

3.0 REQUIREMENTS
3.1 The Quality Assurance Representative shall provide objective evidence that the proposed supplier either has or can supply the necessary requirements listed below, before requesting formal bids on which to base Energy Supply's final approval.

3.2 Energy Supply Engineering, through a complete review of the applicable design requirements, provides a listing of the special processes for the project. These selected special processes shall be defined as applicable to each separate purchase order.

Each special process requires:

- A detailed written procedure defining compliance with higher order specifications, environmental controls required, calibration requirements, the parameters of the process, acceptance criteria and the details an operator or inspector must perform throughout the entire process.
- The process must be qualified to applicable codes, specifications, or standards, and evidence of such qualification must be documented, current, and available.
- The operators or inspectors must have been qualified to perform, and evidence of the qualification must be documented, current, and available.
- Processes must be traceable on route cards or other evidence showing prerequisites met and manufacturing steps, such that the actual revision of the process used is documented, along with the qualified operator's or inspector's signature and date, to verify the process or inspection was acceptably conducted under controlled conditions with satisfactory results recorded.
- The qualification records of equipment associated with the special processes are established, filed, and kept current.

The above special process requirements shall be met by Energy Supply 's supplier and evidence of having met these requirements or being able to implement them is required, before placing of a purchase order.

3.3 The Quality Assurance Representative schedules pre-award surveys as required to assure the bidder's capability to comply with the above requirements. Once the contract is awarded to Energy Supply to assure that adequate in process surveillance is conducted to verify conformance.

QUALITY ASSURANCE MANUAL

SECTION X

INSPECTION

Xcel Energy		XES 2.620 _P01
Energy Supply Policy System		**Revision: 2.0**
TITLE:	*Quality Assurance Manual*	

1.0 PURPOSE
To describe the means by which activities related to supplier and on-site inspections are controlled.

POLICY
ENERGY SUPPLY employees shall, as a minimum, provide for meeting applicable inspection requirements. Where engineering or quality considerations, in the opinion of Energy Supply, warrant additional quality requirements, they may be specified in purchase orders to Energy Supply suppliers.

All inspections must be performed in accordance with written procedures and standards for inspection. Energy Supply shall prepare/obtain manufacturing and inspection process descriptions, such that an accurate procedure controls are available from raw material to finished product. The supplier's procedures may be examined, and modifications may be requested as necessary to assure proper inspection and mandatory hold points are identified. When required, the manufacturing inspection and hold points will be forwarded to the customer/plant operations for approval.

3.0 REQUIREMENTS

3.1 Energy Supply Engineering, through a complete review of all applicable supplier documents, shall identify all inspections, tests and hold point requirements and document their source. As a result of Energy Supply design, consider, in conjunction with the Quality Assurance Representative, added inspection requirements, tests or hold points as deemed necessary.

3.2 The Quality Assurance Representative shall obtain from the supplier or provide:

3.2.1 Inspection procedures, instructions or checklists that contain:

- Identification of characteristics to be inspected.
- Identification of the individual or groups responsible for performing the inspection operation.
- Acceptance and rejection criteria.
- A description of the method of inspection and revision level.
- Verification of completion and certification of inspection.
- A record of the results of the inspection operation.

3.2.2 Assurance that inspection instructions or procedures are available with necessary drawings and specifications for use prior to inspection of the parts.

3.2.3 Assurance that inspectors are qualified in accordance with appropriate codes, standards and company training programs, and their qualifications and certifications are kept current.

3.2.4 Assurance that modifications, repairs, replacement or reprocessed parts are inspected in accordance with original design and inspection requirements or accepted alternatives.

3.2.5 Notification that the product will be at designated hold points, in sufficient time to be witnessed by Energy Supply as required.

3.2.6 Waived hold point inspections shall be documented prior to continuation of process.

3.2.7 Assurance that the individuals or groups who perform receiving and process verification inspections at the construction or installation site are identified.

3.2.8 Assurance that provisions are established for indirect control by monitoring processing methods, equipment and personnel, if direct inspection is not possible.

3.2.9 Monitoring of processes and inspection when control is inadequate without both. When required, inspection and process monitoring shall be performed in a systematic manner to assure that both process control and product quality are maintained. Documentation of the above controls shall be maintained.

3.2.10 Final inspections, which include a review of the records, results, completeness, resolution of non-conformances identified by prior inspections, and a conclusion for acceptability or rejection by authorized personnel.

3.2.11 Quality records shall, as a minimum, identify:
- Item inspected.
- Date of inspection.
- Inspector.
- Type of observation.
- Results or acceptability.
- Reference to information on action taken in connection with non-conformances.

3.3 Conduct a thorough review of the Energy Supply inspection, test, and hold point requirements, to create a history of all necessary documents along with the source of the requirements. As the result of joint analysis with the project engineer, additional inspection, tests or hold points may be added as required to satisfy Energy Supply's concerns.

3.4 Assure that all requirements are maintained.

3.5 Assure, on the basis of pre-award surveys, that an acceptable level of independence exists.

QUALITY ASSURANCE MANUAL

SECTION XI

TEST CONTROL

Xcel Energy	XES 2.620 _P01
Energy Supply Policy System	**Revision: 2.0**
TITLE: *Quality Assurance Manual*	

1.0 PURPOSE
To describe the means by which Energy Supply assures control of tests and test procedures in accordance with contract requirements.

2.0 POLICY
Energy Supply personnel shall assure that tests, required by contracts, are accurately performed in accordance with controlled written procedures. These procedures may be supplied by Energy Supply or by suppliers of Energy Supply. They shall be referenced as part of the Energy Supply contract or purchase order issued to the supplier.

3.0 REQUIREMENTS
3.1 Energy Supply shall perform the following actions:

- Review all applicable requirements to determine what documents control the test procedures.
- Include a purchase order requirement that:
  - The supplier's established procedures are provided.
  - Electronic copies of each are submitted.
- Compare supplier's procedures to contract requirements and assure the procedures meet all contract requirements.

3.2 The following points should be considered as appropriate to the items being procured by Energy Supply:

- The test program demonstrates the item will perform satisfactorily in service is documented and is accomplished in accordance with written procedures.
- The written test procedures may include:
  - Test objectives and characteristics.
  - Instructions for testing method, instrumentation, test equipment, and condition of test equipment.
  - Instrument calibration.
  - Appropriate equipment.
  - Operation by trained, qualified and licensed or certified personnel.
  - Preparation, condition and completeness of item to be tested.
  - Suitable and controlled environmental conditions.
  - Mandatory inspection or hold-points by plant operations representative and/or Energy Supply Departments.
  - Provisions for data collection and storage.
  - Acceptance and rejection criteria.
  - Methods of documenting or recording test data and the results.

3.3 The test results are documented, evaluated and acceptance status identified by a qualified responsible individual or group. The test records shall, as a minimum, identify:

- Item tested.
- Date tested.
- Tester or data recorder.
- Type of observation.
- Results or acceptability.
- Action taken in connection with any deviation noted.
- Individual evaluating the test results.

3.4 The Quality Assurance Representative and/or Project Management shall independently review the test control procedures in accordance with the above requirements.

QUALITY ASSURANCE MANUAL

SECTION XII

CONTROL OF MEASURING AND TEST EQUIPMENT

Xcel Energy	XES 2.620 _P01
Energy Supply Policy System	**Revision: 2.0**
TITLE: *Quality Assurance Manual*	

1.0 PURPOSE
To describe the means by which Energy Supply controls activities related to calibration of measuring and test equipment.

2.0 POLICY
When Energy Supply contracts require control of measuring and test equipment, the Quality Assurance Representative has the responsibility to assess Energy Supply's suppliers to assure that adequate systems are in place to comply with the contract requirements.

3.0 REQUIREMENTS
3.1 The Business Area staff in coordination with the Quality Assurance Representative should develop an inspection plan to review and evaluate contractor/supplier use and control of measuring and test equipment. The inspection plan should consider the following items for the evaluation:

- The availability of written procedures which describe the calibration technique, frequency, maintenance and control of all measuring and test instruments, tools, gages, fixtures, reference and transfer standards, non destructive test equipment which is used in measuring, inspecting and monitoring safety related components, systems and structures.
- The selection of measuring and test equipment shall be controlled to assure that such items are of proper type, range, accuracy, and tolerance to accomplish the function intended.
- Marking of equipment to identify its calibration status.
- Identification of measuring and test equipment, and calibration test data traceable to the applicable equipment item.
- Assurance that intervals of calibration are defined and maintained based on the required accuracy, purpose, degree of usage, stability characteristics, and other factors affecting measurement.
- The availability of a procedure to be implemented when measuring equipment is found out of calibration, which includes conducting an investigation to determine the cause and corrective action required, and the effect on items produced since the last acceptable calibration.
- The precision with which a standard is calibrated is a ratio of 4/1, without interpolation, on the gage or instrument being calibrated. Less precision may be accepted when limited by "state of-the-art."
- The maintenance of records identifying the complete status of all items under the calibration system.
- Assurance that reference and transfer standards are traceable to National Institute of Standards and Technology (NIST), or where standards do not exist, provisions are established to document the basis for calibration.

- Provision for removal from use of any gages and measuring equipment consistently found to be out of calibration.
- Calibration when equipment accuracy is suspect.
- If periodic checking is used, the procedure shall be documented.
- Tagging and segregation of out of calibration equipment.
- Proper storage and handling of measuring and test equipment.

QUALITY ASSURANCE MANUAL

SECTION XIII

HANDLING, STORAGE AND SHIPPING

Xcel Energy	XES 2.620 _P01
Energy Supply Policy System	**Revision: 2.0**
TITLE: *Quality Assurance Manual*	

1.0 PURPOSE
To describe the means by which Energy Supply assures the required handling, storage and shipping requirements involved in current or proposed contracts are implemented.

2.0 POLICY
Personnel responsible for procurement of components and other items are required to supply detailed handling, storage, or shipping requirements to Energy Supply suppliers in accordance with Energy Supply requirements.

3.0 REQUIREMENTS
3.1 Energy Supply shall:

- Transmit, as part of the purchase order, all shipping, storage and handling requirements. Include any additional requirements considered necessary on the part of Energy Supply personnel, based on either past experience or unique design requirements.
- Assure that instructions and procedures for handling, storage, packaging, marking, preservation and shipping are prepared by a qualified individual, and based upon design and specification requirements. Such instructions and procedures are intended to preclude damage, loss, or deterioration in transit or by environmental conditions. The applicable procedures and inspections shall be performed by qualified personnel.
- Assure that special devices and/or special protective environments are specified and their existence verified
- Assure that special handling tools and equipment are inspected and tested in accordance with written procedures and at specified times, to verify that tools and equipment are adequately maintained.

QUALITY ASSURANCE MANUAL

SECTION XIV

INSPECTION, TEST AND OPERATING STATUS

Xcel Energy	XES 2.620 _P01
Energy Supply Policy System	**Revision: 2.0**
TITLE: *Quality Assurance Manual*	

1.0 PURPOSE
To describe the means by which Energy Supply assures compliance with contractually required identification of inspection, test, and operating status.

2.0 POLICY
Personnel responsible for procurement of components and other items are required to obtain, from suppliers, procedures, which accurately maintain the status of required inspection, testing or operating capability of items under contract to Energy Supply.

3.0 REQUIREMENTS
3.1 Energy Supply shall perform the following:

- Request transmittal, as part of the purchase order, of all procedures which are involved in establishing, maintaining and controlling the status of inspections, tests and operating capability of items under contract.
- Assure that the procedures contain the following provisions, as required:
  - Identification of the inspection, test, and operating status of structures, systems, and components is known throughout manufacturing and installation.
  - Control of the application and removal of inspection and welding stamps and status indicators such as tags, markings, labels, and stamps.
  - Control of bypassing of required inspection, tests, and other critical operations through documented measures under the cognizance of the supplier QA organization.
  - Identification and control of nonconforming, inoperative or malfunctioning structures, systems or components to prevent inadvertent use.

3.2 The Quality Assurance Representative shall:

- Provide assistance to Energy Supply in reviewing the submitted procedures for adequacy.

QUALITY ASSURANCE MANUAL

SECTION XV

CONTROL OF NONCONFORMING ITEMS

Xcel Energy		XES 2.620 _P01
Energy Supply Policy System		**Revision: 2.0**
TITLE:	*Quality Assurance Manual*	

1.0 PURPOSE
To describe the means by which identification, documentation, evaluation and disposition of non-conformances are controlled within the scope of Energy Supply operations and this Manual.

2.0 POLICY
Non-conformances of specified requirements for purchased products and services, and Non-compliances with established procedures or instructions are identified and reported to the responsible department for evaluation and disposition.

3.0 REQUIREMENTS
Detailed procedures shall be established to define the responsibilities and describe the activities that implement the requirements for control of nonconforming items or conditions.

Personnel shall be qualified and authorized to provide evaluation and disposition of non-conformances. Non-conforming conditions shall be documented on non-conformance reports.

Personnel shall be responsible for identifying non-conformances for both Energy Supply or Plant operations purchased material, processes and procedures.

Non-conformances that impact contracted work under a Suppliers QA program are to be identified to the Supplier for disposition under their corrective action program.

Nonconforming material shall have a means of being segregated from acceptable products and identified as discrepant, and that any further actions are performed under controlled and documented procedures until final disposition by authorized personnel.

Nonconformance reports shall be reviewed for trends and potential need for further management attention and corrective action of apparent generic non-conformances. Supplier resolutions of non-conformances shall be classified as “accept as is” (suitable for use as is), “reject” (replace with new), “repair” (make it suitable for use), or “rework” (restore it to specified requirements). Assure that technical justification for dispositions other than “rework” are submitted for approval, as required. Completed nonconformance dispositions shall be inspected or verified in the same manner as required originally and that records reflect accepted deviations from specified requirements.

QUALITY ASSURANCE MANUAL

SECTION XVI

CORRECTIVE ACTION

Xcel Energy	XES 2.620 _P01
Energy Supply Policy System	**Revision: 2.0**
TITLE: *Quality Assurance Manual*	

1.0 PURPOSE
To describe the means by which Energy Supply identifies and corrects conditions adverse to quality.

2.0 POLICY
Energy Supply activities resulting in conditions adverse to quality are identified and reported for corrective action as necessary to the appropriate levels of Management based on their significance.

3.0 REQUIREMENTS
All personnel have the freedom and the responsibility to ensure that identified conditions adverse to quality are reported promptly under the event assessment process

Initiate appropriate steps to correct identified conditions adverse to quality and prevent recurrence.

Energy Supply leadership is responsible for the completion of corrective actions, verification of the completion of corrective actions and reporting the status to all concerned personnel as appropriate.

Conditions adverse to quality are evaluated against an established set of criteria to determine the level of significance of the nonconformance.

Completed corrective actions shall be reviewed for trends and the need for further management attention. This includes audit findings and any other documents utilized to identify conditions adverse to quality.

Maintain, as quality assurance records, the corrective action documentation that provides objective evidence of quality.

QUALITY ASSURANCE MANUAL

SECTION XVII

QUALITY ASSURANCE RECORDS

Xcel Energy	XES 2.620 _P01
Energy Supply Policy System	**Revision: 2.0**
TITLE: *Quality Assurance Manual*	

1.0 PURPOSE
To describe the means by which Energy Supply maintains records that provide objective evidence of activities affecting quality.

2.0 POLICY
Records that are identifiable, legible and retrievable shall be maintained to furnish evidence of activities affecting Quality.

These Quality Records shall be protected against damage, deterioration, or loss. The requirements and responsibilities shall be documented for record transmittal, distribution, retention, maintenance and disposition.

3.0 REQUIREMENTS
Quality Records will be identified in this Quality Manual section as "records."
A records system shall be established at the earliest practicable time consistent with the schedule of work to be accomplished.

- The records system shall be defined, implemented and enforced in accordance with written procedures.
- Records to be generated, supplied, or maintained by or for Energy Supply, are to be identified in the appropriate generating document.
- Record authentication and validity shall be defined in lower tier procedures.
- Records shall be indexed and the records system shall document information defining retention times and locations.
- The distribution, handling and controlling of Quality Records shall be defined in lower tier procedures.
- Records shall be identified sufficiently to allow for proper indexing and other activities involving the records.
- Records shall be classified for retention purposes with classifications including, but not limited to, lifetime, yearly duration, until revised, etc.
- Methods for correcting records shall be defined in lower tier procedures.
- Records received from external sources shall be complete, identifiable, and controlled during the work process they are being used for as defined by the Energy Supply contractual requirements.
- The method for storing records shall be documented including parameters such as responsibility, description of storage facility, filing system, verification method upon receipt, access control, removal accountability, and control of superseded or additional information.
- Records shall be stored in a manner that will preclude deterioration caused by moisture, temperature, pressure, light, and electromagnetic fields, as appropriate for the types of records.
- Methods shall be established to preclude unauthorized entry to records storage areas, as well as providing replacement of lost or damaged records.

- Storage facilities that are used by Energy Supply for the retention of Quality Records shall meet the requirements defined in Energy Supply Records Management Policy.
- Records can be stored temporarily as defined in lower tier procedures.
- Records can be stored using a dual storage method as defined in lower tier procedures.
- The storage system shall provide defined retrieval mechanisms with defined times based upon record types.

QUALITY ASSURANCE MANUAL

SECTION XVIII

AUDITS

Xcel Energy	XES 2.620 _P01
Energy Supply Policy System	**Revision: 2.0**
TITLE: *Quality Assurance Manual*	

1.0 PURPOSE
To describe the means by which Energy Supply performs oversight of the Business Area programs, procedures, and processes to ensure they are effectively implemented.

2.0 POLICY
Periodic monitoring to verify compliance with programs, procedures, and processes is performed at the discretion of each Business Area through various department self-assessments. Focused program assessments (audits) may also be performed by the Audit Services Department upon request from the Business Area.

3.0 REQUIREMENTS

Evaluation of Business Area compliance with programs and processes is performed as scheduled by the Business Area management. Business Area Management shall contact the Audit Services Department to review and evaluate and schedule focused audits of individual Business Area processes.

QUALITY ASSURANCE MANUAL

Appendix A

Program Terminology & Definitions

Xcel Energy	XES 2.620 _P01
Energy Supply Policy System	Revision: 2.0
TITLE: *Quality Assurance Manual*	

Appendix A

DEFINITIONS (Program execution terminology)

acceptance criteria –specified limits placed on characteristics of an item, process, or service defined in codes, standards, or other requirement documents.

audit - a planned and documented activity performed to determine by investigation, examination, or evaluation of objective evidence the adequacy *of* and compliance with established procedures, instructions, drawings, and other applicable documents, and the effectiveness of implementation. An audit should not be confused with surveillance or inspection activities performed for the sole purpose of process control or product acceptance.

Certificate *of* Conformance - a document signed or otherwise Authenticated by an authorized individual certifying the degree to which items or services meet specified requirements.

characteristic - any property or attribute of an item, process, or service that is distinct, describable, and measurable.

condition adverse to quality - an all-inclusive term used in reference to any of the following: failures, malfunctions, deficiencies, defective items, and non-conformances.

significant condition adverse to quality - is a condition, if uncorrected, could have a serious effect on safety or operability of equipment.

corrective action - measures taken to rectify conditions adverse to quality and, where necessary, to preclude repetition.

design change - any revision or alteration of the technical requirements defined by approved and issued design output documents and approved and issued changes thereto.

design input - those criteria, parameters, bases, or other design requirements upon which detailed final design is based.

design output - drawings, specifications, and other documents used to define technical requirements of structures, systems, components, and computer programs.

design process - technical and management processes that commence with identification of design in- put and that lead to and include the issuance of design output documents.

design, final - approved design output documents and approved changes thereto.

deviation - a departure from specified requirements

document - any written or pictorial information describing, defining, specifying, reporting, or certifying activities, requirements, procedures, or results. A document is not considered to be a Quality Assurance Record until it satisfies the definition of a Quality Assurance Record which are those records required to show evidence that an activity was performed in accordance with the applicable requirements.

guideline - a suggested practice that is not mandatory in programs intended to comply with a standard.

The word **should** denotes an expected action; the word **shall** denotes a required action; the word **may** denotes a permitted action.

inspection - examination or measurement to verify whether an item or activity conforms to specified requirements.

inspector - a person who performs inspection activities to verify conformance to specific requirements.

item - an all-inclusive term used in place of any of the following: appurtenance, assembly, component, equipment, material, module, part, structure, subassembly, subsystem, system, or unit.

measuring and test equipment (M & TE) - devices or systems used to calibrate, measure, gage, test, or inspect in order to control or acquire data to verify conformance to specified requirements.

nonconformance - a deficiency in characteristic, documentation, or procedure that renders the quality of an item or activity unacceptable or indeterminate.

objective evidence - any documented statement of fact, other information, or record, either quantitative or qualitative, pertaining to the quality of an item or activity, based on observations, measurements, or tests which can be verified.

procedure - a document that specifies or describes how an activity is to be performed.

procurement document - purchase requisitions, purchase orders, drawings, contracts, specifications, or instructions used to define requirements for purchase.

purchaser - the organization responsible for establishment of procurement requirements and for issuance or administration, *or* both, of procurement documents.

qualification, personnel - the characteristics or abilities gained through education, training, or experience, as measured against established requirements, such as standards or tests, that qualify an individual to perform a required function.

qualified procedure - an approved procedure that has been demonstrated to meet the specified requirements for its intended purpose.

quality assurance (QA) - all those planned and systematic actions necessary to provide adequate confidence that a structure, system, or component will perform satisfactorily in service.

quality assurance record - a completed document that furnishes evidence of the quality of items and/or activities affecting quality.

receiving - taking delivery of an item at a designated location.

repair - the process of restoring a nonconforming characteristic to a condition such that the capability of an item to function reliably and safely is unimpaired, even though that item still does not conform to the original requirement.

rework - the process by which an item is made to conform to original requirements by completion or correction.

right of access - the right of a Purchaser or designated representative to enter the premises of a Supplier for the purpose of inspection, surveillance, or quality assurance audit.

service - the performance of activities such as design, fabrication, inspection, nondestructive examination, repair, or installation.

special process - a process, the results of which are highly dependent on the control of the process or the skill of the operators, or both, and in which the specified quality cannot be readily determined by inspection or test of the product.

supplier - any individual or organization who furnishes items or services in accordance with the procurement document. An all-inclusive term used in place of any of the following: supplier, seller, supplier, supplier, fabricator, consultant, and their sub-tier levels.

surveillance - the act of monitoring or observing to verify whether an item or activity conforms to specified requirements.

testing - an element of verification for the determination of the capability of an item to meet specified requirements by subjecting the item to a set of physical, chemical, environmental, or operating conditions.

traceability - the ability to trace the history, application, or location of an item and like items or activities by means of recorded identification.

use-as-is - a disposition permitted for a nonconforming item when it can be established that the item is satisfactory for its intended use.

verification - the act of reviewing, inspecting, testing, checking, auditing, or otherwise determining and documenting whether items, processes, services, or documents conform to specified requirements.

waiver - documented authorization to depart from specified requirements.

contract documents – those documents generated for the construction of plant projects for the utility by others. The project documentation requirements are defined in the Capital Projects Records Management Policy. Contract documentation shall be controlled in accordance with this policy and at a minimum must comply with FERC 18CFR125.3 requirements.

Quality Assurance Representative – individual(s) that perform quality, oversight, inspection, and/or observation functions that either reside in the Quality Assurance department or as designated by a Energy Supply Business Area.

XcelEnergy	XES 2.620 _P01
Energy Supply Policy System	Revision: 2.0
TITLE: Quality Assurance Manual	

DEFINITIONS (Program Section terminology)

Organization - The authority and duties of persons and organizations performing activities affecting the quality-related functions of structures, systems, and components shall be clearly established and delineated in writing. These activities include both the performing functions of attaining quality objectives and the quality assurance functions. The quality assurance functions are those of (a) assuring that an appropriate Quality Assurance Program is established and effectively executed and (b) verifying, such as by checking, auditing, and inspection, that, activities affecting the Business Area work functions have been correctly performed.

Quality Assurance Program - The Quality Assurance Program shall provide control over activities affecting the quality of the identified structures, systems, and components, to an extent consistent with their importance to reliability. Activities affecting quality shall be accomplished under suitably controlled conditions. Controlled conditions include the use of appropriate equipment; suitable environmental conditions for accomplishing the activity, such as adequate cleanness; and assurance that all prerequisites for the given activity have been satisfied. The program shall take into account the need for special controls, processes, test equipment, tools, and skills to attain the required quality, and the need for verification of quality by inspection and test. The program shall provide for indoctrination and training of personnel performing activities affecting quality as necessary to assure that suitable proficiency is achieved and maintained.

Design Control - Measures shall be established to assure that the design basis, for those structures, systems, and components are correctly translated into specifications, drawings, procedures, and instructions, including provisions to assure that appropriate quality standards are specified and included in design documents and that deviations from such standards are controlled.

Measures shall also be established for the selection and review for suitability of application of materials, parts, equipment, and processes that are essential to the quality-related functions of the structures, systems and components, and for the identification and control of design interfaces and for coordination among participating design organizations. These measures shall include the establishment of procedures among participating design organizations for the review, approval, release, distribution, and revision of documents involving design interfaces.

The design control measures shall provide for verifying or checking the adequacy of design, such as by the performance of design reviews, by the use of alternate or simplified calculation methods, or by the performance of a suitable testing program.

The verifying or checking process shall be performed by individuals or groups other than those who performed the original design, but who may be from the same organization. Design control measures shall be applied to items such as the following: stress, thermal, hydraulic, compatibility of materials; accessibility for in-service inspection, maintenance, and repair; and delineation of acceptance criteria for inspections and tests. Design changes, including field changes, shall be subject to design control measures commensurate with those applied to the original design and be approved by the organization that performed the original design unless the Energy Supply designates another responsible organization.

Procurement Document Control - Measures shall be established to assure that applicable regulatory requirements, design bases, and other requirements which are necessary to assure adequate quality are suitably included or referenced in the documents for procurement of material, equipment, and services, whether purchased by the applicant or by its suppliers or sub-suppliers. To the extent necessary, procurement documents shall require suppliers or sub-suppliers to provide a Quality Assurance Program consistent with the Energy Supply contract provisions and/or the Energy Supply Quality Assurance Manual.

Instructions, Procedures, and Drawings - Activities affecting quality shall be prescribed by documented instructions, procedures, or drawings, of a type appropriate to the circumstances and shall be accomplished in accordance with these instructions, procedures, or drawings. Instructions, procedures, or drawings shall include appropriate quantitative or qualitative acceptance criteria for determining that important activities have been satisfactorily accomplished.

Document Control - Measures shall be established to control the issuance of documents, such as instructions, procedures, and drawings, including changes thereto, which prescribe all activities affecting quality. These measures shall assure that documents, including changes, are reviewed for adequacy and approved for release by authorized personnel and are distributed to and used at the location where the prescribed activity is performed. Changes to documents shall be reviewed and approved by the same organizations that performed the original review and approval unless the applicant designates another responsible organization.

Control of Purchased Material, Equipment, and Services - Measures shall be established to assure that purchased material, equipment, and services, whether purchased directly or through suppliers and sub-suppliers, conform to the procurement documents. These measures shall include provisions, as appropriate, for source evaluation and selection, objective evidence of quality furnished by the supplier or sub-supplier, and inspection at the supplier or sub-supplier source, and examination of products upon delivery.

Documentary evidence that material and equipment conform to the procurement requirements shall be available at the power plant site prior to installation or use of such material and equipment. This documentary evidence shall be retained as an Energy Supply quality record and shall be sufficient to identify the specific requirements, such as codes, standards, or specifications, met by the purchased material and equipment. The effectiveness of the control of quality by suppliers and sub-suppliers shall be assessed by Energy Supply or a designee at intervals consistent with the importance, complexity, and quantity of the product or services.

Identification and Control of Materials, Parts, and Components - Measures shall be established for the identification and control of materials, parts, and components, including partially fabricated assemblies.
These measures shall assure that identification of the item is maintained by heat number, part number, serial number, or other appropriate means, either on the item or on records traceable to the item, as required throughout fabrication, erection, installation, and use of the item. These identification and control measures shall be designed to prevent the use of incorrect or defective material, parts, and components.

Control of Special Processes - Measures shall be established to assure that special processes, including welding, heat treating, and nondestructive testing, are controlled and accomplished by qualified personnel using qualified procedures in accordance with applicable codes, standards, specifications, criteria, and other special requirements.

Inspection - A program for inspection of activities affecting quality and executed by or for the organization performing the activity to verify conformance with the documented instructions, procedures, and drawings for accomplishing the activity. Such inspections are performed by individuals other than those who performed the activity being inspected. Examinations, measurements, or tests of material or products processed shall be performed for each work operation where necessary to assure quality. If inspection of processed material or products is impossible or disadvantageous, indirect control by monitoring processing methods, equipment, and personnel shall be provided. Both inspection and process monitoring shall be provided when control is inadequate. If mandatory, inspection hold points, which require witnessing or inspecting by an Energy Supply designated representative, the specific hold points shall be indicated in appropriate documents.

Test Control - A test program shall be established to assure that all testing required to demonstrate that structures, systems, and components will perform satisfactorily in service is identified and performed in accordance with written test procedures which incorporate the requirements and
acceptance limits contained in applicable design documents.

The test program shall include, as appropriate, proof tests prior to installation, preoperational tests, and operational tests during power plant operation, of structures, systems, and components. Test procedures shall include provisions for assuring that all prerequisites for the given test have been met, that adequate test instrumentation is available and used, and that the test is performed under suitable environmental conditions. Test results shall be documented and evaluated to assure that test requirements have been satisfied.

Control of Measuring and Test Equipment - Measures shall be established to assure that tools, gages, instruments, and other measuring and testing devices used in activities affecting quality are properly controlled, calibrated, and adjusted at specified periods to maintain accuracy within necessary limits.

Handling, Storage and Shipping - Measures shall be established to control the handling, storage, shipping, cleaning and preservation of material and equipment in accordance with work and inspection instructions to prevent damage or deterioration. When necessary for particular products, special protective environments, such as inert gas atmosphere, specific moisture content levels, and temperature levels, shall be specified and provided.

Inspection, Test, and Operating Status -Measures shall be established to indicate, by the use of markings such as stamps, tags, labels, routing cards, or other suitable means, the status of inspections and tests performed upon individual items of the power plant. These measures shall provide for the identification of items which have satisfactorily passed required inspections and tests, where necessary to preclude inadvertent bypassing of such inspections and tests. Measures shall also be established for indicating the operating status of structures, systems, and components of the power plant, such as by tagging valves and switches, to prevent inadvertent operation.

Nonconforming Materials, Parts, or Components- Measures shall be established to control materials, parts, or components which do not conform to requirements in order to prevent their inadvertent use or installation. These measures shall include, as appropriate, procedures for identification, documentation, segregation, disposition, and notification to affected organizations. Nonconforming items shall be reviewed and accepted, rejected, repaired or reworked in accordance with documented procedures.

Corrective Action -Measures shall be established to assure that conditions adverse to quality, such as failures, malfunctions, deficiencies, deviations, defective material and equipment, and non-conformances are promptly identified and corrected. In the case of significant conditions adverse to quality, the measures shall assure that the cause of the condition is determined and corrective action taken to preclude repetition.

The identification of the significant condition adverse to quality, the cause of the condition, and the corrective action taken shall be documented and reported to appropriate levels of management.

Quality Assurance Records - Sufficient records shall be maintained to furnish evidence of activities affecting quality. The records shall include at least the following: Operating logs and the results of reviews, inspections, tests, audits, monitoring of work performance, and materials analyses. The records shall also include closely-related data such as qualifications of personnel, procedures, and equipment. Inspection and test records shall, as a minimum, identify the inspector or data recorder, the type of observation, the results, the acceptability, and the action taken in connection with any deficiencies noted. Records shall be identifiable and retrievable. Consistent with applicable regulatory requirements, the applicant shall establish requirements concerning record retention, such as duration, location, and assigned responsibility.

Audits - A comprehensive system of planned and periodic self-assessments and audits shall be carried out to verify compliance with all aspects of the quality assurance program and to determine the effectiveness of the program. The self-assessments and audits shall be performed in accordance with the written procedures or check lists by appropriately trained personnel not having direct responsibilities in the areas being audited. Results shall be documented and reviewed by management having responsibility in the area audited. Follow-up action, including re-audit of deficient areas, shall be taken where indicated.

REVISION HISTORY

Date	Revision Number	Change
8/22/2011	1.0	New Document N/A
2-4-14	1.0	Reviewed for self-audit. No Changes needed.
9-25-2018	2.0	Revised to reflect current practices

Approved by:

Date: September 28, 2018

Teresa Mogensen
Sr. Vice President, Energy Supply

NSPM Total Company

	2016 Budget	2016 Actual	2017 Budget	2017 Actual	2018 Budget	2018 Actual	2016-18 Avg	2019 Forecast	2020 Budget	2021 Budget	2022 Budget
Lime	$ 5,349,406	$ 3,445,798	$ 4,946,565	$ 2,814,819	$ 5,996,156	$ 2,855,981	$ 3,038,866	$ 2,980,823	$ 2,871,451	$ 2,889,994	$ 3,143,439
Mercury Sorbent	$ 1,254,590	$ 1,765,804	$ 1,289,039	$ 2,244,636	$ 2,799,841	$ 1,023,096	$ 1,677,845	$ 1,128,347	$ 753,793	$ 670,283	710,582
Ammonia	$ 3,599,948	$ 2,239,485	$ 3,052,081	$ 2,185,677	$ 3,193,316	$ 1,860,611	$ 2,095,258	$ 1,926,305	$ 1,218,195	$ 1,209,138	1,207,667
Sulfuric Acid	$ 725,165	$ 547,890	$ 734,455	$ 647,093	$ 855,406	$ 763,803	$ 652,929	$ 802,561	$ 731,414	$ 672,972	681,230
Other	$ 944,422	$ 637,168	$ 938,951	$ 672,609	$ 933,680	$ 361,645	$ 557,141	$ 1,202,649	$ 1,098,864	$ 1,025,145	1,004,745
Total:	**$ 11,873,531**	**$ 8,636,145**	**$ 10,961,091**	**$ 8,564,834**	**$ 13,778,399**	**$ 6,865,136**	**$ 8,022,038**	**$ 8,040,685**	**$ 6,673,717**	**$ 6,467,532**	**$ 6,747,663**

Minnesota Jurisdiction (Net of Interchange Billings)

	2016 Budget	2016 Actual	2017 Budget	2017 Actual	2018 Budget	2018 Actual	2016-18 Avg	2019 Forecast	2020 Budget	2021 Budget	2022 Budget
Lime	$ 3,930,377	$ 2,543,756	$ 3,643,681	$ 2,073,419	$ 4,430,393	$ 2,110,205	$ 2,242,460	$ 2,176,654	$ 2,096,788	$ 2,110,329	$ 2,295,399
Mercury Sorbent	$ 921,787	$ 1,303,551	$ 949,517	$ 1,653,418	$ 2,068,725	$ 755,937	$ 1,237,635	$ 823,941	$ 550,434	$ 489,453	518,881
Ammonia	$ 2,644,995	$ 1,653,232	$ 2,248,188	$ 1,609,988	$ 2,359,453	$ 1,374,754	$ 1,545,991	$ 1,406,625	$ 889,549	$ 882,936	881,862
Sulfuric Acid	$ 532,801	$ 404,463	$ 541,006	$ 476,654	$ 632,036	$ 564,353	$ 481,823	$ 586,045	$ 534,093	$ 491,417	497,447
Other	$ 693,898	$ 470,370	$ 691,639	$ 495,449	$ 689,870	$ 267,209	$ 411,010	$ 878,197	$ 802,412	$ 748,581	733,684
Total:	**$ 8,723,858**	**$ 6,375,373**	**$ 8,074,032**	**$ 6,308,929**	**$ 10,180,477**	**$ 5,072,458**	**$ 5,918,920**	**$ 5,871,462**	**$ 4,873,276**	**$ 4,722,716**	**$ 4,927,273**

Northern States Power Company

Chemical Costs by Plant and Type

PUBLIC DOCUMENT
NOT-PUBLIC DATA HAS BEEN EXCISED

Major Chemical Usage	2016 Budget	2016 Actual	2017 Budget	2017 Actual	2018 Budget	2018 Actuals	2016-18 Avg	2019 Forecast	2020 Budget	2021 Budget	2022 Budget
	[PROTECTED DATA BEGINS										
Lime (tons)											
AS King Plant											
Sherco Unit 3											
Red Wing Plant											
Wilmarth Plant											
Sub-total:											
Mercury Sorbent (tons)											
AS King Plant											
Sherco Plant											
Sub-total:											
Ammonia (tons)											
AS King Plant											
Black Dog Plant											
High Bride Plant											
Riverside Plant											
Sub-total:											

Major Chemical Price ($/ton)	2016 Budget	2016 Actual	2017 Budget	2017 Actual	2018 Budget	2018 Actuals	2016-18 Avg	2019 Forecast	2020 Budget	2021 Budget	2022 Budget
Lime											
AS King Plant											
Sherco Unit 3 (Unallocated rate)											
Red Wing Plant											
Wilmarth Plant											
Mercury Sorbent											
AS King Plant											
Sherco Plant											
Ammonia											
AS King Plant											
Black Dog Plant											
High Bride Plant											
Riverside Plant											

Overall Cost	2016 Budget	2016 Actual	2017 Budget	2017 Actual	2018 Budget	2018 Actuals	2016-18 Avg	2019 Forecast	2020 Budget	2021 Budget	2022 Budget
Lime											
AS King Plant											
Sherco Unit 3											
Red Wing Plant											
Wilmarth Plant											
Sub-total:											
Mercury Sorbent											
AS King Plant											
Sherco Plant											
Sub-total:											
Ammonia											
AS King Plant											
Black Dog Plant											
High Bride Plant											
Riverside Plant											
Sub-total:											
Other Chemicals											
AS King Plant											
Black Dog Plant											
Crowned Ridge Wind											
High Bride Plant											
Riverside Plant											
Sherco Plant (Allocated)											
Angus Anson Plant											
Blue Lake Plant											
Lake Benton Wind											
Nobles Wind											
Red Wing Plant											
St. Anthony Hydro											
Wilmarth Plant											
Sub-total:											
Total Chemical (Allocated)											

PROTECTED DATA ENDS]

PUBLIC DOCUMENT
NOT-PUBLIC DATA HAS BEEN EXCISED

Overall Cost By Plant ($1000)	2016 Budget	2016 Actual	2017 Budget	2017 Actual	2018 Budget	2018 Actuals	2016-18 Avg	2019 Forecast	2020 Budget	2021 Budget	2022 Budget
	[PROTECTED DATA BEGINS										
AS King Plant											
Black Dog Plant											
Crowned Ridge Wind											
High Bride Plant											
Riverside Plant											
Sherco Plant (Allocated)											
Angus Anson Plant											
Blue Lake Plant											
Lake Benton Wind											
Nobles Wind											
Red Wing Plant											
St. Anthony Hydro											
Wilmarth Plant											
Total Chemical (Allocated)											

PROTECTED DATA ENDS]

2019						
Unit	MW	Start	End	Days	Driver	Scope
HighBridge8	265	1/14/2019	2/3/2019	21	Hot Gas Path	Hot Gas Path
SherCo2	712	1/21/2019	1/31/2019	11	Install Torsional Test Instrumentation and Boroscope IP Turbine	Install Torsional Test Instrumentation and Boroscope IP Turbine
Wilmarth1	9	1/22/2019	1/25/2019	4	Boiler Clean	Boiler Clean
Wilmarth2	9	1/29/2019	2/1/2019	4	Boiler Clean	Boiler Clean
RedWing1	9	2/10/2019	2/17/2019	8	Boiler Inspection	Boiler Inspection
SherCo2	712	2/23/2019	4/29/2019	66	HP/IP, Turbine, valves, generator, AVR, boiler	HP/IP, Turbine, valves, generator, AVR, boiler
RedWing1	9	2/24/2019	3/13/2019	18	Boiler clean/inspect/repair, Gen Rewind, Retube Condenser, Air heaters	Boiler clean/inspect/repair, Gen Rewind, Retube Condenser, Air heaters
InverHills1	47	3/2/2019	4/28/2019	58	Controls Upgrade and Combustion Inspection	Controls Upgrade and Combustion Inspection
RedWing2	9	3/3/2019	3/16/2019	14	Boiler clean/inspect/repair, Air Heaters	Boiler clean/inspect/repair, Air Heaters
SherCo3	900	3/25/2019	3/29/2019	5	Transmission Related / State Required Boiler Internal Inspection	Transmission Related / State Required Boiler Internal Inspection
BlueLake1	39	4/1/2019	6/9/2019	70	Blue Lake Tank 35 API 653 Internal/External Inspection	Blue Lake Tank 35 API 653 Internal/External Inspection
BlueLake2	39	4/1/2019	6/9/2019	70	Blue Lake Tank 35 API 653 Internal/External Inspection	Blue Lake Tank 35 API 653 Internal/External Inspection
BlueLake3	36	4/1/2019	6/9/2019	70	Blue Lake Tank 35 API 653 Internal/External Inspection	Blue Lake Tank 35 API 653 Internal/External Inspection
BlueLake4	39	4/1/2019	6/9/2019	70	Blue Lake Tank 35 API 653 Internal/External Inspection	Blue Lake Tank 35 API 653 Internal/External Inspection
Wheaton1	44	4/1/2019	4/12/2019	12	Summer prep	Summer prep
Wheaton2	55	4/1/2019	4/12/2019	12	Summer prep	Summer prep
BlackDog5	282	4/7/2019	4/16/2019	10	Summer Prep	Summer Prep
BlackDog6	212	5/12/2019	5/18/2019	7	U6 CT Borecope, other minor inspections	U6 CT Borecope, other minor inspections
HighBridge7	265	5/16/2019	5/29/2019	14	Summer prep	Summer prep
HighBridge8	265	5/16/2019	5/24/2019	9	Summer Prep	Summer Prep
Wilmarth2	9	9/7/2019	9/14/2019	8	Boiler Clean	Boiler Clean
Wilmarth1	9	9/8/2019	9/15/2019	8	Boiler Clean	Boiler Clean
Wheaton1	44	9/9/2019	9/20/2019	12	Winter prep	Winter prep
Wheaton2	55	9/9/2019	9/20/2019	12	Winter prep	Winter prep
InverHills2	47	9/14/2019	10/13/2019	30	TR1 IVH 1-2 GSU Transformer Leak Repair	TR1 IVH 1-2 GSU Transformer Leak Repair
Wheaton3	44	9/23/2019	10/4/2019	12	Winter prep	Winter prep
Wheaton4	47	9/23/2019	10/4/2019	12	Winter prep	Winter prep
Wheaton6	48	10/7/2019	10/18/2019	12	Winter Prep	Winter Prep
Riverside10	227	10/14/2019	10/18/2019	5	Fall Condenser Cleaning	Fall Condenser Cleaning
BlackDog5	282	10/27/2019	11/6/2019	11	Winter prep	Winter prep
SherCo1	712	10/28/2019	11/1/2019	5	State Required Boiler Internal Inspection	State Required Boiler Internal Inspection
HighBridge7	265	11/11/2019	11/15/2019	5	Fall Condenser Cleaning	Fall Condenser Cleaning
HighBridge8	265	11/11/2019	11/15/2019	5	Fall Condenser Cleaning	Fall Condenser Cleaning
2020						
Unit	MW	Start	End	Days	Driver	Scope
Wilmarth1	9	1/4/2020	1/14/2020	11	Boiler Clean/Inspect/Repair	Boiler Clean/Inspect/Repair
Wilmarth2	9	1/5/2020	1/15/2020	11	Boiler Clean/Inspect/Repair	Boiler Clean/Inspect/Repair
HighBridge7	265	2/8/2020	3/24/2020	46	U7 CT Major Overhaul	U7 CT Major Overhaul
RedWing1	9	2/9/2020	2/29/2020	21	Boiler clean/inspect/repair, Burner Management System, Traveling Grate Bed	Boiler clean/inspect/repair, Burner Management System, Traveling Grate Bed
SherCo3	900	2/15/2020	5/4/2020	80	LP Turbine, valves, boiler, 37 FWHS,BFPT, Controls, APH Baskets	LP Turbine, valves, boiler, 37 FWHS,BFPT, Controls, APH Baskets
RedWing2	9	2/16/2020	3/7/2020	21	Fuel chutes, Boiler clean/inspect/repair, Gen Rewind, Burner Management System	Fuel chutes, Boiler clean/inspect/repair, Gen Rewind, Burner Management System
BlackDog6	212	2/23/2020	2/29/2020	7	Summer Prep	Summer Prep
HighBridge8	265	2/29/2020	3/13/2020	14	Summer prep	Summer prep
BlackDog5	282	3/29/2020	4/7/2020	10	Summer Prep	Summer Prep
Wheaton1	44	4/6/2020	4/17/2020	12	Summer prep	Summer prep
Wheaton2	55	4/6/2020	4/17/2020	12	Summer prep	Summer prep
Riverside9	227	4/11/2020	5/17/2020	37	Combustion Turbine Major	Combustion Turbine Major
Riverside10	227	4/18/2020	4/27/2020	10	Summer Prep	Summer Prep
Wheaton3	44	4/20/2020	5/1/2020	12	Summer prep	Summer prep
Wheaton4	47	4/20/2020	5/1/2020	12	Summer prep	Summer prep
Wheaton6	48	5/4/2020	5/15/2020	12	Summer prep	Summer prep
Wilmarth2	9	9/13/2020	9/20/2020	8	Boiler Clean	Boiler Clean
Wheaton1	44	9/14/2020	9/25/2020	12	Winter Prep	Winter Prep
Wheaton2	55	9/14/2020	9/25/2020	12	Winter Prep	Winter Prep
Wilmarth1	9	9/14/2020	9/21/2020	8	Boiler Clean	Boiler Clean
Wheaton3	44	9/28/2020	10/9/2020	12	Winter Prep	Winter Prep
Wheaton4	47	9/28/2020	10/9/2020	12	Winter Prep	Winter Prep
HighBridge7	265	10/5/2020	10/9/2020	5	Fall Condenser Cleaning	Fall Condenser Cleaning
HighBridge8	265	10/5/2020	10/9/2020	5	Fall Condenser Cleaning	Fall Condenser Cleaning
Wheaton6	48	10/12/2020	10/23/2020	12	Winter Prep	Winter Prep
BlackDog6	212	10/19/2020	11/1/2020	14	Warranty Inspection	Warranty Inspection
Riverside10	227	11/9/2020	11/13/2020	5	Fall Condenser Cleaning	Fall Condenser Cleaning
Riverside9	227	11/9/2020	11/13/2020	5	Fall Condenser Cleaning	Fall Condenser Cleaning
BlackDog5	282	11/16/2020	11/22/2020	7	Winter Prep	Winter Prep
2021						
Unit	MW	Start	End	Days	Driver	Scope
Wilmarth1	9	1/10/2021	1/20/2021	11	Boiler Clean/Inspect/Repair	Boiler Clean/Inspect/Repair
Wilmarth2	9	1/11/2021	1/21/2021	11	Boiler Clean/Inspect/Repair	Boiler Clean/Inspect/Repair
RedWing1	9	1/31/2021	4/16/2021	76	Fuel Chutes, Boiler clean/inspect/repair, Turbine	Fuel Chutes, Boiler clean/inspect/repair, Turbine
RedWing2	9	2/14/2021	3/6/2021	21	Boiler clean/inspect/repair, Replace Boiler Rear Wall	Boiler clean/inspect/repair, Replace Boiler Rear Wall
ASKing1	511	2/19/2021	5/11/2021	82	Boiler cleaning, Superheat Section Replacement, Generator, Turbine Valves	Boiler cleaning, Superheat Section Replacement, Generator, Turbine Valves
SherCo1	712	2/20/2021	4/19/2021	59	Boiler overhaul,turbine valves	Boiler overhaul,turbine valves
BlackDog5	282	3/7/2021	3/16/2021	10	Summer Prep	Summer Prep
SherCo2	712	3/26/2021	4/11/2021	17	Dual Unit Stack Inspections/Repairs	Dual Unit Stack Inspections/Repairs
AngusAnson3	90	4/3/2021	4/11/2021	9	Generator Breaker Replacement	Generator Breaker Replacement
Wheaton1	44	4/5/2021	4/16/2021	12	Summer prep	Summer prep
Wheaton2	55	4/5/2021	4/16/2021	12	Summer prep	Summer prep
Riverside10	227	4/12/2021	5/9/2021	28	CT Major	CT Major
Riverside9	227	4/19/2021	4/28/2021	10	Summer Prep	Summer Prep
Wheaton3	44	4/19/2021	4/30/2021	12	Summer prep	Summer prep
Wheaton4	47	4/19/2021	4/30/2021	12	Summer prep	Summer prep
HighBridge7	265	5/3/2021	5/12/2021	10	Summer prep	Summer prep
Unit	MW	Start	End	Days	Driver	Scope
HighBridge8	265	5/3/2021	5/12/2021	10	Summer prep	Summer prep
Wheaton6	48	5/3/2021	5/14/2021	12	Summer prep	Summer prep
BlackDog6	212	5/23/2021	5/29/2021	7	Borescope Inspection	Borescope Inspection
Wilmarth2	9	9/11/2021	9/24/2021	14	Boiler Clean	Boiler Clean
Wilmarth1	9	9/12/2021	9/25/2021	14	Boiler Clean	Boiler Clean
Wheaton1	44	9/13/2021	9/24/2021	12	Winter Prep	Winter Prep
Wheaton2	55	9/13/2021	9/24/2021	12	Winter Prep	Winter Prep
Wheaton3	44	9/27/2021	10/8/2021	12	Winter Prep	Winter Prep
Wheaton4	47	9/27/2021	10/8/2021	12	Winter Prep	Winter Prep
HighBridge7	265	10/4/2021	10/8/2021	5	Fall Condenser Cleaning	Fall Condenser Cleaning
HighBridge8	265	10/4/2021	10/8/2021	5	Fall Condenser Cleaning	Fall Condenser Cleaning
Wheaton6	48	10/11/2021	10/22/2021	12	Winter Prep	Winter Prep
Riverside10	227	10/18/2021	10/22/2021	5	Fall Condenser Cleaning	Fall Condenser Cleaning
Riverside9	227	10/18/2021	10/22/2021	5	Fall Condenser Cleaning	Fall Condenser Cleaning
AngusAnson2	90	10/23/2021	4/22/2022	182	CT Major	CT Major
BlackDog5	282	11/1/2021	11/7/2021	7	Winter Prep	Winter Prep
BlueLake7	150	11/8/2021	12/19/2021	42	Control System replacement	Control System replacement
BlueLake8	150	11/8/2021	12/19/2021	42	Control system replacement	Control system replacement

2022						
Unit	MW	Start	End	Days	Driver	Scope
Wilmarth2	9	1/8/2022	1/18/2022	11	Boiler Clean/Inspect/Repair	Boiler Clean/Inspect/Repair
Wilmarth1	9	1/9/2022	1/19/2022	11	Boiler Clean/Inspect/Repair	Boiler Clean/Inspect/Repair
RedWing1	9	1/16/2022	3/18/2022	62	Boiler Clean/Inspect/Repair	Boiler Clean/Inspect/Repair
RedWing2	9	1/16/2022	3/4/2022	48	Boiler Clean/Inspect/Repair	Boiler Clean/Inspect/Repair
BlueLake7	150	3/5/2022	4/17/2022	44	Exhaust Silencer & Air Filter Replacement	Exhaust Silencer & Air Filter Replacement
BlackDog6	212	3/28/2022	4/3/2022	7	Borescope Inspection	Borescope Inspection
HighBridge7	265	4/4/2022	4/13/2022	10	Summer Prep	Summer Prep
HighBridge8	265	4/4/2022	4/13/2022	10	Summer Prep	Summer Prep
Wheaton1	44	4/4/2022	4/15/2022	12	Summer Prep	Summer Prep
Wheaton2	55	4/4/2022	4/15/2022	12	Summer Prep	Summer Prep
InverHills3	47	4/9/2022	5/20/2022	42	Controls Upgrade	Controls Upgrade
InverHills4	47	4/9/2022	5/20/2022	42	Controls Upgrade	Controls Upgrade
Wheaton4	47	4/18/2022	4/29/2022	12	Summer Prep	Summer Prep
AngusAnson4	147	4/23/2022	5/15/2022	23	Hot Gas Path	Hot Gas Path
Riverside10	227	4/25/2022	5/4/2022	10	Summer Prep	Summer Prep
Riverside9	227	4/25/2022	5/4/2022	10	Summer Prep	Summer Prep
SherCo2	712	4/30/2022	5/23/2022	23	Minor Unit Inspection, Cleaning	Minor Unit Inspection, Cleaning
Wheaton6	48	5/2/2022	5/13/2022	12	Summer Prep	Summer Prep
BlackDog5	282	5/15/2022	5/21/2022	7	Summer Prep	Summer Prep
Wilmarth2	9	9/10/2022	9/25/2022	16	Boiler Clean	Boiler Clean
Wilmarth1	9	9/11/2022	9/26/2022	16	Boiler Clean	Boiler Clean
Wheaton1	44	9/12/2022	9/23/2022	12	Winter Prep	Winter Prep
Wheaton2	55	9/12/2022	9/23/2022	12	Winter Prep	Winter Prep
BlackDog5	282	9/24/2022	12/2/2022	70	Turbine HP, Turbine LP, Turbine Valves, Unit 5 Hot Gas Path	Turbine HP, Turbine LP, Turbine Valves, Unit 5 Hot Gas Path
Wheaton4	47	9/26/2022	10/7/2022	12	Winter Prep	Winter Prep
HighBridge7	265	10/3/2022	10/7/2022	5	Fall Condenser Cleaning	Fall Condenser Cleaning
HighBridge8	265	10/3/2022	10/7/2022	5	Fall Condenser Cleaning	Fall Condenser Cleaning
ASKing1	511	10/8/2022	10/25/2022	18	Boiler cleaning	Boiler cleaning
Wheaton6	48	10/10/2022	10/21/2022	12	Winter Prep	Winter Prep
Riverside10	227	10/24/2022	10/28/2022	5	Fall Condenser Cleaning	Fall Condenser Cleaning
Riverside9	227	10/24/2022	10/28/2022	5	Fall Condenser Cleaning	Fall Condenser Cleaning

Location and Capacity Rating

Plant Description	Address	Unit Type	Net Max Capacity (NMC)	Net Dependable Capacity (NDC)	Net Max Capacity (NMC)	Net Dependable Capacity (NDC)	Net Max Capacity (NMC)	Net Dependable Capacity (NDC)	Net Max Capacity (NMC)	Net Dependable Capacity (NDC)
			2016	**2016**	**2017**	**2017**	**2018**	**2018**	**2019**	**2019**
Base Load Coal										
Allen S King 1	1103 King Plant Road, Bayport MN 55003	FC/Steam	511.0	511.0	511.0	511.0	511.0	511.0	511.0	511.0
Sherburne 1,2,3*	13999 Industrial Blvd., Becker MN 55308	FC/Steam	1879.0	1879.0	1879.0	1879.0	1879.0	1879.0	1879.0	1879.0
Intermediate										
Black Dog 2	1400 Black Dog Road, Burnsville, MN 55337	Gas CC	109.0	110.0	117.0	117.0	117.0	117.0	117.0	117.0
Black Dog 5**	1400 Black Dog Road, Burnsville, MN 55337	FC/Steam	189.0	172.0	181.0	165.0	181.0	165.0	181.0	165.0
High Bridge 7,8**	501 Shepard Road, St. Paul MN. 55102	Gas CC	374.0	312.0	370.0	304.0	370.0	304.0	370.0	304.0
High Bridge 9	501 Shepard Road, St. Paul MN. 55102	FC/Steam	236.0	226.0	236.0	226.0	236.0	226.0	236.0	226.0
Riverside 9,10**	3100 Marshall Street NE, Minneapolis, MN 55418	Gas CC	328.0	310.0	342.0	294.0	342.0	294.0	342.0	294.0
Riverside 7	3100 Marshall Street NE, Minneapolis, MN 55418	FC/Steam	160.0	160.0	160.0	160.0	160.0	160.0	160.0	160.0
Biomass / RDF										
Red Wing 1,2	801 E 5th Street, Redwing MN 55066	RDF/Steam	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0
Wilmarth 1,2	800 Summit Ave, Mankato MN 56001	RDF/Steam	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0
Wind										
Border Wind	5190 107th Street NE, Rolla, ND 58367	Wind	150.0	22.1	148.0	23.1	148	23.1	148.0	22.5
Courtenay Wind	1401 Hwy 9 SE, Courtenay, ND 53426	Wind	0.0	0.0	195.0	30.4	195	30.4	195.0	29.6
Grand Meadow	228 Industrial Park Dr, Dexter, MN 55926	Wind	100.5	16.0	100.5	15.7	100.5	15.7	100.5	15.3
Nobles Wind	19469 McCall Avenue, Reading, MN 56165	Wind	201.0	32.0	200.0	31.2	200	31.2	200.0	30.4
Pleasant Valley Wind	228 Industrial Park Dr, Dexter, MN 55926	Wind	200.0	29.4	196.0	30.6	196	30.6	196.0	29.8
Hydro Production										
Hennepin ISD**	31 3rd Ave SE, Minneapolis MN	Hydro	13.9	6.3	13.9	6.3	13.9	6.3	13.9	6.3
St Croix Falls**	St Croix Falls, WI	Hydro	25.9	15.0	25.9	15.0	25.9	15.0	25.9	15.0
Peaking										
Angus Anson 2,3,4**	7100 E Rice Street, Sioux Falls, SD 57110	CT	386.0	327.0	386.0	327.0	386.0	327.0	386.0	327.0
Black Dog 6**	1400 Black Dog Road, Burnsville, MN 55337	CT	0.0	0.0	0.0	0.0	0	0	228.0	212.0
Blue Lake 1-4, 7,8**	1200 70th Street, Shakopee, MN 55379	CT	545.0	453.0	545.0	453.0	545.0	453.0	545.0	453.0
Granite City 1,2,3,4**	Hwy 10 & East St Germain, St Cloud MN 56302	CT	64.0	52.0	64.0	52.0	64.0	52.0	64.0	52.0
Inver Hills 1,2,3,4,5,6**	3185 117th Street, Inver Grove Heights, MN 55077	CT	371.0	282.0	371.0	282.0	371.0	282.0	371.0	282.0
Diesel Engine Peaking										
Inver Hills	3185 117th Street, Inver Grove Heights, MN 55077	Diesel	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6
United Hospital	6300 Olson Memorial Hwy., Golden Valley, MN 55427	Diesel	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8
No generation at these locations										
Minn Valley	Hwy 212 East, Granite Falls, MN 56241	-								
Lake Benton 75	1740 US Hwy 14, Lake Benton, MN 56149	-								
Lake Benton Wnd	1740 US Hwy 14, Lake Benton, MN 56149	-								
West Faribault	Co Rd 18 & Hwy 65, Faribault MN 55021	-								
Wind Storage	800 S Kniss Ave, Luverne, MN 56156	-								
Key City 2,3,4	PO Box 1090, Mankato MN 56002	-								

* Sherco 3 capacity ratings are shown as Xcel Energy allocation
** Capacity rating is for summer dispatch

Monthly Generation

Net kWh	2016											
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Base Load Coal												
Allen S. King 1	300475000	182190000	158953000	-4684000	137056800	236699000	187353000	271194000	260514000	326324000	323364880	336133000
Sherburne Co. 1	390223000	321229000	289975000	289170000	316803000	376279000	352375000	386281000	332333000	348004000	284098000	361537000
Sherburne Co. 2	393062000	208763000	-1399000	-1156000	-5977000	70863000	319256000	348312000	306160000	140728000	294657000	419713000
Sherburne Co. 3*	283408000	250116000	268509000	256031000	274545000	272550000	300377000	320373000	299209000	310456000	296356000	324468000
Sub-Total:	1367168000	962298000	716038000	539361000	722427800	956391000	1159361000	1326160000	1198216000	1125512000	1198475880	1441851000
Intermediate												
Black Dog 5/2	99404210	116542410	79175000	108571260	154936060	126054960	137332000	158727000	70298000	-559810	52771660	41204880
High Bridge 7	92188000	93719000	89478000	67631000	48918000	59355000	75329000	89058000	33535000	33787000	46341000	30352000
High Bridge 8	44597000	11258000	83508000	72242000	44233000	47436000	70486000	79881000	25602000	39298000	53814000	29019000
High Bridge 9	68057000	53647000	93343000	77631000	53677000	62386000	89242000	105273000	35009000	40323000	54697000	31177000
Riverside 7	90907000	87149000	57789000	83169000	70340000	74195000	86809000	107484000	34381000	54741000	49119000	42590000
Riverside 9	101749000	85826000	50203000	76229000	80522000	66692000	81873000	97452000	27798000	49094000	48190000	43072000
Riverside 10	89160000	96297000	62676000	79315000	48291000	69917000	77545000	99373000	33704000	47746000	43733000	37451000
Sub-Total:	586062210	544438410	516172000	564788260	500917060	506035960	618616000	737248000	260327000	264429190	348665660	254865880
Biomass / RDF												
Red Wing 1	5893420	2054210	5992210	5371410	6180960	5871300	4376770	4466190	4811550	5346560	5782750	6016120
Red Wing 2	6127750	2842620	6714340	6415350	5347490	6346400	5516590	5784690	4022650	5288710	6338890	5229690
Wilmarth 1	958300	4994860	5950920	5329970	5426410	4472050	5486980	5005260	4205300	5046210	3628110	5696710
Wilmarth 2	2133000	4798980	5604260	5266390	5383170	4348560	5356860	4474400	4056580	5086740	0	0
Sub-Total:	15112470	14690670	24261730	22383120	22338030	21038310	20737200	19730540	17096080	20768220	15749750	16942520
Wind												
Border	43432960	42791800	50623180	63282660	53981730	47719080	36789600	38431270	56623010	61941180	60845690	65763650
Courtenay	86382030	81303280	68576910	66527210	61621430	69473740	59963800	43770900	34745340	61504890	77564860	73570440
Grand Meadow	27993320	31221690	28636580	37141500	21761560	20361290	15515550	11475670	24966390	26923060	26145670	38790330
Nobles	59668790	64491530	69559680	84260410	53137760	49059200	38754170	29469830	54334900	67311160	70557680	81010620
Pleasant Valley	72151550	74516720	72280750	87589810	58348010	56977820	45391930	35644910	70351000	70978710	67950940	90687920
Sub-Total:	289628650	294325020	289677100	338801590	248850490	243591130	196415050	158792580	241020640	288659000	303064840	349822960
Hydro Production												
St. Anthony Falls All	5953000	7429000	8221000	8453000	8169000	8261000	7016000	8487000	8206000	8061000	8088000	7270000
St. Croix Falls All	7562000	7377000	13444000	15006000	14071000	11794000	10947000	15158000	14806000	14170000	12538000	12334000
Sub-Total:	13515000	14806000	21665000	23459000	22240000	20055000	17963000	23645000	23012000	22231000	20626000	19604000
Peaking												
Angus Anson 2	38340	-135970	-114590	17120	1145010	179320	5479080	6639000	270670	1144960	-110550	462600
Angus Anson 3	41320	-135970	-114000	1103850	1947680	-137820	3101800	2639000	346700	1101020	-110550	263010
Angus Anson 4	-247300	-262610	-271880	9522000	7165000	-140	-140	-5790	14148570	10856050	-110550	-155860
Black Dog 6	0	0	0	0	0	0	0	0	0	0	0	0
Blue Lake 1	-74500	-61500	41500	-43000	-33000	-30500	200500	186500	-38500	-61500	-44500	-88000
Blue Lake 2	-74500	-61500	-48500	-43000	-33000	-30500	345500	294500	-38500	-61500	-45500	-63000
Blue Lake 3	-57500	-46500	-46500	-33500	-34500	-26500	281000	152000	0	0	0	0
Blue Lake 4	-56500	-46500	-46500	-33500	-34500	-26500	341000	137000	0	0	0	0
Blue Lake 7	-109000	-73000	132000	5624000	14052000	12798000	24693000	28635000	4609000	6596000	-95000	-107000
Blue Lake 8	-200000	70000	-25000	6136000	11797000	13441000	25555000	34112000	5383000	4274000	-150000	-156000
Granite City 1	-18960	-16020	-14000	-12380	-10160	-8480	67620	-8180	-7080	-7860	-12180	-18240
Granite City 2	-18960	-16020	-14000	-12380	-10160	-8480	75620	-8180	-7080	-7860	-12180	-18240
Granite City 3	-18960	-16020	-14000	-12380	-10160	-8480	71620	-8180	-7080	-7860	-12180	-18240
Granite City 4	-18960	-16020	-14000	-12380	-10160	-8480	57620	-8180	-7080	-7860	-12180	-18240
Inver Hills 1	-105000	-89000	-82000	-73000	364000	322000	1170000	2247000	-48000	48000	-22000	-79000
Inver Hills 2	-34000	-21000	-24000	-19000	-14000	749000	848000	851000	-11000	-15000	23000	-7000
Inver Hills 3	-44000	-25000	182000	-27000	-26000	166000	1208000	944000	-29000	-28000	4000	-22000
Inver Hills 4	-39000	-28000	-28000	-23000	-20000	286000	1788000	2229000	-15000	26000	-23000	-40000
Inver Hills 5	-40000	-21000	-3000	-22000	-21000	257000	1261000	1376000	-22000	-22000	49000	-40000
Inver Hills 6	-39000	-36000	-19000	-21000	-17000	214000	1272000	970000	-15000	-19000	13000	-15000
Sub-Total:	-1116480	-1037630	-523470	22015450	36197050	28126440	67816220	81373490	24512620	23807590	-671370	-120210
TOTAL:	2270369850	1829520470	1567290360	1510808420	1552970430	1775237840	2080908470	2346949610	1764184340	1745407000	1885910760	2082966150

*Only Xcel Portion

Monthly Generation

Net kWh	2017											
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Base Load Coal												
Allen S. King 1	353510000	292454860	147255540	68123000	289990390	181603000	267663100	253888000	195011000	265482000	312942000	285424000
Sherburne Co. 1	376332000	285488000	332421000	333196000	311088000	286405000	385089000	331091000	359996000	310424000	394980000	353969000
Sherburne Co. 2	382561000	301121000	412220000	158729000	375004000	386463000	376986000	412415000	356920000	304214000	386254000	384995000
Sherburne Co. 3*	305340000	190972000	0	0	0	152452000	294273000	301533000	199495000	214114000	243005000	267351000
Sub-Total:	1417743000	1070035860	891896540	560048000	976082390	1006923000	1324011100	1298927000	1111422000	1094234000	1337181000	1291739000
Intermediate												
Black Dog 5/2	47810960	31135170	63565270	92002370	64520080	90862260	98038370	59215250	66287510	75563990	2096170	-1299020
High Bridge 7	68396000	37689000	83312000	53448000	70172000	58918000	74114000	46420000	44192000	35490000	59926000	89782000
High Bridge 8	59368000	14907000	73621000	40328000	55100000	47904000	58559000	34606000	35910000	34653000	36770000	62478000
High Bridge 9	66219000	27697000	82955000	52888000	71959000	62572000	78410000	47458000	48512000	40378000	51515000	77404000
Riverside 7	73407000	31698000	82564000	84463000	31320000	72550000	87491000	53660000	4012000	0	0	33623000
Riverside 9	75148000	40150000	81703000	78500000	22381000	62607000	79633000	51733000	2866000	0	0	35356000
Riverside 10	71683000	22584000	79016000	79249000	32344000	68089000	77781000	45364000	3590000	0	0	35458000
Sub-Total:	462031960	205860170	546736270	480878370	347796080	463502260	554026370	338456250	205369510	186084990	150307170	332801980
Biomass / RDF												
Red Wing 1	6009920	986560	0	4238630	6277760	6098280	5948810	6084490	6086090	6417880	6382270	5933020
Red Wing 2	5821090	987250	6474780	6575020	5936430	5828930	5225310	5694630	4459660	324890	0	0
Wilmarth 1	530000	2311720	0	0	0	3574530	5523480	5087000	4222500	4695890	3955920	5118400
Wilmarth 2	0	2918420	5213300	5593400	3492050	5544000	5612570	5231470	4956850	4946600	4192220	4997010
Sub-Total:	12361010	7203950	11688080	16407050	15706240	21045740	22310170	22097590	19725100	16385260	14530410	16048430
Wind												
Border	57445830	52793480	57161710	52530980	43570080	50335000	46440840	29715530	59287970	62675920	62675920	67230050
Courtenay	78425830	77740110	74715510	61222920	69412640	54216440	54861100	35678470	39714120	60305780	69652530	53944390
Grand Meadow	24354750	34461150	34843950	27370240	26833010	21365220	11532780	14501220	22334080	33723640	32139130	29506470
Nobles	58312110	70411460	78488530	70331670	61190340	46032890	32040570	25501130	48660020	72403400	69692510	66962170
Pleasant Valley	67463340	84175310	83346810	71919290	71176720	58458000	37140740	44118510	67225510	85974970	83892090	78055510
Sub-Total:	286001860	319581510	328556510	283375100	272182790	230407550	182016030	149514860	237221700	315083710	318052180	295698590
Hydro Production												
St. Anthony Falls All	5396000	6057000	6947000	8300000	8070000	7229000	4335000	2667000	6822000	5997000	7291000	4570000
St. Croix Falls All	11307000	9399000	12186000	11427000	11182000	10279000	11437000	10843000	10310000	10675000	-45000	2892000
Sub-Total:	16703000	15456000	19133000	19727000	19252000	17508000	15772000	13510000	17132000	16672000	7246000	7462000
Peaking												
Angus Anson 2	-152680	-121360	-41880	-100270	783000	-80050	3836640	1025800	1835000	79700	62630	-157820
Angus Anson 3	-152680	-121360	-37030	-100270	767240	300530	1955980	697630	720000	-105080	86180	-157820
Angus Anson 4	-119810	-99070	-167900	6031990	2903710	6149690	18556740	8361600	8479000	9749100	-289140	-253220
Black Dog 6	0	0	0	0	0	0	0	0	0	0	0	0
Blue Lake 1	-109500	-54000	-56000	-27000	-30500	-25500	134000	-31500	50000	-41000	-53500	-75500
Blue Lake 2	-109500	-54000	43000	-27000	-30500	-21500	152000	-31500	42000	-41000	-53500	-75500
Blue Lake 3	-1000	-20000	-45500	-33000	-25000	-22000	226000	-25000	43000	-32000	-36000	-45000
Blue Lake 4	-1000	-5000	-45500	-33000	-25000	-22000	249000	-25000	58000	-32000	-36000	-45000
Blue Lake 7	-82000	-42000	-67000	1887000	2606000	6120000	11342000	4145000	3756000	4681000	-60000	-69000
Blue Lake 8	-138000	-85000	-112000	3604000	4392000	5516000	17952000	4960000	4335000	6034000	-108000	-145000
Granite City 1	-17780	-14260	-15040	-11540	-10300	-6600	-4000	34020	37960	-12440	-12320	-18140
Granite City 2	-17780	-14260	-15040	-11540	-10300	-3600	-8000	37020	37960	-12440	-12320	-18140
Granite City 3	-17780	-14260	-15040	-11540	-10300	-7600	-8000	24020	43960	-12440	-12320	-18140
Granite City 4	-17780	-14260	-15040	-11540	-10300	-4600	-8000	22020	55960	-12440	-12320	-18140
Inver Hills 1	-115000	-91000	27000	39000	-62000	43000	344000	560000	59000	-40000	206000	-111000
Inver Hills 2	-34000	-22000	-17000	48000	-15000	-10000	373000	200000	70000	32000	9000	-31000
Inver Hills 3	-48000	-35000	-24000	-26000	-26000	18000	150000	220000	58000	-31000	93000	-41000
Inver Hills 4	-41000	-29000	-21000	-21000	-19000	107000	394000	239000	-14000	-21000	291000	-36000
Inver Hills 5	-42000	-31000	-20000	71000	-21000	53000	240000	196000	-19000	15000	90000	-26000
Inver Hills 6	-40000	-29000	-24000	60000	-19000	68000	1119000	207000	-12000	26000	115000	-36000
Sub-Total:	-1257290	-895830	-668970	11327290	11137750	18171770	56996360	20816110	19635840	20223960	267390	-1377420
TOTAL:	2193583540	1617241660	1797341430	1371762810	1642157250	1757558320	2155132030	1843321810	1610506150	1648683920	1827584150	1942372580

*Only Xcel Portion

Monthly Generation

Net kWh	2018											
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Base Load Coal												
Allen S. King 1	277486000	219119000	216313000	-4891000	19296000	195494000	321554000	219281000	245051000	344839000	296996000	348153000
Sherburne Co. 1	366738000	226999000	-3130000	-2085000	97760000	303417000	323327000	284916000	135015000	323055000	407110000	390582000
Sherburne Co. 2	395804000	336902000	331721000	308358000	310319000	350819000	321950000	373057000	364889000	427843000	413940000	419394000
Sherburne Co. 3*	299787000	241232000	242696000	259757000	287623000	192869000	281442000	293106000	262553000	140471000	304660000	303825000
Sub-Total:	1339815000	1024252000	787600000	561139000	714998000	1042599000	1248273000	1170360000	1007508000	1236208000	1422706000	1461954000
Intermediate												
Black Dog 5/2	-1314740	-916620	-317000	-1007000	98514000	121075000	163719000	157620000	106386000	82799000	42060040	38094040
High Bridge 7	96529000	64415000	86583000	79993000	82265000	85702670	106829840	96238000	61691000	-189000	20827000	39399000
High Bridge 8	53284000	52367000	71505000	61729000	74574490	53913240	107241270	89615000	56061000	-190000	15437000	38489000
High Bridge 9	76224000	59348000	83383000	75883000	91952000	81539000	127702000	111595000	69427000	k -	19040000	41094000
Riverside 7	59396000	63065000	98698000	86867000	37999000	87082000	107946000	106298000	102197000	56770000	61054000	34545000
Riverside 9	58713000	66289000	99823000	86751000	48111000	77081000	98990000	97653000	97924000	54981000	62499000	33312000
Riverside 10	65510000	66700000	98659000	78962000	21943000	85473000	104416000	99292000	91808000	53285000	52850000	30326000
Sub-Total:	408341260	371267380	538334000	469178000	455358490	591865910	816844110	758311000	585494000	247456000	273767040	255259040
Biomass / RDF												
Red Wing 1	6407600	6271960	5278270	3990730	6429170	6110520	6045830	6259350	5770960	6270530	6364420	5555940
Red Wing 2	0	0	0	0	5579130	6595140	5801360	7051020	5999110	6763130	6364420	6431320
Wilmarth 1	1013570	5057110	5453810	5852410	5359950	4425010	5546240	5963700	2351570	6307290	6938140	6172740
Wilmarth 2	3209630	4188060	4794130	5533600	5349250	3338170	5502050	5616300	278820	0	0	2185100
Sub-Total:	10630800	15517130	15526210	15376740	22717500	20468840	22895480	24890370	14400460	19340950	19666980	20345100
Wind												
Border	62289090	58599280	49621000	51799790	46360020	42485600	44599950	40668590	51018960	60019780	46601770	55453310
Courtenay	62773310	57713440	53701930	70502850	65318220	59401050	48980410	35204880	49071420	59395010	53944390	62773310
Grand Meadow	34263240	21807810	26226450	21859140	18556000	22862790	14169090	13410210	19514280	25177090	26647540	26368110
Nobles	71507540	59118900	66423790	58565060	47533150	56867140	36702440	36709790	55070150	55191000	53917350	53597840
Pleasant Valley	85995840	61784770	71208990	64161390	51516340	62459050	46326850	42147680	61037590	67922000	72732390	69357420
Sub-Total:	316829020	259024200	267182160	266888230	229283730	244075630	190778740	168141150	235712400	267704880	253843440	267549990
Hydro Production												
St. Anthony Falls All	3226000	2993000	5817000	6267000	6682000	1985000	9096000	6799000	5783000	5086000	3933000	3483000
St. Croix Falls All	7324000	5968000	9035000	12109000	14730000	12576000	11871000	7304000	7123000	9237000	7982000	8565000
Sub-Total:	10550000	8961000	14852000	18376000	21412000	14561000	20967000	14103000	12906000	14323000	11915000	12048000
Peaking												
Angus Anson 2	-151600	-277120	-160970	827170	5076740	1408350	7801560	1757760	392890	7420	194890	65480
Angus Anson 3	930600	-277120	-160970	-111420	2142260	-79900	-86280	-85940	-53110	-122430	-103750	-114000
Angus Anson 4	-269210	-105700	264520	9787510	28209820	11158940	22725190	16512490	6196930	6671430	527260	-202240
Black Dog 6	0	0	0	9517000	38112000	20776000	32506000	25903000	12581000	19667000	5626890	2676890
Blue Lake 1	-80000	-68500	-60000	-49000	-27500	-28500	127500	-4000	0	0	0	0
Blue Lake 2	-80000	-68500	-60000	-49000	-27500	-27500	118500	-4000	0	0	0	0
Blue Lake 3	-42500	-41000	71500	-33500	-24000	-3500	-21500	164000	6000	-36500	0	-35500
Blue Lake 4	-42500	-41000	-40500	-33500	-24000	-4500	-21500	178000	36000	-36500	0	-36500
Blue Lake 7	-96000	2157000	-116000	3554000	13864000	1859000	10394000	3195000	5183000	4441000	0	-144000
Blue Lake 8	-162000	2147000	2701000	6274000	23833000	2911000	11053000	6987000	2433000	3472000	0	-210000
Granite City 1	-19640	-17220	-15000	-13980	-9580	-8220	-8140	-8160	-2420	-7380	-14840	-16420
Granite City 2	-19640	-17220	-15000	-13980	-9580	-8220	-8140	-8160	6580	-6380	-14840	-16420
Granite City 3	-19640	-17220	-15000	-13980	-9580	-8220	-8140	-8160	-2420	-7380	-14840	-16420
Granite City 4	-19640	-17220	-15000	-13980	-9580	-8220	-8140	-8160	-2420	-7380	-14840	-16420
Inver Hills 1	-57000	248000	18000	118000	1787000	84000	539000	452000	931000	-253000	-44000	-82000
Inver Hills 2	113000	-34000	-25000	17000	273000	-9000	404000	226000	49000	407000	41000	-18000
Inver Hills 3	154000	107000	-34000	7000	654000	-26000	263000	221000	-39000	-29000	39000	-31000
Inver Hills 4	109000	155000	-28000	15000	1010000	12000	520000	459000	89000	-23000	63000	-24000
Inver Hills 5	71000	-28000	-21000	-22000	539000	-15000	408000	328000	1039000	335000	37000	-30000
Inver Hills 6	149000	122000	17000	15000	464000	-13000	328000	170000	1063000	323000	55000	-19000
Sub-Total:	467230	3926180	2305580	29777340	115823500	37969510	87025910	56426670	29907030	34794900	6376930	1730450
TOTAL:	2086633310	1682947890	1625799950	1360735310	1559593220	1951539890	2386784240	2192232190	1885927890	1819827730	1988275390	2018886580

*Only Xcel Portion

Monthly Generation

Net kWh	2019											
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Base Load Coal												
Allen S. King 1	335309000	237045000	81650000	-7465000	229658000	272070000	223992000	28327000	89477000			
Sherburne Co. 1	206791000	362043000	392538000	262755000	346688000	301480000	357925000	282826000	113386000			
Sherburne Co. 2	400446000	165629000	-1665000	22507000	289602000	290832000	381735000	343740000	297565000			
Sherburne Co. 3*	342126000	295948000	295738000	208032000	174141000	240376000	280533000	260029000	228371000			
Sub-Total:	1284672000	1060665000	768261000	485829000	1040089000	1104758000	1244185000	914922000	728799000	0	0	0
Intermediate												
Black Dog 5/2	55793040	66765000	115819000	143348000	123548000	106382000	177982000	177917000	123017000			
High Bridge 7	96383000	124438000	113546000	116654000	66686000	85593000	101180000	108364810	87773700			
High Bridge 8	10674000	120335000	104338000	113841000	56950000	76363000	113294000	109036990	80286700			
High Bridge 9	54117000	124249000	115585000	135287000	73824000	102048000	146827000	137752540	104380000			
Riverside 7	67577000	105350000	73651000	68772000	82623000	103236000	108068000	114655000	100242000			
Riverside 9	71423000	110627000	79933000	71330000	76207000	95787000	99651000	107629000	90589000			
Riverside 10	69055000	110986000	72920000	69944000	77598000	96073000	103097000	107248000	89768000			
Sub-Total:	425022040	762750000	675792000	719176000	557436000	665482000	850099000	862603340	676056400	0	0	0
Biomass / RDF												
Red Wing 1	6621830	2628630	3660100	6321100	6013450	6490770	5374740	6134260	5903090			
Red Wing 2	6490550	4882410	4339430	7046160	6475850	6955020	6388390	7617130	6284620			
Wilmarth 1	3995300	4210600	4339620	5310980	4880880	4666400	4842910	5415480	1752400			
Wilmarth 2	4299800	3445040	3989800	5102710	4293630	4171480	4470380	4899720	2141820			
Sub-Total:	21407480	15166680	16328950	23780950	21663810	22283670	21076420	24066590	16081930	0	0	0
Wind												
Border	51793400	42860250	62089420	53146050	53091620	44741870	40392110	47821690	47257020			
Courtenay	57713440	53701930	70502850	65318220	59401050	48980410	35204880	49071420	59395010			
Grand Meadow	27385280	18544510	28649890	26129500	23657310	15706610	11659680	10499470	21519470			
Nobles	59923500	49217310	65275640	49969240	60948520	39508460	36498350	29061240	52714260			
Pleasant Valley	71855720	54544440	76872900	78071650	63970340	48564230	42522010	37378600	68466190			
Sub-Total:	268671340	218868440	303390700	272634660	261068840	197501580	166277030	173832420	249351950	0	0	0
Hydro Production												
St. Anthony Falls All	1875000	3102000	3356000	452000	6868000	7444000	8375000	8877000	7556000			
St. Croix Falls All	7724000	6256000	9640000	9614000	12180000	11787000	12403000	8594000	13127000			
Sub-Total:	9599000	9358000	12996000	10066000	19048000	19231000	20778000	17471000	20683000	0	0	0
Peaking												
Angus Anson 2	3622130	-136890	-116460	-86060	903100	-67370	1969290	-80230	742810			
Angus Anson 3	-124730	-136890	-116440	-86060	2258790	1132950	2694830	-80230	380430			
Angus Anson 4	-197810	-142140	-173440	7378000	11972100	13511660	23207210	15768110	10435660			
Black Dog 6	2532890	8558000	5719000	37969000	18596000	26807000	61778000	51193000	21235000			
Blue Lake 1	-22500	-69500	-66500	-32500	-28000	-19000	-21500	-29000	-20000			
Blue Lake 2	500	-69500	-66500	-32500	-28000	-19000	-21500	306000	-20000			
Blue Lake 3	897000	-37500	-42500	-32500	-29500	-3500	-15500	149500	-22000			
Blue Lake 4	-72000	-37500	74500	-32500	-29500	-3500	-15500	187500	-22000			
Blue Lake 7	-252000	-141000	-156000	1611000	4612000	2645000	16118000	11679000	-129000			
Blue Lake 8	-241000	-188000	-183000	-165000	4609000	2669000	12223000	11546000	-161000			
Granite City 1	-19280	-37240	-15280	-11880	-10620	-8100	-5540	-4480	-6360			
Granite City 2	-19280	-37240	-15280	-11880	-10620	-8100	-5540	-4480	-6360			
Granite City 3	-19280	-37240	-15280	-11880	-10620	-8100	-5540	-4480	-636000			
Granite City 4	-19280	-37240	-15280	-11880	-10620	-8100	-5540	-4480	-6360			
Inver Hills 1	290000	-104000	-45000	20000	34000	194000	-4000	-73000	-52000			
Inver Hills 2	359000	-36000	0	51000	37000	225000	32000	-12000	-2000			
Inver Hills 3	208000	-47000	-56000	-44000	-33000	211000	311000	-26000	-18000			
Inver Hills 4	225000	-40000	-39000	-26000	-20000	233000	83000	-16000	-8000			
Inver Hills 5	323000	-47000	-40000	-38000	-33000	204000	290000	-24000	-16000			
Inver Hills 6	368000	-36000	-26000	-19000	-14000	226000	246000	-10000	-2000			
Sub-Total:	7838360	7140120	4605540	46387360	42764510	47913840	118852170	90460730	31666820	0	0	0
TOTAL:	2017210220	2073948240	1781374190	1557873970	1942070160	2057170090	2421267620	2083356080	1722639100	0	0	0

*Only Xcel Portion

Rate Base

	2016	2017	2018	2019
Demand Prod MN Jur %	**87.7424%**	**87.4350%**	**87.6880%**	**86.9990%**
Energy Prod MN Jur %	**87.4505%**	**87.2656%**	**87.1688%**	**86.6960%**
Demand MN Co %	**84.1349%**	**84.2464%**	**84.2615%**	**83.9342%**
Demand After Interchange %	**73.8220%**	**73.6608%**	**73.8872%**	**73.0219%**
Energy After Interchange %	**73.5764%**	**73.5181%**	**73.4497%**	**72.7676%**

Plant Description	2016 Rate Base	2016 MN Jurisdiction Rate Base	2017 Rate Base	2017 MN Jurisdiction Rate Base	2018 Rate Base	2018 MN Jurisdiction Rate Base	2019 Rate Base	2019 MN Jurisdiction Rate Base	Allocator
Hydro Production									
Hennepin ISD**	$ 11,912,550	$ 8,794,081	$ 11,141,139	$ 8,206,657	$ 10,621,077	$ 7,847,619	$ 9,939,930	$ 7,258,327	Demand
Lower Dam**	$ (194,846)	$ (143,839)	$ (183,496)	$ (135,164)	$ -	$ -		$ -	Demand
St Croix Falls*	$ 1,907,109	$ 1,407,866	$ 1,783,654	$ 1,313,854	$ 1,758,678	$ 1,299,438	$ 1,612,484	$ 1,177,467	Demand
Upper Dam**	$ 1,633,271	$ 1,205,713	$ 1,507,986	$ 1,110,795	$ 1,281,414	$ 946,801	$ 1,166,463	$ 851,773	Demand
Sub-Total:	$ 15,258,085	$ 11,263,820	$ 14,249,283	$ 10,496,141	$ 13,661,169	$ 10,093,859	$ 12,718,877	$ 9,287,567	
Other Production									
Alliant Tech	$ (86,702)	$ (64,005)	$ (111,832)	$ (82,377)	$ -	$ -		$ -	Demand
Black Dog	$ 123,347,435	$ 91,057,519	$ 162,762,143	$ 119,891,961	$ 181,286,817	$ 133,947,797	$ 174,599,074	$ 127,495,587	Demand
Blue Lake	$ 28,659,235	$ 21,156,815	$ 25,469,215	$ 18,760,838	$ 22,636,749	$ 16,725,665	$ 20,694,650	$ 15,111,629	Demand
Border Wind	$ 179,845,819	$ 132,324,063	$ 161,170,269	$ 118,489,362	$ 148,105,211	$ 108,782,890	$ 137,480,746	$ 100,041,431	Energy
Courtenay Wind	$ 264,947,546	$ -	$ 217,989,051	$ 160,261,466	$ 192,609,052	$ 141,470,845	$ 175,537,822	$ 127,734,650	Energy
Grand Meadow	$ 83,861,958	$ 61,702,602	$ 78,038,959	$ 57,372,780	$ 72,324,874	$ 53,122,431	$ 67,887,244	$ 49,399,914	Energy
Granite City	$ (1,858,629)	$ (1,372,077)	$ (2,212,834)	$ (1,629,992)	$ (2,471,393)	$ (1,826,044)	$ (2,456,644)	$ (1,793,889)	Demand
High Bridge-MERP	$ 231,962,257	$ 171,239,132	$ 220,295,201	$ 162,271,295	$ 223,371,066	$ 165,042,680	$ 225,439,532	$ 164,620,263	Demand
Inver Hills	$ 4,889,713	$ 3,609,683	$ 4,200,200	$ 3,093,903	$ 3,699,772	$ 2,733,659	$ 4,167,088	$ 3,042,887	Demand
Key City*	$ (2,336,477)	$ (1,724,834)	$ (2,340,892)	$ (1,724,320)	$ (2,357,749)	$ (1,742,075)	$ (2,192,589)	$ (1,601,070)	Demand
Lake Benton 75*	$ 624,559	$ 461,062	$ 624,549	$ 460,048	$ 624,558	$ 461,468	$ 653,814	$ 477,428	Demand
Lake Benton Wnd*	$ 9,567,541	$ 7,062,948	$ 9,653,086	$ 7,110,544	$ 30,787,797	$ 22,748,249	$ 166,450,664	$ 121,545,462	Demand
Nobles Wind	$ 222,191,781	$ 163,480,693	$ 213,633,540	$ 157,059,376	$ 200,038,972	$ 146,928,102	$ 188,369,913	$ 137,072,254	Energy
Pleasant Valley Wind	$ 226,558,938	$ 166,693,889	$ 202,356,681	$ 148,768,841	$ 185,720,618	$ 136,411,308	$ 171,531,363	$ 124,819,246	Energy
Riverside-MERP	$ 187,417,261	$ 138,355,134	$ 176,799,186	$ 130,231,765	$ 169,853,751	$ 125,500,222	$ 162,657,540	$ 118,775,650	Demand
United Hospital	$ 35,057	$ 25,880	$ 2,333	$ 1,719	$ (46,424)	$ (34,301)	$ (24,672)	$ (18,016)	Demand
West Faribault*	$ 622,617	$ 459,628	$ 622,488	$ 458,530	$ 613,704	$ 453,449	$ 617,530	$ 450,932	Demand
Wind Storage*	$ 1,382,181	$ 1,020,353	$ 1,202,768	$ 885,969	$ 1,057,307	$ 781,215	$ 869,073	$ 634,613	Demand
Angus Anson	$ 23,774,633	$ 17,550,905	$ 21,348,600	$ 15,725,558	$ 25,752,888	$ 19,028,094	$ 27,686,594	$ 20,217,281	Demand
Sub-Total:	$ 1,585,406,722	$ 973,039,390	$ 1,491,502,710	$ 1,097,407,265	$ 1,453,607,572	$ 1,070,535,654	$ 1,519,968,743	$ 1,108,026,253	
Steam Production									
Allen S King	$ 349,062,602	$ 257,684,926	$ 332,633,926	$ 245,020,943	$ 319,755,762	$ 236,258,657	$ 295,849,112	$ 216,034,686	Demand
Black Dog	$ 4,930,655	$ 3,639,907	$ 2,349,893	$ 1,730,951	$ 707,976	$ 523,104	$ 3,258,419	$ 2,379,360	Demand
Coal Cars		$ -		$ -		$ -		$ -	Demand
High Bridge	$ (12,602)	$ (9,303)	$ (21,091)	$ (15,536)	$ (26,865)	$ (19,850)	$ (32,417)	$ (23,672)	Demand
Minn Valley*	$ (12,987,678)	$ (9,587,761)	$ (13,043,491)	$ (9,607,945)	$ (10,929,646)	$ (8,075,612)	$ (9,775,022)	$ (7,137,909)	Demand
Red Wing	$ 6,054,243	$ 4,469,362	$ 8,644,723	$ 6,367,776	$ 9,898,564	$ 7,313,774	$ 7,948,393	$ 5,804,069	Demand
Riverside	$ 7,552,291	$ 5,575,251	$ 7,311,356	$ 5,385,606	$ 7,068,998	$ 5,223,086	$ 6,827,147	$ 4,985,314	Demand
Sherburne	$ 369,248,246	$ 272,586,368	$ 350,702,968	$ 258,330,751	$ 328,993,549	$ 243,084,201	$ 301,852,431	$ 220,418,424	Demand
Wilmarth	$ 1,764,585	$ 1,302,652	$ 4,185,293	$ 3,082,922	$ 8,812,711	$ 6,511,467	$ 7,599,400	$ 5,549,227	Demand
Sub-Total:	$ 725,612,342	$ 535,661,401	$ 692,763,576	$ 510,295,468	$ 664,281,047	$ 490,818,826	$ 613,527,463	$ 448,009,500	
Total Production:	$ 2,326,277,148.87	$ 1,519,964,612.13	$ 2,198,515,568.64	$ 1,618,198,874.86	$ 2,131,549,788.45	$ 1,571,448,339.15	$ 2,146,215,083.23	$ 1,565,323,321.23	

*No generation at these locations
**Saint Anthony Falls

Unit Outage Information

[PROTECTED DATA BEGINS

Unit	Outage Category	Primary Reason for outage	Outage Dates Start	End	Duration (Days)	Equipment that resulted in the forced outage	Description of Equipment Failure	Change in Energy Costs	Steps Taken to Alleviate Reoccurrence
JANUARY 2016									
Prairie Island 1	Derate	Heater Drain Valves	01/22/2016	01/30/2016	**8**	This was a 1% derate and not a forced outage. Approximately 6 MWe of output was lost, a 1% reduction in power and steam flow, when Control Valve-31096 failed closed from its normally open position.	Control Valve-31096 failed closed when the valve plug separated from the valve stem. The valve plug separated from the stem when the plug unscrewed itself stem because a groove pin had not been installed when the valve was overhauled in May 2011.		Control Valve-31096 was repaired and returned to service.
Sherburne.3	Forced	Condensate/hotwell Pump Moto	01/21/2016	01/31/2016	**10**	31 Condensate Pump	During routine inspection of 31 Condensate Pump Motor, it was found to have oil leaking onto the motor windings. It was decided to remove the pump from service and send the motor out for cleaning, reconditioning, and a bearing seal inspection to determine the source of the oil leak. During this work, the vendor discovered lower bearing journal and babbit bearing scoring. Decision was made to hard chrome plate the journal and machine to keep the bearing the original size.		Oil contamination caused by excessive seal clearance. The seal clearance issue may be related to incorrect locating pin positions. Leaking oil caused the inlet screen to become plugged causing a DP which may have encouraged additional contaminants to enter the oil reservoir. Severe oil contamination eventually led to bearing and shaft damage.
Allen.S.King.1	Forced	Waterwall (Furnace Wall)	01/01/2016	01/04/2016	**3**	Boiler Leak	Leak in boiler waterwall due to erosion on tube from sootblower turning on too soon		Adjustment made to sootblower to ensure correct timing to prevent erosion on tube. Tube that was repaired was replaced during spring 2016 outage along with 2 surrounding tubes that also had shown signs of wear.
French.Is.1	Forced	Induced Draft Fan Motor Outbou	01/21/2016	01/31/2016	**10**	Induced Draft Fan Motor	Motor bearing failed.		The motor is being replaced with a new motor.
Prairie Island 2	Forced	~~Condensate/hotwell Pump Moto~~	01/01/2016	01/31/2016	**30**	Continuation of outage beginning on 12/17/2015. See explanation above.	Continuation of outage beginning on 12/17/2015. See explanation above.		Continuation of outage beginning on 12/17/2015. See explanation above.
FEBRUARY 2016									
Allen.S.King.1	Forced	Issues with governer valve not f	02/07/2016	02/12/2016	**5**	#3 Governor Valve	Inconsistent operation of the #3 governor valve resulted in valve being forced to a fixed position as to not negatively affect the operations of the other 3 governor valves.		Valve was rebuilt, servo motor was replaced. Flush of control oil system, replacement of control oil, control wiring checked, and control components replaced.
Sherburne.3	Forced	Condensate/hotwell Pump Moto	02/08/2016	02/11/2016	**2**	36-2 High Pressure Heater	Heater tube failure neccessitated the need to remove the high pressure string from service and derate the unit. 84 tubes were previously plugged prior to this incident. The damage was split between the inlet and outlet sections and appears to be general erosion.		76 tubes were inspected on the outlet section and 32 on the inlet section. 13 tubes were plugged which includes the leaking tubes, surrounding tubes, and any inspected tube with 70% or greater wall loss. This heater is original equipment. Heater is at end of life and is scheduled to be replaced in 2020.
Allen.S.King.1	Forced	Offline due to governer valve re	02/12/2016	02/17/2016	**5**	#3 Governor Valve	Inconsistent operation of the #3 governor valve resulted in valve being forced to a fixed position as to not negatively affect the operations of the other 3 governor valves.		Valve was rebuilt, servo motor was replaced. Flush of control oil system, replacement of control oil, control wiring checked, and control components replaced.
French.Is.4	Maintenance	Replace 4L73 69kv switch	02/22/2016	02/23/2016	**2**	This was not a forced outage. This was a scheduled maintenance activity.	69 KV Swithch		Rebuilding of this switch was a preventative maintenance activity to prevent equipment failure.
Prairie Island 2	Forced	Generator Rotor Windings	02/01/2016	02/12/2016	**11**	Continuation of outage beginning on 12/17/2015. See explanation above.	Continuation of outage beginning on 12/17/2015. See explanation above.		Continuation of outage beginning on 12/17/2015. See explanation above.
Sherburne.3	Forced	36-2 HP heater leak repair	02/11/2016	02/12/2016	**2**	36-2 High Pressure Heater	Due to single block isolation valve arrangement on these heaters, the unit had to be removed from service to facilitate repairs. 84 tubes were previously plugged prior to this incident. The damage was split between the inlet and outlet sections and appears to be general erosion.		76 tubes were inspected on the outlet section and 32 on the inlet section. 13 tubes were plugged which includes the leaking tubes, surrounding tubes, and any inspected tube with 70% or greater wall loss. This heater is original equipment. Heater is at end of life and is scheduled to be replaced in 2020.
MARCH 2016									
Blk_Dog_G52	Forced	Turbine Governing System	03/05/2016	03/06/2016	**1**	Steam Turbine Speed Probe	Speed Probe assembly failed to read speed		All three speed probes were replaced and orientation was changed to limit variations in readings. The entire assembly will be replaced in the fall of 2016 to a more robust design.
French_2	Maintenance	Minor Boiler Overhaul (less Tha	03/13/2016	03/15/2016	**3**	This was not a forced outage.	This was a maintenance outage for periodic cleaning and inspection.		RDF fuel causes boiler fouling. We believe we are cleaning at appropriate intervals.
French_2	Forced	Generating Tube Leaks	03/30/2016	03/31/2016	**2**	Boiler Tube	Failure due to erosion.		Generating tubes will be replaced in 2017 as part of a capital project.
King_G1	Forced	Feedwater Pump Drive - Gear	03/20/2016	03/23/2016	**3**	11 boiler feed pump	11 BFP removed from service due to high vibrations on the pump, as a result of using the startup pump as a normal operating pump during the 12 BFP replacement process that began with the 7/14 event.		Pump was removed from service, and replaced with rebuilt element pump. Pump was originally scheduled for replacement spring of 2016.
Redwing_1	Forced	Turbine Lube Oil Pumps	03/06/2016	03/08/2016	**2**	Turbine Lube Oil Pumps	Turbine Lube Oil Pumps		Repaired pump
Redwing_1	OMC	Lack Of Fuel (Outside Managem	03/27/2016	03/30/2016	**3**	Fuel (RDF)	N/A		N/A
APRIL 2016									
Blk_Dog_G52	Forced	Unit tripped due to Static Freque	04/17/2016	04/18/2016	**2**	Combustion Turbine Starting Equipment	Voltage fluctuations prevented operation		The Static Frequency Converter is past useful life and is scheduled for replacement in 2018

Unit Outage Information

[PROTECTED DATA BEGINS

Unit	Outage Category	Primary Reason for outage	Outage Dates Start	End	Duration (Days)	Equipment that resulted in the forced outage	Description of Equipment Failure	Change in Energy Costs	Steps Taken to Alleviate Reoccurrence
CC Highbridge1	OMC	Gas Line Leak, Gas dept had to	04/05/2016	04/08/2016	3	This is an OMC (Out of Management Control) event. No plant equipment was involved in this outage. The gas line supplying High Bridge required work and therefore had to be taken out of service. High Bridge could not run during the gas line outage.	N/A		N/A
CC Highbridge2	OMC	Gas Line Leak, Gas dept had to	04/05/2016	04/08/2016	3	This is an OMC (Out of Management Control) event. No plant equipment was involved in this outage. The gas line supplying High Bridge required work and therefore had to be taken out of service. High Bridge could not run during the gas line outage.	N/A		N/A
Redwing_1	Forced	Unit 1 Baghouse Maintenance	04/10/2016	04/13/2016	3	Unit 1 Baghouse	Unit 1 Baghouse - several bags needed to be replaced.		Replaced bags / developed cleaning method to extend bag life.
MAY 2016									
King_G1	Forced	Thrust Bearings	05/22/2016	05/24/2016	1	Turbine Thrust bearing	Turbine removed from service due to abnormal vibrations		Repairs on the IP turbine intercept valves resulted in uneven steam distribution to the turbine resuling in uneven heat and vibrations. Interecept valve repairs have been completed and operations practices have been changed to limit the time that intercept valves can be closed to prevent uneven steam distribution
Anson_G4	Forced	Main transformer	05/11/2016	06/01/2016	20	GSU Transformer	Shorted windings		Transformer replacement
Redwing_2	Forced	First Superheater Leaks	05/05/2016	05/08/2016	3	Unit 1 Superheat Tubes	Unit 1 Superheat Tubes		Repaired leak / transitioned to less errosive sootblowing methods / capital project to replace superheat tubes in Feb 2017
Redwing_2	Forced	First Superheater Leaks	05/23/2016	05/26/2016	3	Unit 1 Superheat Tubes	Unit 1 Superheat Tubes		Repaired leak / transitioned to less errosive sootblowing methods / capital project to replace superheat tubes in Feb 2018
JUNE 2016									
King_G1	Forced	Forced Draft Fans	06/22/2016	06/24/2016	3	11 Forced Draft Fan	Fan in board bearing failure and inlet damper linkage failure		Repairs made to the inlet damper linkage, inboard bearing replaced, thrust collar machined, and fan/motor aligned.
SHERCO_G2	Forced	Switchyard Circuit Breakers - ex	06/27/2016	07/01/2016	5	Unit 2 MegaWatt Transducer	Unit 2 Megawatt transducer failed during startup following the 2016 overhaul. The data aquisition and information signal could be used for power output indication, but the unit had to be operated in boiler base/turbine follow mode. There was a risk of not being able to control throttle pressure at the upper end of the load range which could have resulted in a Unit trip so the unit was de-rated to 650 MWnet.		New MW transducer was received by the site and installed. A second transducer was also received by the site as Unit 1's transducer is of the same vintage.
SHERC3	Forced	High Pressure Heater Tube Leal	06/07/2016	06/14/2016	7	36-1 High Pressure Heater	Heater tube failure neccessitated the need to remove the high pressure string from service and derate the unit. 2 tubes were previously plugged in this heater prior to this incident. Most of the damage was found in the drain cooler section. The damage appears to be mainly from fretting at tube support areas.		Inspected 12 tubes on the outlet section, 105 on the inlet section. Found 2 leaking tubes. 19 total tubes were plugged which includes the leakers, surrounding tubes and anything with 70% or greater wall loss. This heater is original equipment. Heater is at end of life and is scheduled to be replaced in 2020.
Anson_G4	Forced	Main Transformer	06/01/2016	07/01/2016	30	GSU Transformer	Shorted windings		Transformer replacement
King_G1	Forced	Other Slag And Ash Removal P	06/24/2016	06/28/2016	4	Slag Tank	Slag tank plugged with hardened slag (molten ash).		This event was the result of being unable to go higher on load due to repairs made to 11 FD fan.Slag tank inspected and nozzles replaced/cleaned. Operational practices changed to run until at higher load for 48 hours following a unit start up to improve tapping of boiler. Working with OEM on study to improve slag tank performance.
CCRiverside1	Forced	Gas Turbine - Gas Fuel System	06/26/2016	06/27/2016	1	Unit 9 fuel gas performance heater	Heat exchanger end bell gasket failure		Original equipment manufacturer gasket installed and torqued to specifications.
SHERC3	Forced	High Pressure Heater Tube Leal	06/14/2016	06/15/2016	2	36-1 High Pressure Heater	Due to single block isolation valve arrangement on these heaters, the unit had to be removed from service to facilitate repairs. 2 tubes were previously plugged in this heater prior to this incident. Most of the damage was found in the drain cooler section. The damage appears to be mainly from fretting at tube support areas.		Inspected 12 tubes on the outlet section, 105 on the inlet section. Found 2 leaking tubes. 19 total tubes were plugged which includes the leakers, surrounding tubes and anything with 70% or greater wall loss. This heater is original equipment. Heater is at end of life and is scheduled to be replaced in 2020.
JULY 2016									
King_G1	Forced	Forced Draft Fans	07/05/2016	07/08/2016	4	11 Forced Draft Fan	A failed inlet damper control ring allowed partial closure on the inboard side damper of the 11 FD Fan resulting in excessive thrust loading towards the 11 FD fan motor. This thrust loading was enough to cause premature wear on the fan side thrust pad of the inboard bearing which ultimately resulted in damage to the integral thrust collar.		Replaced broken control ring. Inspected fan internals and north side inlet damper assembly for damage. Lubricated all pivot points and linkages to ensure smooth operation. Inspected the 12 FD fan for similar issues. Updated annual preventive maintenance plan to include Non-Destructive Examination of the inlet control dampers on both FD fans.

Unit Outage Information

[PROTECTED DATA BEGINS

Unit	Outage Category	Primary Reason for outage	Outage Dates Start	End	Duration (Days)	Equipment that resulted in the forced outage	Description of Equipment Failure	Change in Energy Costs	Steps Taken to Alleviate Reoccurrence
King_G1	Forced	Forced Draft Fans	07/11/2016	07/14/2016	4	11 Forced Draft Fan	A failed inlet damper control ring allowed partial closure on the inboard side damper of the 11 FD Fan resulting in excessive thrust loading towards the 11 FD fan motor. This thrust loading was enough to cause premature wear on the fan side thrust pad of the inboard bearing which ultimately resulted in damage to the integral thrust collar.		Replaced broken control ring. Inspected fan internals and north side inlet damper assembly for damage. Lubricated all pivot points and linkages to ensure smooth operation. Inspected the 12 FD fan for similar issues. Updated annual preventive maintenance plan to include Non-Destructive Examination of the inlet control dampers on both FD fans.
King_G1	Forced	High Pressure Heater Tube Leal	07/14/2016	07/15/2016	1	16B Feedwater Heater	Tube leaks were discovered in three FWH tubes in the outlet pass of the desuperheating zone of the Feedwater Heater.		A total of five tubes were plugged during the repairs completed on 7/15/2016. Eddy current testing/inspection was completed on all HP heaters during April of 2017.
SHERC3	Forced	Other Pulverizer Problems	07/03/2016	07/06/2016	3	303 Mill and 306 Mill	307 was out for scheduled mill major overhaul, 303 was out of service from 6/25-7/13 due to high stator temps requiring motor replacement. Loss of 303 eliminated our normal redundant configuration of mills. The loss of 306 mill due to the rotating throat segment coming loose as the result of two of the three hold-down bolts breaking caused a derate when combined with loss of our normal redundant mill 303.		Replaced the rotating throat segment and installed using new bolts on 306 mill. Motor was replaced on 303 mill and a spare motor compatible with all Unit 3 mills has been added to inventory.
SHERC3	Forced	Other Pulverizer Problems	07/07/2016	07/08/2016	1	303 Mill and 310 Mill	307 was out for scheduled mill major overhaul, 303 was out of service from 6/25-7/13 due to high stator temps requiring motor replacement. Loss of 303 eliminated our normal redundant configuration of mills. The loss of 310 mill due to internal damage to metal fenders, tile and pyrite scraper caused a derate when combined with loss of our normal redundant mill 303.		Replaced 2 fenders, ceramic tile, and pyrite scraper on 310 mill. Motor was replaced on 303 mill and a spare motor compatible with all Unit 3 mills has been added to inventory.
Anson_G2	Forced	Gas Turbine - Cooling Water Sy	07/22/2016	07/25/2016	3	Water Injection Pump	Motor failure		Yearly preventative maintenance motor inspection
Anson_G4	Forced	Main Transformer	07/01/2016	08/01/2016	31	Main Transformer	Shorted winding		Replaced Transformer
King_G1	Forced	Forced Draft Fans	07/08/2016	07/11/2016	2	11 Forced Draft Fan	A failed inlet damper control ring allowed partial closure on the inboard side damper of the 11 FD Fan resulting in excessive thrust loading towards the 11 FD fan motor. This thrust loading was enough to cause premature wear on the fan side thrust pad of the inboard bearing which ultimately resulted in damage to the integral thrust collar.		Replaced broken control ring, Inspected fan internals and north side inlet damper assembly for damage. Lubricated all pivot points and linkages to ensure smooth operation. Inspected 12 FD fan for similar issues. Updated annual preventive maintenance plan to include Non-Destructive Examination of the inlet control dampers on both FD fans.
King_G1	Forced	High Pressure Heater Tube Leal	07/15/2016	07/18/2016	3	16B Feedwater Heater	Tube leaks were discovered in three FWH tubes in the outlet pass of the desuperheating zone of the Feedwater Heater.		A total of five tubes were plugged during the repairs completed on 7/15/2016. Eddy current testing/inspection was completed on all HP heaters during April of 2017.
King_G1	Forced	Bottom Ash Hoppers (including	07/30/2016	08/01/2016	1	Bottom Ash Slag Tank	Unable to sluice bottom ash from tank. Contributing factors included degraded coal grind, lower load operation and a sluicing assist process change.		Retrained operators on fineness testing process and acceptance standard. Modifications made to the slag tank during the 2017 spring outage to improve ash moving capability.
Redwing_1	Forced	First Superheater Leaks	07/13/2016	07/16/2016	3	Boiler	Superheater Tube Leak		Repaired Leak - Capital Replacement in 2017
Redwing_1	Forced	First Superheater Leaks	07/18/2016	07/21/2016	3	Boiler	Superheater Tube Leak		Repaired Leak - Capital Replacement in 2017
AUGUST 2016									
Sherco_3	Forced	PLC - hardware problems (inclu	08/09/2016	08/11/2016	2	34 and 36 PLC	PLC equipment failures on both 34 and 36 PLC's. Partial list of equipment controlled by 34 & 36 PLC's included; all west side coal mills (306-310), 32 PA & FD fans, 32 ignitor oil pump, 32 scanner cooling fan, 32 closed cooling pump, 32 air compressor, 32 & 34 condenser exhausters, condenser vacuum breakers, condensate polisher bypass and auxiliary electrical switch gear. Trouble shooting, testing or restart of these PLC's at full load posed significant risk of unit upset / runback or unit trip so unit was derated to low operating limit of 430 MW to perform troubleshooting and repairs.		Obsolete PLC equipment had already been scheduled to be replaced in 2017. Multiple equipment issues as a result of equipment aging. Steps taken: 1. Change to 400 series processor. 2. Changed out 1 suspect power supply. 3. Changed local interface cards inside processors cabinet. 4. Fiber ends cleaned at the remote cards. 5. Addressing problem was discovered and each processor was reloaded. 6. MCC PL replacement project completed during 2017 overhaul.
Wilmarth_1	Forced	Coal Conveyors And Feeders	08/02/2016	08/03/2016	1	RDF Scalper	Main RDF fuel supply to the plant broken pans causing scalper to be unable to run.		Major hardware replacement in the spring of 2017 outage and scheduled for capital replacement in 2022.
Wilmarth_1	Forced	First Superheater Leaks	08/04/2016	08/06/2016	2	Boiler superheat tube	Boiler superheat tube leak		Increased NDE, tube build up, and repairs made in the spring 2017 outage and capital replacement in 2018.
Wilmarth_1	Forced	Coal Conveyors And Feeders	08/10/2016	08/11/2016	1	RDF Screw feeder	Screw feeder auger broken shaft. Had to replace auger.		All augers on unit 1 inspected in spring 2017 and all 6 remaining replaced with new augers on unit 1, scheduled for capital replacements in 2022.
Anson_G4	Forced	Main Transformer	08/01/2016	09/01/2016	31	Main Transformer	Shorted winding		Replaced Transformer
King_G1	Forced	Slag-tap (cyclone Furnace)	08/08/2016	08/11/2016	3	Bottom Ash Slag Tank	Unable to sluice bottom ash from tank. Contributing factors included, lower load operation and a sluicing assist process change.		Changed slag tank operating parameters in 2016. Modifications made to the slag tank during the 2017 spring outage to improve ash moving capability.
King_G1	Forced	Slag-tap (cyclone Furnace)	08/18/2016	08/21/2016	3	Bottom Ash Slag Tank	Unable to sluice bottom ash from tank. Contributing factors included, lower load operation and a sluicing assist process change.		Changed slag tank operating parameters in 2016. Modifications made to the slag tank during the 2017 spring outage to improve ash moving capability.
Redwing_1	Forced	First Superheater Leaks	08/03/2016	08/05/2016	2	Boiler	Superheater Tube Leak		Repaired Leak - Capital Replacement in 2017
Redwing_1	Forced	First Superheater Leaks	08/18/2016	08/22/2016	4	Boiler	Superheater Tube Leak		Repaired Leak - Capital Replacement in 2017
Redwing_1	Forced	First Superheater Leaks	08/28/2016	09/01/2016	4	Boiler	Superheater Tube Leak		Repaired Leak - Capital Replacement in 2017

Unit Outage Information

Unit	Outage Category	Primary Reason for outage	Outage Dates Start	End	Duration (Days)	Equipment that resulted in the forced outage	Description of Equipment Failure	[PROTECTED DATA BEGINS Change in Energy Costs	Steps Taken to Alleviate Reoccurrence
Redwing_2	Forced	First Superheater Leaks	08/10/2016	08/13/2016	3	Boiler	Superheater Tube Leak		Repaired Leak - Capital Replacement in 2017
Wheaton_4	Forced	Other Gas Turbine Exhaust Prol	08/11/2016	08/18/2016	7	Hot gas path leak into the bearing tunnel.	Tunnel bolts came loose. No welded lock down tabs on bolts.		Bars welded across bolt heads to prevent this same occurance.
SEPTEMBER 2016									
Monticello_1	Forced	Feedwater Pump	09/17/2016	10/01/2016	13	11 Reactor Feedwater Pump (RFP)	A component internal to the pump (suction flow straightener) experienced a failure of a vane attachment weld causing increased vibrations which required the pump to be removed from service on 9/17/2016 for repair. The unit was de-rated to 58% power during the time the 11 RFP was out of service for repair. A new flow straighter was installed, the pump was returned to service, and the unit was returned to 100% power.		Monticello, working with the pump OEM, pursued an extensive redesign and upgrade of the Reactor Feedwater Pump (RFP) internal components aimed at achieving a minimum 10 year reliable operating period. These upgrades were implemented on both Monticello's RFP's (11 and 12) during the spring 2017 refueling outage (RFO28).
Wilmart_1	Forced	Coal Conveyors And Feeders	09/10/2016	09/12/2016	2	RDF Screw feeder	Screw feeder auger broken shaft. Had to replace auger.		All augers on unit 1 inspected in spring 2017 and all 6 remaining replaced with new augers on unit 1, scheduled for capital replacements in 2022
King_G1	Forced	Automatic Turbine Control Syste	09/01/2016	09/02/2016	1	#3 High Pressure Turbine Control Valve	#3 High Pressure Turbine Control Valve closed unexpectedly while the turbine was operating in partial arc steam admission. This caused the other turbine control valves to begin opening further in response to the loss of flow through #3 HP CV. The turbine tripped seconds later per design due to the deviation between the failed valve and the functional valves.		We continue to operate in Full Arc mode. The #3 HP CV was rebuilt during the 2017 spring outage. RVP interface card and interconnecting cables replaced during the 2017 spring outage. Emerson DCS SME completed logic review during the 2017 spring outage
Redwing_1	Forced	First Superheater Leaks	09/01/2016	09/03/2016	2	Boiler	Superheater Tube Leak		Repaired Leak - Capital Replacement in 2017
Redwing_1	Forced	Generator Metering Devices	09/06/2016	09/09/2016	2	Generator	Lightning Strike caused 87 Lockout & tripped the unit. Tube leak discovered while walking down of unit prior to startup.		Generator Lockout reset - Repaired Leak - Capital Replacement in 2017
Redwing_2	Forced	First Superheater Leaks	09/19/2016	09/27/2016	8	Boiler	Superheater Tube Leak		Replaced Multiple Hairpins in Suspect Areas - Captial Replacement in 2018
Redwing_2	Forced	First Superheater Leaks	09/27/2016	09/29/2016	2	Boiler	Superheater Tube Leak		Repaired Leak - Capital Replacement in 2018
OCTOBER 2016									
King_G1	Forced	Other Feedwater Pump Problem	10/10/2016	10/15/2016	5	12 Boiler Feed Pump condenser expansion joint	12 Boiler Feed Pump tripped due to loss of vacuum in its turbine condenser as a result of a failed expansion joint. The plant is configured for normal operation with 2 out of 3 condenser vacuum pumps in-service maintaining proper vacuum for the main condenser and auxiliary condensers for 12 BFP and 13 BFP. The sudden loss of vacuum on 12 BFP condenser cascaded to 13 BFP which also tripped on loss of vacuum, and eventually led to a plant trip due to low feedwater flow. Upon confirming the failed expansion joint boot between 12 BFP Turbine and its condenser, 12 BFP Turbine was isolated and the plant was returned to service several hours later using 11 Motor Driven BFP and 13 Steam Driven BFP.		The failed expansion joint on 12 BFP was replaced and the BFP was returned to service on 10/15/2016. The same expansion joint on the 13 BFP was replaced in May of 2017.
Monticello_1	Forced	Feedwater Pump	10/09/2016	10/13/2016	4	11 Reactor Feedwater Pump (RFP)	A component internal to the pump (pump shaft sleeve) experienced a delamination of the hardened surface coating material causing increased vibrations which required the pump to be removed from service on 10/9/2016 for repair. The unit was de-rated to 58% power during the time the 11 RFP was out of service for repair. A new shaft sleeve was installed, the pump was returned to service, and the unit was returned to 100% power.		Monticello, working with the pump OEM, pursued an extensive redesign and upgrade of the Reactor Feedwater Pump (RFP) internal components aimed at achieving a minimum 10 year reliable operating period. These upgrades were implemented on both Monticello's RFP's (11 and 12) during the spring 2017 refueling outage (RFO28).
SHERCO_G1	Forced	High Pressure Heater Tube Leal	10/24/2016	10/28/2016	4	16 HP Feed water heater	16 FW heater tube leak - heater taken out of service due to tube leaks. Found three leaking tubes due to support fretting in the superheating zone. The failed tubes had short, sharp indications near the third support. 9 other surrounding tubes had fretting damage at the 2nd and/or 3rd support.		Performed an RFT inspection bounding the damaged tubes and all plugs in the outlet pass. 12 tubes were plugged, including 3 of the leaking tubes. RFT previously performed in 2015 found this heater in excellent condition with the exception of some tubes showing wear at support plate locations so they had stabilization cables installed and then plugged. This and surrounding area will be inspected during the 2018 overhaul.
Wilmart_1	Forced	First Superheater Leaks	10/10/2016	10/13/2016	3	Boiler superheat tube	Boiler superheat tube leak		Increased NDE, tube weld build up, and repairs made in the spring 2017 outage and capital replacement in 2018
Wilmart_1	Forced	First Superheater Leaks	10/24/2016	10/26/2016	1	Boiler superheat tube	Boiler superheat tube leak		Increased NDE, tube weld build up, and repairs made in the spring 2017 outage and capital replacement in 2018
Blue_Lk_G8	Forced	Other Exciter Problems	10/26/2016	10/27/2016	1	SCR Fault in LCI	Failed Component in Starting System		Tested SCR's and replaced failed component
French_1	Maintenance	Minor Boiler Overhaul (less Tha	10/06/2016	10/07/2016	2	Boiler	This was a maintenance outage for periodic cleaning and inspection.		RDF fuel causes boiler fouling. We believe we are cleaning at appropriate intervals.
French_1	Maintenance	Condenser Tube And Water Bo	10/13/2016	10/14/2016	1	Condenser	Routine fall cleaning during tree de-leafing time		Consider installing new screens. Currently on hold for 316b.
French_1	Maintenance	Minor Boiler Overhaul (less Tha	10/27/2016	10/28/2016	1	Boiler	This was a maintenance outage for periodic cleaning and inspection.		RDF fuel causes boiler fouling. We believe we are cleaning at appropriate intervals.
Redwing_2	Forced	First Superheater Leaks	10/05/2016	10/07/2016	2	Boiler	Superheater Tube Leak		Repaired Leak - Capital Replacement in 2018
Redwing_2	Forced	First Superheater Leaks	10/12/2016	10/15/2016	3	Boiler	Superheater Tube Leak		Repaired Leak - Capital Replacement in 2018

Unit Outage Information

Unit	Outage Category	Primary Reason for outage	Outage Dates Start	End	Duration (Days)	Equipment that resulted in the forced outage	Description of Equipment Failure	[PROTECTED DATA BEGINS Change in Energy Costs	Steps Taken to Alleviate Reoccurrence
Redwing_2	Forced	First Superheater Leaks	10/22/2016	10/25/2016	3	Boiler	Superheater Tube Leak		Repaired Leak - Reduced Soot Blowing from twice daily to every other day - Capital Replacement in 2018
SHERCO_G2	Forced	Air Heater (regenerative)	10/08/2016	10/21/2016	14	22 Air heater	Upper guide bearing repair. Failure of the tapered fitting, guide bearing assembly, and trunion shaft.		Trunion shaft machined in place, tapered spacer sleeve fabricated, oil seal tube fabricated, and completed repairs. Air heater guide bearing overhaul inspection will now include inspection for this type of failure.
Wilmart_1	Forced	First Superheater Leaks	10/30/2016	11/01/2016	1	Boiler superheat tube	Boiler superheat tube leak		Increased NDE, tube build up, and repairs made in the spring 2017 outage and capital replacement in 2018
NOVEMBER 2016									
CCRiverside1	Maintenance	Circulating Water Piping Fouling	11/15/2016	11/17/2016	3	This was not a forced outage. Classified as a MO because we chose when to take the outage.	T-Screens for Circulating Water System.		The Maintenance Outage was taken to replace the T-Screens with new models to address failure mechanisms in the originally installed T-Screens. All 5 T-Screens have been replaced with new models to eliminate the welding failures which had caused problems with the orginal T-Screens
CCRiverside1	Forced	Solid State Exciter Element	11/19/2016	11/21/2016	2	Unit 7 Steam Turbine Generator Exciter	Voltage exciter experienced a controls failure which prevented the field breaker from closing and bringing the unit on line. The steam turbine must be on line for both units to be available to operate.		OEM representative was brought on site to identify root cause. Root cause was determined to be an opto-isolator. This component provides control output to the field breaker. The output was moved to a separate location not subject to the failure experienced during this event; per direction of the OEM representative.
CCRiverside2	Forced	Solid State Exciter Element	11/19/2016	11/21/2016	2	Same event as Riverside 1, above.	Same event as Riverside 1, above.		OEM representative was brought on site to identify root cause. Root cause was determined to be an opto-isolator. This component provides control output to the field breaker. The output was moved to a separate location not subject to the failure experienced during this event; per direction of the OEM representative.
DECEMBER 2016									
Wheaton_1	Forced	Generator Rotor Windings	12/01/2016	12/31/2016	31	Generator	Testing showed electrical leads and windings in need of repair.		Maintenance program in place to electrically test windings and record readings.
Wheaton_4	Forced	General Gas Turbine Unit Inspe	12/01/2016	12/28/2016	28	Turbine blades	Inspection found blade migration on 3rd row of turbine blades.		Inspection program in place based on starts and hours of service
JANUARY 2017									
BayFrnt_G6	Forced	Other Fire Protection System Pr	01/01/2017	01/02/2017	1	Substation Fire Protection System	System did not fail, it was an emergent capital project to replace the deluge valves, wiring and sensors at transformers. Old system was failing with no replacement parts		Fire protection system was replaced under capital project.
SHERCO_G1	Forced	Opacity - Fossil Steam Units	01/03/2017	01/11/2017	8	Scrubber Modules	Upper wet ESP fields had become dirty requiring derates to avoid exceeding opacity limitations. Recent power supply upgrades on the fields to increase particle removal efficiency have resulted in the need for more aggressive cleaning.		ESP field cleaning was accelerated to allow a baseline point to establish a new more aggressive cleaning schedule. Time during overhauls will be used to effectively allow further cleaning of modules.
Redwing_2	Forced	Lack Of Fuel (outside managem	01/01/2017	01/03/2017	2	Lack Of Fuel (outside management control)	The vendor failed to adequately estimate the fuel they would receive for processing and delivery to Red Wing for burning.		The vendor has a yearly contract minimum to deliver and as of the date of this report (9/1/17) they are well on their way to meeting that amount.
SHERCO_G1	Forced	Boiler Recirculation Piping inclu	01/17/2017	01/19/2017	2	Boiler Circ Pump trim piping	Following the failure of a 1" schedule 160, SA106 grade B, mild steel pipe (trimp piping) around the 24 boiler circulation pump (BCP) TEAM Industrial Services conducted digital radiography on the piping on U1 December 7-8, 2016. TEAM submitted their final NDE report on December 14, 2016. The lowest thickness was recorded on the piping surrounding the trim piping on 14 BCP at 0.032". This was a significant loss in wall thickness from an original design thickness of 0.250". Unit was taken off line to replace piping.		Four pipes were replaced to eliminate the risk of pipe failure. Maintenance made preparations prior to the shutdown to efficiently complete welding. All fillet welds were inspected and approved by a Certified Weld Inspector per ASME B31.1 weld inspection requirements.
SHERCO_G2	Forced	Other Forced Draft Fan Problem	01/23/2017	01/28/2017	4	22 FD Fan	22 FD Fan developed excessive vibration at elevated unit load. Derate was submitted to allow troubleshooting and testing of the fan to prevent further failures. Thrust bearing clearance was found out of design spec .008-.002 inches. We found it at .046 -.050 inches. Review of historical data showed that fan room temperature stratification may have an affect on vibration.		Ventilation modifications have been made to create more even temperatures in the fan room. Operators are biasing fan damper position to avoid vibration incidents. A new bearing has been ordered, once on site, it will be installed at the next available opportunity.

Unit Outage Information

[PROTECTED DATA BEGINS

Unit	Outage Category	Primary Reason for outage	Outage Dates Start	End	Duration (Days)	Equipment that resulted in the forced outage	Description of Equipment Failure	Change in Energy Costs	Steps Taken to Alleviate Reoccurrence
FEBRUARY 2017									
SHERC3	Forced	Condensate/hotwell Pumps	02/01/2017	02/25/2017	**24**	32 Condensate pump	Condenser shaft failure due to water hammer events. Prior to this failure, a water hammer event was occurring while this pump was in service. A vent line from the pump can to the condenser was found closed and may have resulted in air-intrusion into the pump causing water hammers. In addition, these pumps have had an issue since original construction with water hammer on startup when there is vacuum in the condenser. Due to elevation and discharge head design, a void forms in the upper portion of the pump resulting in water impacting the stuffing box area upon startup.		A modification was performed to the 31 pump in 1990 to mostly fill this area and appeared to correct this issue. However the spool pieces were never installed in the 32 and 33 pumps and the parts are currently in the warehouse. It was decided in 1990 to defer installation until a future inspection was needed due to cost and complexity. The modification may be installed in the future on the 32 and 33 CDP but it requires considerable work to not only remove the motor and pump but to disassemble the columns and shaft and perform the welding. Improvements are being made to original valve checklist to eliminate inadequacies. A contributor to this issue is the capacity of each pump being ~47% of full load since the uprate in 2011. Since that time, a third condensate pump must be started when the unit is brought above ~900 MW gross to maintain DA level. This more frequent starting and resulting water hammers likely contributed to the shaft failure. The short term solution to this issue to is to have the 31 CDP be the last in and first out going forward since it has the modification installed. This will result in 32 and 33 CDPs being in service at all times and therefore not have the water hammer on startup.
Wilmart_1	Forced	Fly Ash Handling	02/05/2017	02/06/2017	**1**	Dustmaster collection mixer	Transmission oil seal failure resulting in loss of oil and equipment being unable to run.		Motor and seal replaced. Scheduled for capital replacement in 2018
MARCH 2017									
SHERCO_G1	Forced	Other Pulverizer Problems	03/05/2017	03/21/2017	**17**	11 and 14 coal mill	Rocks in the coal supply from the mines caused increased wear on the crusher hammers, increasing the gap and hence size of the pulverized coal. This allowed large chunks of coal to enter the mills, causing either pluggage in the cone or hideout by the air inlet vanes. This resulted in puffing or spontaneous combustion in the classifier in the mill causing damage.		Concerns have been expressed to the mine about quality and our expectations that they need to improve in this aspect. We have recently tested Belle Ayre coal in all three units and are in the process of qualifying this as suitable replacement as a hedge against the mine sending us poor quality coal. Crusher amp indication has been set up in OSI PI software for real time indication to give early detection wear on crusher hammers and the need to readjust classifier plates. Yard operations is monitoring belts for increased coal size and will adjust classifying plates on this condition based assessment as opposed to previous frequency based adjustments.
King_G1	Forced	High Pressure Heater Tube Leal	03/01/2017	03/04/2017	**3**	16B High Pressure Feedwater Heater	Tube failure inside Feedwater Heater.		5 leaking tubes were plugged during the forced outage. During the 2017 Spring overhaul stabilizers were installed in the Feedwater heater per OEM guidance to eliminate tube fretting which was the root cause of the tube failures.
Anson_G4	OMC	Gas Turbine - Gas Fuel System	03/01/2017	03/27/2017	**26**	Gas Turbine	This is not a forced outage **** NG Curtailment Seasonal		Seasonal Occurrence
King_G1	Forced	Slag-tap (cyclone Furnace)	03/04/2017	03/08/2017	**4**	Bottom Ash Slag Tank	Unable to sluice bottom ash from tank. Contributing factors included lower load operation and a sluicing assist process change.		Changed slag tank operating parameters in 2016. Modifications made to the slag tank during the 2017 spring outage to improve ash moving capability.
Blue_Lk_G7	OMC	Lack of fuel (within managemen	03/01/2017	03/27/2017	**26**	NA	This is not a forced outage **** NG Curtailment Seasonal		Seasonal Occurrence
Blue_Lk_G8	OMC	Lack of fuel (within managemen	03/01/2017	03/27/2017	**26**	NA	This is not a forced outage **** NG Curtailment Seasonal		Seasonal Occurrence
French_1	Maintenance	Minor Boiler Overhaul (less Tha	03/02/2017	03/06/2017	**3**	Boiler	This was a maintenance outage for periodic cleaning and inspection.		RDF fuel causes boiler fouling. We believe we are cleaning at appropriate intervals.
French_2	Maintenance	Minor Boiler Overhaul (less Tha	03/23/2017	03/27/2017	**4**	Boiler	This was a maintenance outage for periodic cleaning and inspection.		RDF fuel causes boiler fouling. We believe we are cleaning at appropriate intervals.
APRIL 2017									
SHERCO_G1	Forced	Other Pulverizer Problems	04/01/2017	04/27/2017	**27**	12 and 14 coal mill	Rocks in the coal supply from the mines caused increased wear on the crusher hammers, increasing the gap and hence size of the pulverized coal. This allowed large chunks of coal to enter the mills, causing either pluggage in the cone or hideout by the air inlet vanes. This resulted in puffing or spontaneous combustion in the classifier in the mill causing damage.		Concerns have been expressed to the mine about quality and our expectations that they need to improve in this aspect. We have recently tested an alternative coal in all three units and are in the process of qualifying this as suitable replacement as a hedge against the mine sending us poor quality coal. Crusher amp indication has been set up in OSI PI software for real time indication to give early detection wear on crusher hammers and the need to readjust classifier plates. Yard operations is monitoring belts for increased coal size and will adjust classifying plates on this condition based assessment as opposed to previous frequency based adjustments.
Anson_G4	Forced	Main Transformer	04/01/2017	04/05/2017	**4**	Main Transformer	Transformer conservator tank low oil level		Added oil to tank. New transformer, oil level decrease to to cold weather.

Unit Outage Information

Unit	Outage Category	Primary Reason for outage	Outage Dates Start	End	Duration (Days)	Equipment that resulted in the forced outage	Description of Equipment Failure	[PROTECTED DATA BEGINS Change in Energy Costs	Steps Taken to Alleviate Reoccurrence
French_1	Maintenance	Minor Boiler Overhaul (less Tha	04/05/2017	04/07/2017	2	Boiler	This was a maintenance outage for periodic cleaning and inspection.		RDF fuel causes boiler fouling. We believe we are cleaning at appropriate intervals.
French_1	Maintenance	Minor Boiler Overhaul (less Tha	04/20/2017	04/21/2017	1	Boiler	This was a maintenance outage for periodic cleaning and inspection.		RDF fuel causes boiler fouling. We believe we are cleaning at appropriate intervals.
French_2	Forced	Economizer Leaks	04/01/2017	04/27/2017	27	Boiler	Hand hole leak due to thermal fatigue		The plant normally runs on a Monday through Friday basis and any leaks such as this one are repaired on the weekends while the plant is off line. Due to contractual requirements of burning refused derived fuel, it was necessary to run through the weekend in this instance. The unit had to be taken off line the following week when the size of the leak increased to the point where the unit could not be operated. The issue with the contractual requirements has been resolved so going forward, this type of maintenance can be performed when the unit is not in service on the weekends.
Redwing_1	Forced	Bottom Ash Systems (wet Or Dr	04/19/2017	04/21/2017	1	#11 Traveling Grate Bed	Grate Bed Seized due to FME jammed between Bars		Replaced/Repaired missing grate weight closure components & double nutted all hold down hardware.
SHERCO_G2	Forced	Second Reheater Leaks	04/05/2017	04/08/2017	4	Boiler reheater Tube #4 on assembly 101.	Tube leak - long term overheating due to the combined effects of buildup of inside diameter surface oxide scale, it was concluded that the tube failed due to long term overheating (creep) with an oxide thickness of at least 25 mils.		Repaired original leak and five other surrounding tubes due to collateral damage. Inspection and subsequent proactive repairs/replacement to this area will be completed during the next planned overhaul in 2019.
SHERCO_G2	Forced	Turbine Gland Seal System	04/16/2017	04/27/2017	11	21 Gland Steam Exhauster	Shortly after the unit came offline for economy shutdown, the 21 Gland Steam Exhauster tripped with turbine seals still in service. This caused water to accumulate in the turbine oil to a point which caused grounds in insulated bearings 8,9,10 and the generator end H2 seal which precluded a restart. During disassembly of the bearings, which is required for moisture removal, preexisting electrolysis was found on #10 bearing. This bearing needed to be sent out for repair, which caused additional outage duration.		Tygon tubing was added to the exhauster fan casing and piping to monitor for moisture build up, which could cause the fan to trip. High speed recorder has been put in place for improved monitoring of motor amps.
MAY 2017									
PR_ISLD_1	Forced	Main Transformer	05/21/2017	06/01/2017	10	Hot Spot Identified on Main Step Up Transformer Bus Duct Support	The hot spot identified was beyond acceptable limits. A Unit down power was required in order to reduce the hot spot temperature to an acceptable level. The Unit was ultimately taken offline in order to repair the condition. The cause of the hot spot was due to undersized bonding jumpers for the application. The original plant drawings did not contain the specifications for the proper sized jumpers.		The bonding jumpers were replaced with the correct size jumpers. Actions 500000275548, 500000275549, and 500000275574 have been generated to update the plant drawings/vendor manual for the transformers with the correct size jumpers.
Blue_Lk_G7	Maintenance	Other Voltage Protection Device	05/23/2017	05/24/2017	1	7GSU Relays	This was not a forced outage*** Maintenance Outage to Upgrade to new style of relays		
Blue_Lk_G8	Maintenance	Other Voltage Protection Device	05/25/2017	05/26/2017	1	8GSU Relays	This was not a forced outage*** Maintenance Outage to Upgrade to new style of relays		
French_1	Forced	Air Supply Duct Expansion Joint	05/10/2017	05/15/2017	5	Expansion Joint Failure	Metal Corrosion of expansion joint.		Replaced expansion joint with stainless steel to prevent corrosion failure.
French_2	Maintenance	Minor Boiler Overhaul (less Tha	05/18/2017	05/22/2017	4	Boiler	This was a maintenance outage for periodic cleaning and inspection.		RDF fuel causes boiler fouling. We believe we are cleaning at appropriate intervals.
Redwing_2	Forced	Boiler - Other Internal And Struc	05/30/2017	06/01/2017	1	Boiler	Superheater Tube Leak		Repaired Leak - Capital Replacement in 2018
SHERCO_G1	Forced	Boiler inspections - scheduled o	05/12/2017	05/16/2017	5	Unit 1 boiler -State of MN required inspection	State of MN required inspection. Historically the plant has performed these required inspections coincident with forced outage opportunities during a 3 year overhaul cycle. However, due to major boiler improvements in recent years, opportunities to perform these inspections have become more infrequent. Due to enhanced overhaul boiler inspections the state has granted us extensions in the past to avoid a separate outage. In this case, this extension was not granted and resulted in this outage.		Xcel Energy is working with the MN state boiler inspector to introduce legislation in the next session to allow 3 year inspections if the owner performs enhanced boiler inspections at that frequency, as Sherco currently does.
JUNE 2017									
SHERCO_G1	Forced	Primary Air Fan	06/10/2017	06/22/2017	12	11 PA fan motor	11 PA fan motor stator overheating. This motor along with 12 PA fan motor are original equipment and nearing end of life and have been in service for 45 years.		11 PA fan motor was sent out and rewound and placed back in service. 12 PA fan motor will be rewound during the 2018 overhaul.
Blue_Lk_G7	Forced	12-15kv Circuit Breakers	06/02/2017	06/05/2017	3	7 Generator Breaker	Loss of SF6 Gas Pressure.		Added Gas
French_1	Maintenance	Minor Boiler Overhaul (less Tha	06/16/2017	06/20/2017	4	Boiler	This was a maintenance outage for periodic cleaning and inspection.		RDF fuel causes boiler fouling. We believe we are cleaning at appropriate intervals.
French_2	Maintenance	Minor Boiler Overhaul (less Tha	06/22/2017	06/26/2017	4	Boiler	This was a maintenance outage for periodic cleaning and inspection.		RDF fuel causes boiler fouling. We believe we are cleaning at appropriate intervals.
PR_ISLD_1	Forced	Main Transformer	06/01/2017	06/02/2017	2	Hot Spot Identified on Main Step Up Transformer Bus Duct Support (CONTINUATION)	Continuation of outage beginning on 5/21/17. See explanation above.		Continuation of outage beginning on 5/21/17. See explanation above.

Unit Outage Information

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Unit	Outage Category	Primary Reason for outage	Outage Dates Start	End	Duration (Days)	Equipment that resulted in the forced outage	Description of Equipment Failure	Change in Energy Costs	Steps Taken to Alleviate Reoccurrence
Wheaton_1	Forced	Generator Bearings And Lube O	06/12/2017	06/22/2017	10	Dowel pins and sealing gaskets on gen	Worn pins and bolts created oil leak by collector rings on generator.		New dowel pins and gaskets installed.
Wheaton_2	Forced	Circuit Breakers	06/29/2017	07/01/2017	2	SSS clutch	SSS clutch wouldn't engaged turning gear.		New SSS clutch installed on unit.
JULY 2017									
Wilmart_1	Forced	First Superheater Leaks	07/11/2017	07/14/2017	3	Boiler superheat tube	Boiler superheat tube leak		Superheater section was replaced during the spring outage 2018.
Anson_G4	Forced	Switchyard System Protection Devices - external (OMC)	07/06/2017	07/14/2017	9	Line insulator	Failed Insulator on Overhead to underground structure. Also found bad terminations which didn't need immediate replacement.		Insulator was replaced. Termination replacement scheduled for October of 2018.
Blk_Dog_G52	Forced	Unit Auxiliaries Transformer	07/28/2017	07/30/2017	2	Station Auxiliary Transformer	Sudden Pressure Relay for transformer erroneously opened.		Replaced failed relay.
Blue_Lk_G7	Forced	Generator Voltage Control	07/20/2017	07/26/2017	6	VT4 Potential Transformer Failure	Internal Failure of Component causing indication failure.		Replaced voltage transformer.
French_1	Forced	Waterwall (Furnace wall)	07/13/2017	07/17/2017	3	Boiler water wall	It had multiple leaks from corrosion of tubes.		The water wall was replaced during a planned maintenance outage in October of 2017.
French_2	Maintenance	Minor Boiler Overhaul (less Than 720 Hours)	07/20/2017	07/24/2017	4	Boiler	Preventative maintenance outage for periodic cleaning and inspection.		Preventative maintenance cycle to periodically address boiler fouling, fuel delivery system and other components to aid reliable operation.
French_2	Forced	Forced Draft Fan Motors	07/26/2017	08/01/2017	5	Forced draft fan motor	The motor had cracked windings.		Motor was rewound and placed back in service. We increased the frequency that the motor is inspected.
SHERC3	Forced	Forced Draft Fan Drives (other Than Motor)	07/18/2017	07/19/2017	2	32 Forced Draft Fan	Instrument tubing that was installed during the 2017 overhaul as an enhancement to provide monitoring for hydraulic positioner condition failed at the Swagelock fitting due to cycle fatigue from vibration causing an oil leak.		The hydraulic instrumentation lines were capped on this fan and 31 forced draft fan. Future design considerations will include a flexible/braided hose design.
SHERCO_G1	Forced	Air Heater (regenerative)	07/22/2017	07/23/2017	1	11 Air Preheater Drive Motor	Electrical Failure of the motor.		Replaced Motor. We will check magnetic coupling every overhaul for proper alignment. We will replace motor every 6 years, We will replace motor bearings in the overhaul year when the motor is not being replaced.
SHERCO_G2	Forced	First Reheater Leaks	07/26/2017	07/28/2017	3	Rear Reheat Assembly #107, Tube #2	Longitudinal Tube Leak due to sootblower erosion.		Sootblower lance rotated 90 degrees to change the helical pattern.
Wheaton_2	Forced	Circuit Breakers	07/01/2017	07/28/2017	27	Generator Breaker Stabs	Breaker stabs were leaking insulating compound		Contractor (L&S Electric) rebuilt the components on all 4 GE Frame 7 units.
AUGUST 2017									
Wilmart_1	Forced	First Superheater Leaks	08/26/2017	08/29/2017	3	Boiler superheat tube	Boiler superheat tube leak		Superheater section was replaced during the spring outage 2018.
French_2	Forced	Forced Draft Fan Motors	08/01/2017	08/08/2017	7	Forced draft fan motor	The motor had cracked windings.		Motor was rewound and placed back in service. Increased frequency that the motor is inspected.
Redwing_2	Forced	First Superheater Leaks	08/01/2017	08/05/2017	4	Boiler	Superheater Tube Leak		Superheater section was replaced during the 2018 outage.
SHERCO_G1	Forced	Turbine Gland Seal System	08/12/2017	08/15/2017	3	11 Steam Gland Exhauster	Motor drive end shaft bearing failure.		Motor was sent to L&S for emergency repair and reinstalled. New exhauster assembly installed during the 2018 overhaul. We have adjusted inspection frequency of blower assembly to every 3 years.
SHERCO_G1	Forced	Fire protection system instrumentation and control	08/15/2017	08/16/2017	1	Intercept Valve Proximity Switch	Following a unit trip during startup due to loss of ignitors from a false fire protection flow switch activation, the generator output breakers did not open automatically as designed. This was due to the design of the intercept valve proximity switch linkage which showed the valves as being open.		Design using upgraded attachment brackets installed during the 2018 overhaul. Units 2 and 3 already have the upgraded design.
SEPTEMBER 2017									
SHERCO_G2	Forced	Wet Scrubber Mist Eliminators/demisters & Washdown	09/25/2017	09/30/2017	5	Scrubber Modules	Ash buildup on fields, spargers, and other components resulting in inefficient particulate removal and high stack opacity. Aging of equipment requires regular maintenance. Unit needs to be derated to perform cleaning functions such as flushing, high voltage cleaning, and manual nightly cleaning. Upgrades to emissions control equipment have resulted in the need for more aggressive cleaning in addition to normal equipment maintenance.		Cleaning frequency for each scrubber module (12 total per unit) has increased from once a year to once every 8 months. This strategy will still require some smaller derates to complete all required cleaning evolutions but these smaller derates should be limited mainly to the spring and fall when energy prices are historically less. We are testing a chemical addititive in one of the modules that may reduce the amount of time a module has to be out of service for manual cleaning.
French_1	Maintenance	Minor Boiler Overhaul (less Than 720 Hours)	09/01/2017	09/05/2017	4	Boiler	Preventative maintenance outage for periodic cleaning and inspection.		Preventative maintenance cycle to periodically address boiler fouling, fuel delivery system and other components to aid reliable operation.
French_1	Forced	In-bed reheat tubes (fbc Only)	09/11/2017	09/12/2017	1	Boiler	Tube failure due to erosion.		The tubes were flipped in March of 2018 to address this problem.
French_2	Maintenance	Minor Boiler Overhaul (less Than 720 Hours)	09/14/2017	09/18/2017	3	Boiler	Preventative maintenance outage for periodic cleaning and inspection.		Preventative maintenance cycle to periodically address boiler fouling, fuel delivery system and other components to aid reliable operation.

Unit Outage Information

Unit	Outage Category	Primary Reason for outage	Outage Dates Start	End	Duration (Days)	Equipment that resulted in the forced outage	Description of Equipment Failure	[PROTECTED DATA BEGINS Change in Energy Costs	Steps Taken to Alleviate Reoccurrence
PR_ISLD_2	Forced	Turbine Lube Oil System Valves And Piping	09/18/2017	09/20/2017	2	PI Unit 2 Turbine Lube Oil Piping	On Prairie Island Unit 2, an oil leak on the weld from the Turbine Main Lube Oil Pump discharge feed to the Turbine Auto Stop Oil System was discovered. Based on the leak rate continuing to increase and temporary repairs not considered to be feasible, a decision was made to reduce power and take the Turbine offline to make the repairs. The generator was taken offline and a weld repair was performed for the defective joint. The unit was then returned to 100% power. The reactor remained at power throughout the repair.		An inspection of the lube oil and seal oil piping for the Unit 2 turbine was performed. Prior to this, the Unit 1 piping was also walked down. A hand over hand inspection of all accessible portions of seal oil and lube oil piping was performed. Weld quality was examined, along with pipe stability and supports. The final weld repair for the defective weld under WO 700026968 replaced the failed weld as well as the welds neighboring the failure. No additional welds of similar poor quality were identified during the inspections. Note: This was determined to be an original construction weld from initial plant start up.
Redwing_2	Forced	First Superheater Leaks	09/01/2017	09/03/2017	2	Boiler	Superheater Tube Leak		Superheater section was replaced during the 2018 outage.
Redwing_2	Forced	First Superheater Leaks	09/10/2017	09/12/2017	2	Boiler	Superheater Tube Leak		Superheater section was replaced during the 2018 outage.
Redwing_2	Forced	First Superheater Leaks	09/22/2017	09/27/2017	4	Boiler	Superheater Tube Leak		Superheater section was replaced during the 2018 outage.
Redwing_2	Forced	First Superheater Leaks	09/30/2017	10/01/2017	0	Boiler	Superheater Tube Leak		Superheater section was replaced during the 2018 outage.
Wilmart_1	Forced	First Superheater Leaks	09/14/2017	09/17/2017	3	Boiler superheat tube	Boiler superheat tube leak		Superheater section was replaced during the spring outage 2018.
OCTOBER 2017									
King_G1	Forced	Wet Coal (OMC)	10/01/2017	10/08/2017	7	This is not a forced outage situation. This was a derate due to wet coal.	There was no equipment failure involved.		During signicant rain/snow events coal loading of crushers, belts, chutes and other equipment can result in a derate that is out of operational control.
SHERCO_G1	Forced	Waterwall (Furnace Wall)	10/12/2017	10/15/2017	3	Waterwall tube leak between blowers C23 and C24. Also discovered a front reheat tube leak while off line, pendant #99 tube #4.	Waterwall leak was from sootblower erosion due to an inoperable rotational motor on C23. Reheat tube was a longitudinal crack due to sootblower erosion.		Replaced tubes. Checked operation of all sootblowers, aligned all wallblowers, replaced remaining thin tubes in area during 2018 overhaul. Due to the impending 2026 retirement date of the unit, reheat section tube leaks will be managed via O&M repair/replace vs a large capital investment to replace this boiler section.
SHERCO_G1	Forced	Waterwall (Furnace Wall)	10/16/2017	10/18/2017	2	Management decisison to conservatively keep pressure lower following tube leak repair to avoid exposing new repairs and other suspected thin tubes to full pressure until Unit 2 tube leak repair could be completed.	Tubes adjacent to tubes replaced during the last unit 1 overhaul suspected as thin. The unit was kept at a lower pressure to mitigate potential tube failure while unit 2 was offline for tube leak repair.		Replaced tubes. Checked operation of all sootblowers, aligned all wallblowers, replaced remaining thin tubes in area during 2018 overhaul. Due to the impending 2026 retirement date of the unit, reheat section tube leaks will be managed via O&M repair/replace vs a large capital investment to replace this boiler section.
SHERCO_G1	Forced	Turbine Gland Seal System	10/19/2017	10/23/2017	4	11 Steam Gland Exhauster	Motor drive end shaft bearing failure. Unit was derated with an alternate steam exhaust path until a new motor arrived and then taken off line for repair.		Motor was sent to L&S for emergency repair and reinstalled. New exhauster assembly installed during the 2018 overhaul. Adjusted inspection frequency of blower assembly to every 3 years.
SHERCO_G2	Forced	Wet Scrubber Mist Eliminators/demisters & Washdown	10/01/2017	10/12/2017	12	Scrubber Modules	Ash buildup on fields, spargers, and other components resulting in inefficient particulate removal and high stack opacity. Aging of equipment requires regular maintenance. Unit needed to be derated to perform other normal cleaning functions such as flushing, high voltage cleaning, and manual nightly cleaning. Upgrades to emissions control equipment have resulted in the need for more aggressive cleaning in addition to normal equipment maintenance.		Cleaning frequency for each scrubber module (12 total per unit) has increased from once a year to once every 8 months. This strategy will still require some smaller derates to complete all required cleaning evolutions but these smaller derates should be limited mainly to the spring and fall when energy prices are historically less. We are testing a chemical addititive in one of the modules that may reduce the amount of time a module has to be out of service for manual cleaning.
SHERCO_G2	Forced	Waterwall (Furnace Wall)	10/12/2017	10/17/2017	4	Management decisison to avoid a dual unit outage by keep unit 2 available in a derate by lowering pressure until Unit 1 was restored to operation due to a tube leak repair.	Leak on offset tubes for wallblower 2A15 that could be managed with lower boiler pressure until the tube leak was repaired on unit 1.		Replaced tube. We will inspect non-pressure to pressure part connections at sootblower openings during the unit 2 2019 overhaul for similar failures.
SHERCO_G2	Forced	Waterwall (Furnace Wall)	10/17/2017	10/18/2017	2	Waterwall tube leak near A15 soot blower.	Leak on offset tubes for wallblower 2A15. The leak propagated at the termination of the membrane to tube weld at the sootblower offset tubing.		Replaced tube. We will inspect non-pressure to pressure part connections at sootblower openings during the unit 2 2019 overhaul for similar failures.
SHERC3	Forced	Turbine control valves	10/03/2017	10/06/2017	3	Turbine Control Valve #2	The valve closing spring seat was installed incorrectly within the spring can with an eye bolt still attached. Eventually the eye bolt became free and became lodged within the valve internals, preventing complete closure.		These control valves were serviced in the spring of 2017 by MD&A. The valves were removed and installed on-site during the overhaul by GE.
SHERC3	Forced	Blowdown System Piping	10/10/2017	10/11/2017	1	18 inch plant drain pipe	Drain pipe from the blowdown tank had become plugged due sediment buildup. This limited boiler blowdown caused a delay in water cleanup and increased plant startup time.		WOMA was used to clean out enough to prevent any more backup of water. Entire section will be completely cleaned out during 2020 overhaul. Annual cleaning maintenance plan to be put in place for cleaning of sediment traps in piping vaults.
Wilmart_1	Forced	First Superheater Leaks	10/07/2017	10/11/2017	4	Boiler superheat tube	Boiler superheat tube leak		Superheater section was replaced during the spring outage 2018.
Wilmart_1	Forced	First Superheater Leaks	10/20/2017	10/23/2017	2	Boiler superheat tube	Boiler superheat tube leak		Superheater section was replaced during the spring outage 2018.
Wilmart_1	Forced	First Superheater Leaks	10/28/2017	10/31/2017	3	Boiler superheat tube leak	Boiler superheat tube leak		Superheater section was replaced during the spring outage 2018.
Wilmart_1	Forced	First Superheater Leaks	10/31/2017	11/01/2017	1	Boiler superheat tube leak	Boiler superheat tube leak		Superheater section was replaced during the spring outage 2018.
Redwing_2	Forced	First Superheater Leaks	10/01/2017	10/03/2017	2	Boiler	Superheater Tube Leak		Superheater section was replaced during the 2018 outage.
Redwing_2	Forced	First Superheater Leaks	10/05/2017	10/07/2017	1	Boiler	Superheater Tube Leak		Superheater section was replaced during the 2018 outage.

Unit Outage Information

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Unit	Outage Category	Primary Reason for outage	Outage Dates Start	End	Duration (Days)	Equipment that resulted in the forced outage	Description of Equipment Failure	Change in Energy Costs	Steps Taken to Alleviate Reoccurrence
Redwing_2	Forced	Gen. Stator Windings, Bushings, And Terminals	10/07/2017	11/01/2017	25	Main Generator	Generator synched out of phase due to a delayed closure of the output control breaker.		Generator output breaker was replaced and the Generator was rewound.
French_1	Maintenance	Minor Boiler Overhaul (less Than 720 Hours)	10/20/2017	10/24/2017	4	Boiler	Preventative maintenance outage for periodic cleaning and inspection.		Preventative maintenance cycle to periodically address boiler fouling, fuel delivery system and other components to aid reliable operation.
French_2	Maintenance	Minor Boiler Overhaul (less Than 720 Hours)	10/13/2017	10/16/2017	4	Boiler	Preventative maintenance outage for periodic cleaning and inspection.		Preventative maintenance cycle to periodically address boiler fouling, fuel delivery system and other components to aid reliable operation.
NOVEMBER 2017									
SHERCO_G1	Forced	Flue Gas Expansion Joints	11/18/2017	11/19/2017	2	12 and 13 ID fan outlet expansion joints	Tears in the joints caused by flow turbulence encountered from being physically located close to the damper.		Temporary repair put in place at time of failure. Joints were replaced during the 2018 overhaul and deflector plates were added to minimize turbulence issue.
SHERCO_G1	Forced	Other Boiler Instrumentation and Control Problems	11/23/2017	11/28/2017	5	Distributed Controls System	Unit 1 controls replacement was completed during the 2015 overhaul. We experienced a hidden system response which caused fuel and air swings contributing to already existing opacity issues requiring conservative action.		We are working with our controls vendor to optimize tuning for boiler response.
SHERCO_G2	Forced	Other Pulverizer Problems	11/01/2017	11/05/2017	4	22 Coal Mill Classifier	Classifier drive belt failure.		Alternative design drive belt installed allowing for faster changeout, however, we are finding they only last about 9 months compared to 3 years for the original. Original style belt will be installed during next mill overhaul as it lasts longer.
SHERCO_G2	Forced	Opacity - Fossil Steam Units	11/07/2017	11/12/2017	5	Scrubber Modules	Ash buildup on fields, spargers, and other components resulting in inefficient particulate removal and high stack opacity. Aging of equipment requires regular maintenance. Unit needed to be derated to perform other normal cleaning functions such as flushing, high voltage cleaning, and manual nightly cleaning. Upgrades to emissions control equipment have resulted in the need for more aggressive cleaning in addition to normal equipment maintenance.		Cleaning frequency for each scrubber module (12 total per unit) has increased from once a year to once every 8 months. This strategy will still require some smaller derates to complete all required cleaning evolutions but these smaller derates should be limited mainly to the spring and fall when energy prices are historically less. We are testing a chemical addititive in one of the modules that may reduce the amount of time a module has to be out of service for manual cleaning.
SHERCO_G2	Forced	Opacity - Fossil Steam Units	11/23/2017	11/27/2017	4	Scrubber Modules	Ash buildup on fields, spargers, and other components resulting in inefficient particulate removal and high stack opacity. Aging of equipment requires regular maintenance. Unit needed to be derated to perform other normal cleaning functions such as flushing, high voltage cleaning, and manual nightly cleaning. Upgrades to emissions control equipment have resulted in the need for more aggressive cleaning in addition to normal equipment maintenance.		Cleaning frequency for each scrubber module (12 total per unit) has increased from once a year to once every 8 months. This strategy will still require some smaller derates to complete all required cleaning evolutions but these smaller derates should be limited mainly to the spring and fall when energy prices are historically less. We are testing a chemical addititive in one of the modules that may reduce the amount of time a module has to be out of service for manual cleaning.
SHERC3	Forced	High Pressure Heater Tube Leaks	11/02/2017	11/15/2017	13	Feedwater Heater	Due to single block isolation valve arrangement on these heaters, the unit had to be removed from service to facilitate repairs. This time period is the derate required with the heater out of service until unit was taken off line for repairs on 11/15/2017.		This heater is original equipment. All four high pressure feedwater heaters are nearing end of life and are scheduled to be replaced in the 2020 and 2023 overhauls. A double isolation valve arrangement will also be installed in 2020 to facilitate on line repairs.
SHERC3	Forced	High Pressure Heater Tube Leaks	11/15/2017	11/17/2017	2	36-2 High Pressure Feedwater Heater	Due to single block isolation valve arrangement on these heaters, the unit had to be removed from service to facilitate repairs. One failed and two missing pop-a-plugs discovered.		The three failed plugs were replugged using welded plugs and stabilizer cables installed. 3 other tubes were plugged in the surrounding area based on inspection results. This heater is original equipment. All four high pressure feedwater heaters are nearing end of life and are scheduled to be replaced in the 2020 and 2023 overhauls. A double isolation valve arrangement will also be installed in 2020 to facilitate on line repairs.
SHERC3	Forced	Condensate/hotwell Pumps	11/19/2017	11/30/2017	11	31 Condensate Pump	The motor had been removed to resolve a chronic leak, upon re-install the pump failed to deliver flow. The pump shaft failed along with first stage impeller key resulting in additional damage to the pump.		Pump was rebuilt by a vendor including modifications to change the pump head. A new spare pump is being purchased from the OEM to minimize future down time.
French_2	Forced	Circulating Water Pumps	11/01/2017	11/30/2017	30	#2 circulating water pump	Circulating water impeller was replaced.		This was a planned outage to address a possible de-rate condition on unit 2 turbine generator due to normal degradation of the circulating water pump.
Redwing_2	Forced	Gen. Stator Windings, Bushings, And Terminals	11/01/2017	11/30/2017	30	Main Generator	Generator synched out of phase due to a delayed closure of the output control breaker		Generator output breaker replaced and the Generator was rewound.
Wilmart_1	Forced	Minor Boiler Overhaul (less Than 720 Hours)	11/26/2017	11/30/2017	4	walking floor replacement	Walking floor at end of life.		Walking floor slates replaced during this outage and future install of distribution plate finalized to extend life of the floor. Replacement of slates scheduled for 2023.
DECEMBER 2017									
SHERC3	Forced	Condensate System	12/01/2017	12/31/2017	31	31 Condensate Pump	The motor had been removed to resolve a chronic leak, upon re-install the pump failed to deliver flow. The pump shaft failed along with first stage impeller key resulting in additional damage to the pump.		Pump was rebuilt by a vendor including modifications to change the pump head. A new spare pump is being purchased from the OEM to minimize future down time.
SHERCO_G2	Forced	Boiler Fuel Supply from Bunkers to Boiler	12/26/2017	12/27/2017	1	26 Coal Mill Classifier	Classifier drive belt failure.		Alternative design drive belt installed allowing for faster changeout; however, we are finding they only last about 9 months compared to 3 years for the original. Original style belt will be installed during next mill overhaul as it lasts longer.

Unit Outage Information

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Unit	Outage Category	Primary Reason for outage	Outage Dates Start	End	Duration (Days)	Equipment that resulted in the forced outage	Description of Equipment Failure	Change in Energy Costs	Steps Taken to Alleviate Reoccurrence
SHERCO_G1	Forced	Wet Scrubbers	12/29/2017	12/31/2017	**2**	Scrubber Modules	Ash buildup on fields, spargers, and other components resulting in inefficient particulate removal and high stack opacity. Aging of equipment requires regular maintenance. Unit needed to be derated to perform other normal cleaning functions such as flushing, high voltage cleaning, and manual nightly cleaning. Upgrades to emissions control equipment have resulted in the need for more aggressive cleaning in addition to normal equipment maintenance.		Cleaning frequency for each scrubber module (12 total per unit) has increased from once a year to once every 8 months. This strategy will still require some smaller derates to complete all required cleaning evolutions but these smaller derates should be limited mainly to the spring and fall when energy prices are historically less. We are testing a chemical addititive in one of the modules that may reduce the amount of time a module has to be out of service for manual cleaning.
Wilmart_1	Forced	Boiler Overhaul and Inspections	12/01/2017	12/03/2017	**3**	walking floor replacement	Walking floor at end of life.		Walking floor slates replaced during this outage and future install of distribution plate finalized to extend life of the floor. Replacement of slates scheduled for 2023.
Wilmart_2	Forced	Boiler Overhaul and Inspections	12/01/2017	12/03/2017	**3**	walking floor replacement	Walking floor at end of life.		Walking floor slates replaced during this outage and future install of distribution plate finalized to extend life of the floor. Replacement of slates scheduled for 2023.
Redwing_1	Forced	Controls\Slag and Ash Removal	12/06/2017	12/08/2017	**3**	Traveling Grate Bed	Carrier chain within traveling grate bed failed.		Repaired the chain and performed PM inspection during February 2018 major boiler outage.
King_G1	Forced	Circulating Water Systems (OMC)	12/07/2017	12/10/2017	**3**	Intake traveling screens	Frazil ice caused blockage at the intake traveling screens resulting in a loss of vacuum to the main turbine and a subsequent trip.		This event is classified as Outside of Management Control (OMC) due to the atmospheric conditions required for the formation of frazil ice.
JANUARY 2018									
King_G1	Forced	Reheater plugged derate	01/21/2018	01/24/2018	**3**	First Reheater Slagging Or Fouling	Fouling/plugging of the Reheater section of the boiler resulted in high differential pressure.		The contributing factors were; extended high load operation, higher sodium content coal and higher FEGT operations. Actions taken; operational procedures are in place to ensure that an adequate load reduction and subsequent slag shed occur during extended high load operations. Fuels is restricting the amount of high sodium coal delivered.
SHERCO_G1	Forced	Unit derate to 530 MWn due to cleaning on U/L fields	01/01/2018	01/02/2018	**1**	Scrubber Modules	Ash buildup on fields, spargers, and other components resulting in inefficient particulate removal and high stack opacity. Aging of equipment requires regular maintenance. Unit needed to be derated to perform other normal cleaning functions such as flushing, high voltage cleaning, and manual nightly cleaning. Upgrades to emissions control equipment have resulted in the need for more aggressive cleaning in addition to normal equipment maintenance.		Cleaning frequency for each scrubber module (12 total per unit) has increased from once a year to once every 8 months. This strategy will still require some smaller derates to complete all required cleaning evolutions but these smaller derates should be limited mainly to the spring and fall when energy prices are historically less. We are testing a chemical addititive in one of the modules that may reduce the amount of time a module has to be out of service for manual cleaning.
SHERCO_G1	Forced	Derate to HOL of 420 MW net. (7) scrubber module operation for HV cleaning and flushing.	01/06/2018	01/08/2018	**2**	Scrubber Modules	Ash buildup on fields, spargers, and other components resulting in inefficient particulate removal and high stack opacity. Aging of equipment requires regular maintenance. Unit needed to be derated to perform other normal cleaning functions such as flushing, high voltage cleaning, and manual nightly cleaning. Upgrades to emissions control equipment have resulted in the need for more aggressive cleaning in addition to normal equipment maintenance.		Cleaning frequency for each scrubber module (12 total per unit) has increased from once a year to once every 8 months. This strategy will still require some smaller derates to complete all required cleaning evolutions but these smaller derates should be limited mainly to the spring and fall when energy prices are historically less. We are testing a chemical addititive in one of the modules that may reduce the amount of time a module has to be out of service for manual cleaning.
SHERCO_G1	Forced	Derate to HOL. Scrubber module HV cleaning, flushing and NOx reduction.	01/27/2018	01/29/2018	**2**	Scrubber Modules	Ash buildup on fields, spargers, and other components resulting in inefficient particulate removal and high stack opacity. Aging of equipment requires regular maintenance. Unit needed to be derated to perform other normal cleaning functions such as flushing, high voltage cleaning, and manual nightly cleaning. Upgrades to emissions control equipment have resulted in the need for more aggressive cleaning in addition to normal equipment maintenance.		Cleaning frequency for each scrubber module (12 total per unit) has increased from once a year to once every 8 months. This strategy will still require some smaller derates to complete all required cleaning evolutions but these smaller derates should be limited mainly to the spring and fall when energy prices are historically less. We are testing a chemical addititive in one of the modules that may reduce the amount of time a module has to be out of service for manual cleaning.
SHERCO_G2	Forced	Derate due to 5 coal mill operation.	01/09/2018	01/13/2018	**4**	24 Coal Mill	While 23 mill was out of service for a gearbox inspection, 24 coal mill removed from service due to excessive spillage.		Mill floor clamp ring segment came loose and lodged under journal. The segment was replaced and bolted back into place. Bolts likely failed due to mechanical fatigue or possibly due to tramp metal going through the mill
SHERCO_G2	Forced	Derate to HOL. Scrubber module HV cleaning, flushing and NOx reduction.	01/27/2018	01/29/2018	**2**	Scrubber Modules	Ash buildup on fields, spargers, and other components resulting in inefficient particulate removal and high stack opacity. Aging of equipment requires regular maintenance. Unit needed to be derated to perform other normal cleaning functions such as flushing, high voltage cleaning, and manual nightly cleaning. Upgrades to emmissions control equipment have resulted in the need for more aggressive cleaning in addition to normal equipment maintenance.		Cleaning frequency for each scrubber module (12 total per unit) has increased from once a year to once every 8 months. This strategy will still require some smaller derates to complete all required cleaning evolutions but these smaller derates should be limited mainly to the spring and fall when energy prices are historically less. We are testing a chemical addititive in one of the modules that may reduce the amount of time a module has to be out of service for manual cleaning.
SHERC3	Forced	31 Condensate Pump Issues. Pump removed from service.	01/01/2018	01/31/2018	**31**	31 Condensate Pump	The motor had been removed to resolve a chronic leak, upon re-install the pump failed to deliver flow. The pump shaft failed along with first stage impeller key resulting in additional damage to the pump.		Pump was rebuilt by a vendor including modifactions to change the pump head. A new spare pump is being purchased from the OEM to minimize future down time.

Unit Outage Information

[PROTECTED DATA BEGINS

Unit	Outage Category	Primary Reason for outage	Outage Dates Start	End	Duration (Days)	Equipment that resulted in the forced outage	Description of Equipment Failure	Change in Energy Costs	Steps Taken to Alleviate Reoccurrence
French_1	Maintenance	U1 Boiler Cleaning and Inspection	01/26/2018	01/30/2018	3	Boiler	Preventative maintenance outage for periodic cleaning and inspection.		Preventative maintenance cycle to periodically address boiler fouling, fuel delivery system and other components to aid reliable operation.
Redwing_2	Forced	Generator Rewind Needed	01/01/2018	01/31/2018	30	Main Generator	Generator synched out of phase due to a delayed closure of the output control breaker.		Generator output breaker replaced and the Generator was rewound.
CCRiverside1	Forced	Hydrogen leak on U7 steam turbine generator required unit shut down and de-gas of generator for repairs	01/04/2018	01/08/2018	4	Unit 7 Steam Turbine Generator, NOTE: CCRiverside 1 refers to Unit 9 Combustion Turbine plus 1/2 of Unit 7 Steam Turbine. Steam turbine is common to both combustion turbines.	Following the Fall 2017 Major Steam Turbine Overhaul a hydrogen leak developed on the generator end bells. Thus, the steam turbine and generator were unavailable until repaired which also makes both combustion turbines unavailable.		Generator end bells were inspected and re-secured , no leakage issues expereinced since.
CCRiverside2	Forced	Hydrogen leak on U7 steam turbine generator required unit shut down and de-gas of generator for repairs	01/04/2018	01/08/2018	4	Unit 7 Steam Turbine Generator, NOTE: CCRiverside 2 refers to Unit 10 Combustion Turbine plus 1/2 of Unit 7 Steam Turbine. Steam turbine is common to both combustion turbines.	Same event as Riverside1, above.		Same event as Riverside1, above. Corrective actions to unit 7 address both Riverside1 and Riverside2 events.
King_G1	Forced	Unit to come offline to repair 17A HP Feedwater Heater leak	01/06/2018	01/07/2018	1	17A Feedwater Heater	Four previously install tube plugs were leaking		The leaking plugs were replaced with welded plugs.
King_G1	Forced	Reheater plugged - offline to clean	01/24/2018	01/27/2018	3	First Reheater Slagging Or Fouling	First Reheater Slagging Or Fouling.		The contributing factors were; extended high load operation, higher sodium content coal and higher FEGT operations. Actions taken; operational procedures are in place to ensure that an adequate load reduction and subsequent slag shed occur during extended high load operations. Fuels is restricting the amount of high sodium coal delivered.
FEBRUARY 2018									
SHERCO_G1	Forced	Circulating Water Systems	02/11/2018	02/22/2018	11	11 Boiler Circulating Water Pump Motor	Motor Elecrical Failure		This motor was scheduled to be replaced with a rewound motor during the overhaul but failed two weeks early. Replacement occurred during the overhaul.
SHERCO_G2	Forced	Wet Scrubbers	02/10/2018	02/12/2018	2	Scrubber Modules	Ash buildup on fields, spargers, and other components resulting in inefficient particulate removal and high stack opacity. Aging of equipment requires regular maintenance. Unit needed to be derated to perform other normal cleaning functions such as flushing, high voltage cleaning, and manual nightly cleaning. Upgrades to emissions control equipment have resulted in the need for more aggressive cleaning in addition to normal equipment maintenance.		Cleaning frequency for each scrubber module (12 total per unit) has increased from once a year to once every 8 months. This strategy will still require some smaller derates to complete all required cleaning evolutions but these smaller derates should be limited mainly to the spring and fall when energy prices are historically less. We are testing a chemical addititive in one of the modules that may reduce the amount of time a module has to be out of service for manual cleaning.
SHERCO_G2	Forced	Wet Scrubbers	02/24/2018	02/25/2018	2	Scrubber Modules	Ash buildup on fields, spargers, and other components resulting in inefficient particulate removal and high stack opacity. Aging of equipment requires regular maintenance. Unit needed to be derated to perform other normal cleaning functions such as flushing, high voltage cleaning, and manual nightly cleaning. Upgrades to emissions control equipment have resulted in the need for more aggressive cleaning in addition to normal equipment maintenance.		Cleaning frequency for each scrubber module (12 total per unit) has increased from once a year to once every 8 months. This strategy will still require some smaller derates to complete all required cleaning evolutions but these smaller derates should be limited mainly to the spring and fall when energy prices are historically less. We are testing a chemical addititive in one of the modules that may reduce the amount of time a module has to be out of service for manual cleaning.
SHERC3	Forced	Condensate System	02/01/2018	02/28/2018	27	31 Condensate Pump	The motor had been removed to resolve a chronic leak, uponre-install the pump failed to deliver flow. The pump shaft failed along with first stage impeller key resulting in additional damage to the pump.		Pump was rebuilt by a vendor including modifactions to change the pump head. A new spare pump is being purchased from the OEM to minimize future down time.
Wilmart_1	Forced	Slag and Ash Removal	02/11/2018	02/27/2018	15	C-9, DC conveyor, RDF Scalper	Main RDF fuel supply to the plant broken pans causing scalper to be unable to run.		Repaired broken pans on scalper. Scheduled for replacement in 2022
Wilmart_2	Forced	Boiler Fuel Supply to Bunker	02/19/2018	02/27/2018	7	RDF Scalper	Main RDF fuel supply to the plant broken pans causing scalper to be unable to run.		Repaired broken pans on scalper. Scheduled for replacement in 2022
King_G1	Forced	Boiler Tube Fireside Slagging or Fouling	02/05/2018	02/10/2018	5	First Reheater Slagging Or Fouling	First Reheater Slagging Or Fouling		The contributing factors were; extended high load operation, higher sodium content coal and higher FEGT operations. Actions taken; operational procedures are in place to ensure that an adequate load reduction and subsequent slag shed occur during extended high load operations. Fuels is restricting the amount of high sodium coal delivered.
French_1	Forced	Generator	02/06/2018	02/28/2018	22	Generator	The rotor windings retaining blocks were breaking causing high vibrations.		All retaining blocks on the generator rotor were replaced.
Redwing_2	Forced	Generator	02/01/2018	02/28/2018	27	Main Generator	Generator synched out of phase due to a delayed closure of the output control breaker.		Generator output breaker replaced and the Generator was rewound.

Unit Outage Information

Unit	Outage Category	Primary Reason for outage	Outage Dates Start	End	Duration (Days)	Equipment that resulted in the forced outage	Description of Equipment Failure	[PROTECTED DATA BEGINS Change in Energy Costs	Steps Taken to Alleviate Reoccurrence
MARCH 2018									
SHERCO_G2	Forced	Boiler Air and Gas Systems	03/01/2018	03/02/2018	**1**	24 ID Fan	Broken inlet damper linkage. The threaded stud which connects the west inlet damper clevis to the damper operating mechanism had broken just where the thread met the existing weld. It was noted that there had been an existing crack evidenced by oxidation. Due to years of operation, constant motion, the stud failed. Condition based wear likely due to cycling/load follow operations.		Thourough inspection of ID fan linkages will be performed during the 2019 overhaul. Inspections were completed on the Unit 1 linkages during the 2018 overhaul.
SHERCO_G2	Forced	Boiler Fuel Supply from Bunkers to Boiler	03/12/2018	03/13/2018	**1**	22 Coal Mill	Mill and transport line fire. Damage to transport line gaskets, classifier bearings, classifier rotor, mill floor, and mill liners. Derate until 21 mill which had been out for maintenance could be restored.		Classifier was completely rebuilt, piping gaskets were replaced, and mill liners were repaired/replaced. Hot spots, which ignite mill fires, typically occur near areas of worn liners. Plant plans to continually to inspect all mills annually as a minimum.
SHERCO_G2	Forced	Boiler Fuel Supply from Bunkers to Boiler	03/19/2018	03/20/2018	**2**	21 Coal Feeder motor	Failed clutch on the motor. Loss of redundancy with 22 mill out of service following fire event.		Clutch was replaced.
SHERCO_G2	Forced	Boiler Fuel Supply from Bunkers to Boiler	03/26/2018	03/31/2018	**5**	25 Coal Mill	Bowl hub cover had come loose and pyrite skirt was badly damaged due to tramp metal going through the mill. Repairs completed while 22 Mill was unavailable due to repairs sustained during the fire event resulting in only 5 coal mills being available.		The bowl hub cover and the pyrite skirts were repaired. Sherco Coal Yard is taking steps to identify areas that may have tramp iron and to segregate from rest of coal pile.
SHERC3	Forced	Condensate System	03/01/2018	03/31/2018	**30**	31 Condensate Pump	The motor had been removed to resolve a chronic leak, upon re-install the pump failed to deliver flow. The pump shaft failed along with first stage impeller key resulting in additional damage to the pump.		Pump was rebuilt by a vendor including modifactions to change the pump head. A new spare pump is being purchased from the OEM to minimize future down time.
Redwing_2	Forced	Generator	03/01/2018	03/31/2018	**30**	Main Generator	Generator synched out of phase due to a delayed closure of the output control breaker.		Generator output breaker replaced and the Generator was rewound.
APRIL 2018									
SHERCO_G2	Forced	5 Mill Coal operation due to high door temps on 25 Mill	04/01/2018	04/28/2018	**27**	25 Coal Mill	Bowl hub cover had come loose and pyrite skirt was badly damaged due to tramp metal going through the mill. Repairs completed while 22 Mill was unavailable due to repairs sustained during the fire event resulting in only 5 coal mills being available. 25 mill returned on 4/13/2018 at which time 27 mill was taken out for overhaul as we anticipated it would fail prior to 22 mill return.		The bowl hub cover and the pyrite skirts were repaired. Sherco Coal Yard is taking steps to identify areas that may have tramp iron and to segregate from rest of coal pile.
SHERC3	Forced	31 Condensate Pump Issues. Pump removed from service.	04/01/2018	04/30/2018	**29**	31 Condensate Pump	The motor had been removed to resolve a chronic leak, uponre-install the pump failed to deliver flow. The pump shaft failed along with first stage impeller key resulting in additional damage to the pump.		Pump was rebuilt by a vendor including modifactions to change the pump head. A new spare pump is being purchased from the OEM to minimize future down time.
Anson_G4	Forced	LCI power supply	04/18/2018	04/21/2018	**3**	Power Supply	Complete Loss of functionality.		Power Supply Replaced.
Redwing_2	Forced	Generator Rewind Needed	04/01/2018	04/30/2018	**29**	Main Generator	Generator synched out of phase due to a delayed closure of the output control breaker.		Generator output breaker replaced and the Generator was rewound.
MAY 2018									
King_G1	Forced	High Pressure Turbine	05/29/2018	05/31/2018	**2**	High Pressure Turbine	Turbine over thrust event which occurred during system testing.		Complete review of logic associated with turbine trip restoration for consistency with Alstom guidance specifically as it pertains to turbine flow paths. Placed moratorium on the practice of relatching the steam turbine following a turbine trip from 3600 RPM.
CCRiverside1	Forced	Circulating Water Systems	05/25/2018	05/31/2018	**6**	#6 Circulating Water Pump	Circulating Water Pump developed high vibrations requiring the pump to be removed for inspection. With warmer river temperatures (above 50 F) condenser vacuum can not be maintained when running both Riverside units. Therefore, one CT must be held out of service.		Condition based wear on #6 Circulating Water Pump wchich was sent off site for inspection and repair. Bearings were replaced. Going forward, each of the two circulating water pumps will be overhauled every two years during the winter months to minimize impact of pump outages.
SHERCO_G1	Forced	Boiler Fuel Supply from Bunkers to Boiler	05/18/2018	05/30/2018	**12**	12 PA Fan	Unit derate to to high vibration until troubleshooting efforts could be completed.		Rotor indications were blend-grinded, four of which required weld repair. Replaced outboard bearing. Corrected inlet vane rubbing issue, the vanes were removed and the shafts were trimmed. Tightened loose motor hold-down bolts.
SHERCO_G1	Forced	Boiler Fuel Supply from Bunkers to Boiler	05/30/2018	05/31/2018	**2**	12 PA Fan	Unit off-line to repair fan. Completed NDE inspections of the rotor, inspections of the inlet vanes, outlet vanes, ductwork, fan inlets (pantlegs), inlet cones,etc. Discovered several indications on the rotor (likely original fabrication defects). 4 of the 12 inlet vanes on the inboard side of the fan were threaded too far into the collar allowing the inlet vane shafts to rub on the main fan shaft.		Rotor indications were blend-grinded, four of which required weld repair. Replaced outboard bearing. Corrected inlet vane rubbing issue, the vanes were removed and the shafts were trimmed. Tightened loose motor hold-down bolts.
SHERCO_G2	Forced	Boiler Fuel Supply from Bunkers to Boiler	05/01/2018	05/31/2018	**31**	27 Coal Mill	27 coal mill taken out of service to complete needed mill overhaul while 22 coal mill was out of service for fire event repairs		This was not a failure. 27 mill was taken out for a needed overhaul while 22 was out for repairs to avoid any damage which would extend out of service time and increase cost.
SHERCO_G2	Forced	Boiler Tube Leaks	05/17/2018	05/19/2018	**2**	Waterwall leak near B23	Tube adjacent to the west offset tube for wallblower B23 brought the unit offline due to a leak. The tube leak was repaired with the through-wall repair strategy.		We will inspect tubes near wall blowers for thinning and cracking during the 2019 overhaul.

Unit Outage Information

[PROTECTED DATA BEGINS

Unit	Outage Category	Primary Reason for outage	Outage Dates Start	End	Duration (Days)	Equipment that resulted in the forced outage	Description of Equipment Failure	Change in Energy Costs	Steps Taken to Alleviate Reoccurrence
SHERC3	Forced	Condensate System	05/01/2018	05/04/2018	4	31 Condensate Pump	The motor had been removed to resolve a chronic leak, upon re-install the pump failed to deliver flow. The pump shaft failed along with first stage impeller key resulting in additional damage to the pump.		Pump was rebuilt by a vendor including modifications to change the pump head. A new spare pump is being purchased from the OEM to minimize future down time.
SHERC3	Forced	Boiler Fuel Supply from Bunkers to Boiler	05/04/2018	05/10/2018	6	310 Coal Mill	Discovered one rotating throat segment where all three bolts had failed and the lower support clip had broken off, allowing it to rub against the mill wall. They also found several other sheared rotating throat bolts that all required repair. In addition to the bolts, they found that many of the lower support clips under the rotating throat assembly had cracked welds where they attach to the extension ring.		Repaired failed rotating throat bolts, replaced lower support clips and added additional weld to strenghten the connection to the ring seat. The OEM has proposed a design modification that should mitigate these bolt and clip failures. This design modification will be installed in the next mill overhaul.
Anson_G3	Forced	Miscellaneous (Gas Turbine)	05/25/2018	05/31/2018	7	Turbine Vibration	High Vibration due condition based wear.		Unit held out until completion of Major Overhaul Scheduled for September 2018
CC Highbridge2	Forced	HRSG Boiler Piping System	05/09/2018	05/11/2018	2	U8 HRH Bypass Valve	Bypass Valve stuck due to magnetite binding between plug and guide bushing.		Plant has ordered modified valve trim with an integral strainer and modified plug to extend valve maintenance interval without sticking.
Redwing_2	Forced	Generator	05/01/2018	05/04/2018	4	Main Generator	Generator synched out of phase due to a delayed closure of the output control breaker.		Generator output breaker replaced and the Generator was rewound.
CCRiverside1	Planned	Miscellaneous (Balance of Plant)	05/09/2018	05/24/2018	16	This is not a Forced Outage. Plant performed a Planned Outage during this time window.	No equipment failures.		Not applicable. Planned outage.
CCRiverside2	Planned/Mainten	Miscellaneous (Balance of Plant)\Circulating Water Systems	05/07/2018	05/24/2018	17	Planned Outage for entire plant from 5/9 - 5/24 (see line item above for Riverside1). The dates of 5/7-5/8 were a maintenance outage	Maintenance outage portion related to #6 Circulating Water pump issues (see line 112 above). Pump developed high vibration and needed to be repaired.		Maintenance outage portion is the same event as Riverside1, see line item 112 above. Corrective actions to address both Riverside1 and Riverside2.
CCRiverside2	Forced	Miscellaneous (Gas Turbine)	05/30/2018	05/31/2018	2	#6 Circulating Water Pump	Continuation of previous event. Circulating Water Pump developed high vibrations requiring the pump to be removed for inspection. With warmer river temperatures (above 50 F) condenser vacuum can not be maintained when running both Riverside units. Therefore, one CT must be held out of service.		Condition based wear on #6 Circulating Water Pump wchich was sent off site for inspection and repair. Bearings were replaced. Going forward, each of the two circulating water pumps will be overhauled every two years during the winter months to minimize impact of pump outages.
JUNE 2018									
SHERCO_G1	Forced	Circulating Water Systems	06/07/2018	06/30/2018	23	11 Boiler Circulating Water Pump	Excessive vibration on the pump required removal from service and subsequent derate. Currently suspect a bent shaft or wear ring alignment issue.		Pump will be removed during the upcoming chemical clean outage in September 2018 and repairs made. Corrective actions will be taken once the failure mechanism is understood.
SHERCO_G2	Forced	Boiler Fuel Supply from Bunkers to Boiler	06/01/2018	06/02/2018	2	27 Coal Mill	27 coal mill taken out of service to complete needed mill overhaul while 22 coal mill was out of service for fire event repairs.		This was not a failure. 27 mill was taken out for a needed overhaul while 22 was out for repairs to avoid any damage which would extend out of service time and increase cost.
SHERCO_G2	Forced	Boiler Fuel Supply from Bunkers to Boiler	06/06/2018	06/07/2018	1	25 Coal Mill Classifier	Classifier drive belt failure.		Alternative design drive belt installed allowing for faster changeout, however, we are finding they only last about 9 months compared to 3 years for the original. Original style belt will be installed during next mill overhaul as it lasts longer.
SHERCO_G2	Forced	Boiler Fuel Supply from Bunkers to Boiler	06/20/2018	06/21/2018	2	27 Coal Mill	High Vibration. Unit was derated to perform troubleshooting on this mill.		27 mill taken out of service for internal inspection. No issues were identified that could cause high vibration.
SHERC3	Forced	Feedwater System	06/01/2018	06/05/2018	4	36-1 High Pressure Feedwater Heater	Due to single block isolation valve arrangement on these heaters, the unit had to be removed from service to facilitate repairs. This time period is the derate required with the heater out of service until unit was taken off line for repairs on 6/5/2018.		This heater is original equipment. All four high pressure feedwater heaters are nearing end of life and are scheduled to be replaced in the 2020 and 2023 overhauls. A double isolation valve arrangement will also be installed in 2020 to facilitate on line repairs.
SHERC3	Forced	Feedwater System	06/05/2018	06/08/2018	3	36-1 High Pressure Feedwater Heater	Due to single block isolation valve arrangement on these heaters, the unit had to be removed from service to facilitate repairs. One new leaking tube, one leaking welded plug and eight previously plugged tubes missing plugs discovered.		Leaking tube and three surrounding plugged and missing plugs replaced. Stabilizer cable installed on inlet side of leaking tube. This heater is original equipment. All four high pressure feedwater heaters are nearing end of life and are scheduled to be replaced in the 2020 and 2023 overhauls. A double isolation valve arrangement will also be installed in 2020 to facilitate on line repairs.
SHERC3	Forced	Feedwater System	06/08/2018	06/10/2018	2	36-2 High Pressure Feedwater Heater	Due to single block isolation valve arrangement on these heaters, the unit had to be removed from service to facilitate repairs. This time period is the derate required with the heater out of service until unit was taken off line for repairs on 6/10/2018.		This heater is original equipment. All four high pressure feedwater heaters are nearing end of life and are scheduled to be replaced in the 2020 and 2023 overhauls. A double isolation valve arrangement will also be installed in 2020 to facilitate on line repairs.
SHERC3	Forced	Feedwater System	06/10/2018	06/13/2018	3	36-2 High Pressure Feedwater Heater	Due to single block isolation valve arrangement on these heaters, the unit had to be removed from service to facilitate repairs. One failed welded plug and one failed pop-a-plug discovered.		Leaking plugs welded, eight additional pitted tube plugged. This heater is original equipment. All four high pressure feedwater heaters are nearing end of life and are scheduled to be replaced in the 2020 and 2023 overhauls. A double isolation valve arrangement will also be installed in 2020 to facilitate on line repairs.
SHERC3	Forced	Boiler Air and Gas Systems	06/25/2018	06/26/2018	1	32 Secondary Air Heater	Motor Electrical Failure		Replaced Motor. Check magnetic coupling every overhaul for proper alignment. Replace motor every 6 years, Replace motor bearings in the overhaul year when motor is not being replaced.

Unit Outage Information

Unit	Outage Category	Primary Reason for outage	Outage Dates Start	End	Duration (Days)	Equipment that resulted in the forced outage	Description of Equipment Failure	[PROTECTED DATA BEGINS Change in Energy Costs	Steps Taken to Alleviate Reoccurrence
Wilmart_2	Forced	Boiler Tube Leaks	06/23/2018	06/27/2018	4	Boiler superheat tube	Boiler superheat tube leak		Superheater scheduled replacement during fall outage 2018.
King_G1	Forced	Boiler Tube Leaks	06/20/2018	06/29/2018	9	Secondary Superheater (SSH) boiler tube	Final SSH section on the leading edge of the tube. There was moderate collateral damage to the surrounding tubes.		Damaged boiler tubes were replaced or repaired. Six sections of tube needed to be replaced and 5 pad welds on surrounding tubes.
French_2	Forced	Circulating Water Systems\Boiler Tube Leaks	06/22/2018	06/27/2018	5	Boiler economizer	Tube leaks.		It is scheduled for replacement in fall of 2018.
CC Highbridge2	Forced	HRSG Boiler Piping System	06/06/2018	06/07/2018	1	U8 HRH Bypass Valve	Bypass Valve stuck due to magnetite binding between plug and guide bushing.		Plant has ordered modified valve trim with an integral strainer and modified plug valve to reduce frequency of sticking. Installation Fall 2018.
CC Highbridge2	Forced	Condensate System	06/08/2018	06/10/2018	2	U8 LP Preheater in HRSG	Tube leak at lower header due to corosion fatigue cracking.		Major NDE inspection with ultrasonic phased array testing to identify additional cracks requiring repair is planned for Fall 2018.
CC Highbridge2	Forced	HRSG Boiler Internals and Structures	06/22/2018	06/25/2018	2	U8 HP steam drum door	Steam leak on drum door		New style gasket installed that is designed to handle thermal cycling was installed. New 6 bolt drum doors have been ordered and will be installed in Fall 2018 outage.
CCRiverside1	Forced	Auxiliary	06/03/2018	06/05/2018	2	Unit 9 Hydraulic Pump fitting failure.	Hydraulic oil line fitting developed leak which required the unit to be removed from service for repair and oil clean up.		Root cause was a failed o-ring. O-ring was replaced along with checking other fittings to ensure no other issues identified.
JULY 2018									
BayFrnt_G6	Forced	Exciter\Boiler Tube Leaks	07/28/2018	07/31/2018	3	1) Reserve Exciter 2) Boiler #2 Superheat Tubes	1) The brushes on the reserve exciter failed causing a loss of the unit 2) There were 2 leaks found in the secondary superheat tubes		1) Increased inspections of reserve exciter brushes 2) Boiler #2 Superheat tubes (primary and secondary) were replaced in September - October 2018 as a planned capital project.
SHERCO_G1	Forced	Circulating Water Systems	07/01/2018	07/31/2018	30	11 Boiler Circulating Pump	The thrust disc assembly un-bonded during the initial startup of the pump indicating a manufacturing defect of the thrust disc assembly. This in turn caused high vibrations on the pump.		Thrust disc assembly and other resultant damage to the pump was refurbished by Hayward Tyler. A blanking plate was purchased to facilitate removal of a pump and returning to on line status during any future required repairs to all the boiler circ pumps.
Anson_G3	Forced	Miscellaneous (Gas Turbine)	07/01/2018	07/31/2018	30	Turbine	High vibration on turbine bearings		A major, rotor out overhaul was conducted and the unit was put back into service in May of 2019
Blk_Dog_G6	Forced	Auxiliary	07/01/2018	07/02/2018	1	Turbine Hydraulic Oil	Hydraulic manifold developed a leak and required the unit to be held out of service and the turbine compartment to be cleaned.		Hydraulic manifold was inspected and loose plug was found. Plug was reinstallated and torqued properly and verified.
French_1	Forced	Generator	07/05/2018	07/09/2018	4	Generator	High Vibrations		We performed a balance shot.
French_1	Forced	Boiler Overhaul and Inspections	07/26/2018	07/30/2018	4	Boiler	This was a maintenance outage for periodic cleaning and inspection.		RDF fuel causes boiler fouling. We believe we are cleaning at appropriate intervals.
French_2	Forced	Boiler Tube Leaks	07/18/2018	07/23/2018	5	Boiler	Boiler tube leaks.		We have replaced the tubes that were worn.
Redwing_1	Forced	Miscellaneous Boiler Tube Prob	07/10/2018	07/13/2018	2	Boiler	Boiler tube fouling		Cleaned boiler
Redwing_2	Forced	Miscellaneous Boiler Tube Prob	07/08/2018	07/12/2018	4	Boiler	Boiler tube fouling		Cleaned boiler
SHERCO_G2	Forced	Boiler Tube Leaks	07/28/2018	07/31/2018	3	Sootblower Supply Piping	Unit taken off line to repair a previously identified leak in the penthouse. Leak was on the sootblower supply piping coming off of the west inlet SH pendant platen header on the fillet weld of the stub tube to the header.		Through wall weld repair completed on the leak. MT survey was completed on the rest of the welds on the piping system. Four more welds were identified to have linear crack-like indications which were also repaired.
AUGUST 2018									
King_G1	Forced	Boiler Piping System\Controls	08/21/2018	08/31/2018	10	12 superheaeter attemperator spray	12 superheater attemperator packing leak		12 superheater attemperator valve along with other attemperator valves were repacked to prevent future issues.
SHERCO_G1	Forced	Boiler Piping System	08/18/2018	08/22/2018	5	11 Boiler Circulating Pump	Unit taken off line to install blanking plate which was recently purchased from Hayward Tyler to facilitate removal and repair to 11 Boiler Circulating Pump while returning the Unit to an on line status. Unit was restored to on line on 8/20/18. The following day, 8/21/18, the installed blanking plate developed a leak on the drain plug which forced the unit off line for repair.		Seal welded the drain plug in the blanking plate. Blanking plate will remain on site as a contingency to facilitate removal of a pump and returning to on line status during any future required repairs to all the boiler circ pumps.
SHERCO_G2	Forced	Boiler Tube Leaks	08/01/2018	08/02/2018	1	Sootblower Supply Piping	Unit taken off line to repair a previously identified leak in the penthouse. Leak was on the sootblower supply piping coming off of the west inlet SH pendant platen header on the fillet weld of the stub tube to the header.		Through wall weld repair completed on the leak. MT survey was completed on the rest of the welds on the piping system. Four more welds were identified to have linear crack-like indications which were also repaired.
SEPTEMBER 2018									
BayFrnt_G5	Forced	Boiler Internals and Structures	09/01/2018	09/03/2018	2	Boiler #1 Grating System - Corrected D	The retaining pins on 2 of the boiler grates failed causing the grates to jam up.		Inspected retaining pins on other grates and replaced those showing wear. The entire boiler grating system was replaced in March 2019 as a planned capital project.
King_G1	Forced	Controls	09/01/2018	09/02/2018	1	Feedwater transmitter braided hose	Feedwater transmitter braided hose failure		All feedwater transmitter braided hoses were hard piped and fittings replaced to prevent future failure
Blue_Lk_G7	Forced	Electrical	09/19/2018	09/21/2018	2	Generator Circuit Breaker Charging Motor Power Supply Breaker	Component Failed		Breaker Replaced
Blue_Lk_G8	Forced	Generator	09/17/2018	09/30/2018	13	#1 Generator Bearing	High Temperature		Alignment Adjustment

Unit Outage Information

[PROTECTED DATA BEGINS

Unit	Outage Category	Primary Reason for outage	Outage Dates Start	End	Duration (Days)	Equipment that resulted in the forced outage	Description of Equipment Failure	Change in Energy Costs	Steps Taken to Alleviate Reoccurrence
SHERCO_G1	Forced	Boiler Piping System	09/05/2018	09/08/2018	2	11 Boiler Circulating Pump	This was a maintenance outage to remove the recently installed blanking plate and restore the refurbished 11 Boiler Circulating Pump to service prior to the planned boiler chemical clean outage.		Thrust disc assembly and other resultant damage to the pump was refurbished by Hayward Tyler. A blanking plate was purchased to facilitate removal of a pump and returning to on line status during any future required repairs to all the boiler circ pumps.
SHERCO_G1	Forced	Boiler Tube Leaks	09/29/2018	09/30/2018	1	Steam Cooled Wall Screen Tube	Vibration snubber originally installed on the unit had deteriorated through the years. This caused the initiating failure of both this and the 1/17/19 event to be the #5 steam cooled wall screen tube due to reverse bending fatigue failure. In addition, there was signifigant collateral damage to the primary superheat assemblies. However, during this first event, the evidence found in the damage lead engineering to believe the initiating event was on the leading edge tube of the primary superheat from short term overheating precipitated by oxide blockage. The sheared steam cooled wall screen tube was originally thought to be caused by the impact of the superheat rupture which careened the U-bend into the team cooled wall screen tube.		Tube replacements consisting of 23 total tube welds and 12 pad welds were completed. An air test was completed to confirm no further leads were present.
OCTOBER 2018									
BayFrnt_G5	Forced	Condensing System	10/01/2018	10/19/2018	19	Condenser Low Vacuum Trip Bellows - Note that outage started 9/4/2018	Leak developed in the condenser low vacuum trip bellows assembly - could not draw a vacuum in the condenser		Replaced the low vacuum trip bellows assembly and purchased a spare unit.
Blk_Dog_G52	Forced	Total site gas supply outage to i	10/07/2018	10/16/2018	9	Gas supply regulating station	Gas supply regulating station outage to install additional overpressurization protection in the fuel gas yard. Work scope was added to the fall outage plan. Outside of plant jurisdiction.		Equipment was installed as planned during the outage.
SHERCO_G1	Forced	Boiler Tube Leaks	10/01/2018	10/06/2018	6	Steam Cooled Wall Screen Tube	Vibration snubber originally installed on the unit had deteriorated through the years. This caused the initiating failure of both this and the 1/17/19 event to be the #5 steam cooled wall screen tube due to reverse bending fatigue failure. In addition, there was signifigant collateral damage to the primary superheat assemblies. However, during this first event, the evidence found in the damage lead engineering to believe the initiating event was on the leading edge tube of the primary superheat from short term overheating precipitated by oxide blockage. The sheared steam cooled wall screen tube was originally thought to be caused by the impact of the superheat rupture which careened the U-bend into the team cooled wall screen tube.		Tube replacements consisting of 23 total tube welds and 12 pad welds were completed. An air test was completed to confirm no further leads were present.
SHERC3	Forced	Boiler Tube Leaks	10/04/2018	10/14/2018	10	Finishing Superheat Tube	Initiating tube failure was short term overheating due to oxide exfoliation pluggage, tube #14 on assembly #41. Significant collateral damge spread across 3 assemblies on the finishing superheat.		19 Tube replacements were completed in additon to pad welding on 4 other tubes. An air test was completed prior to returning the unit to service. Continue practice of ramping through the 50-100 MW range druing startup to avoid oxide collection in the superheat section.
SHERC3	Forced	Boiler Tube Leaks	10/16/2018	10/22/2018	6	Finishing Superheat Tube	Initiating tube failure was short term overheating due to oxide exfoliation pluggage, tube #3 on assembly #74. Collateral damage was minimal because the leak was identified immediately. Following analysis of the oxide sample removed during this outage, it was determined that the source of the oxide was from the outlet headers downstream of the finishing superheat assemblies. This indicates the oxide traveled backwards from the headers into the pendants. It is theorized this could happen during boiler air tests, during shutdowns when the steam inside the pendants and header are condensing, or during boiler drains when vents and drains are manipulated.		Tube section was replaced. TEAM Industrial Services was brought in to perform digital readiography on a select number of lower loops on the finishing superheat. If the 5 assemblies, two tubes were found with oxide pluggage on Pendant 42, loops 4 and 5. These tubes were cut, oxide removed, and welded back together. Oxide sample sent to Xcel metallurgist for analysis.
Redwing_2	Forced	Circulating Water Systems	10/21/2018	10/24/2018	2	Condenser	Took unit 2 off-line to coincide with river dredging near plant intake screenhouse		Completed dredging and returned unit to service.
NOVEMBER 2018									
BayFrnt_G4	Forced	T4-Generator Rotor Failed Inspo	11/15/2018	11/30/2018	15	Unit 4 Generator Rotor	During unit overhaul multiple cracks were found during the boresonic inspection of the generator rotor		Decision was made to retire the unit due to age and cost to replace the rotor

Unit Outage Information

[PROTECTED DATA BEGINS

Unit	Outage Category	Primary Reason for outage	Outage Dates Start	End	Duration (Days)	Equipment that resulted in the forced outage	Description of Equipment Failure	Change in Energy Costs	Steps Taken to Alleviate Reoccurrence
SHERCO_G2	Forced	Scrubber module cleaning and r	11/09/2018	11/10/2018	1	Scrubber Modules	Ash buildup on fields, spargers, and other components resulting in inefficient particulate removal and high stack opacity. Aging of equipment requires regular maintenance. Unit needed to be derated to perform other normal cleaning functions such as flushing, high voltage cleaning, and manual nightly cleaning. Upgrades to emissions control equipment have resulted in the need for more aggressive cleaning in addition to normal equipment maintenance. With 2 modules out for major clean at a time we lose our normal redundancy.		Cleaning frequency for each scrubber module (12 total per unit) has increased from once a year to once every 8 months. This strategy will still require some smaller derates to complete all required cleaning evolutions but these smaller derates should be limited mainly to the spring and fall when energy prices are historically less. There will also be derates due to loss of other module components during times which we need to have two major cleans in progress at once due to the loss of reduncancy. We are persuing ways of minimizing the amount of time required to complete a major clean.
SHERCO_G2	Forced	9 Module operation - loss of 203	11/17/2018	11/19/2018	1	Scrubber Modules	Ash buildup on fields, spargers, and other components resulting in inefficient particulate removal and high stack opacity. Aging of equipment requires regular maintenance. Unit needed to be derated to perform other normal cleaning functions such as flushing, high voltage cleaning, and manual nightly cleaning. Upgrades to emissions control equipment have resulted in the need for more aggressive cleaning in addition to normal equipment maintenance. With 2 modules out for major clean at a time we lose our normal redundancy.		Cleaning frequency for each scrubber module (12 total per unit) has increased from once a year to once every 8 months. This strategy will still require some smaller derates to complete all required cleaning evolutions but these smaller derates should be limited mainly to the spring and fall when energy prices are historically less. There will also be derates due to loss of other module components during times which we need to have two major cleans in progress at once due to the loss of reduncancy. We are persuing ways of minimizing the amount of time required to complete a major clean.
King_G1	Forced	Forced outage due to generator	11/09/2018	11/12/2018	3	Generator pot transformer fuse	Generator pot transformer fuse clip failure		Installlation of new style clip for holding fuses in place were installed preventing the stretching that occurred on old style clips
SHERC3	Forced	repair steamleak on DP supply	11/01/2018	11/03/2018	2	Deaerator Steam Supply Piping	Crack in the weld on the aux steam supply piping to the deaerator about eight inches long, in a weld at the end of a 60 degree elbow.		Damaged area was excavated and re-welded. Other welds on the elbow were inspected for cracking. Additional inspections are planned for upcoming overhauls to ensure this condition is corrected.
DECEMBER 2018									
BayFrnt_G4	Forced	Miscellaneous (Generator)	12/01/2018	12/14/2018	14	Unit 4 Generator Rotor	During unit overhaul multiple cracks were found (November 2018) during the boresonic inspection of the generator rotor		Awaiting approval for retirement of unit
BayFrnt_G4	Forced	Miscellaneous (Generator)	12/17/2018	12/31/2018	14	Unit 4 Generator Rotor	During unit overhaul multiple cracks were found (November 2018) during the boresonic inspection of the generator rotor		Awaiting approval for retirement of unit
BayFrnt_G4	Forced	Boiler Piping System	12/14/2018	12/17/2018	3	Boiler 2 Attemperator Valve	Valve body material failed		Valve was replaced
SHERC3	Forced	Boiler Fuel Supply from Bunkers	12/13/2018	12/18/2018	5	301 Coal Mill Motor	306 Mill was out for major overhaul and 302 mill was out for internal inspections when this motor failed which forced us into a derate with only 7 mlls available.		Motor was swapped with the motor previously on 306 mill. Original motor was sent to Lewis Motor for refurbishment.
SHERCO_G1	Forced	Wet Scrubbers	12/01/2018	12/03/2018	2	Scrubber Modules	Ash buildup on fields, spargers, and other components resulting in inefficient particulate removal and high stack opacity. Aging of equipment requires regular maintenance. Unit needed to be derated to perform other normal cleaning functions such as flushing, high voltage cleaning, and manual nightly cleaning. Upgrades to emissions control equipment have resulted in the need for more aggressive cleaning in addition to normal equipment maintenance. With 2 modules out for major clean at a time we lose our normal redundancy. In this instnace, 24 hour high voltage cleans needed to be completed.		Cleaning frequency for each scrubber module (12 total per unit) has increased from once a year to once every 8 months. This strategy will still require some smaller derates to complete all required cleaning evolutions but these smaller derates should be limited mainly to the spring and fall when energy prices are historically less. There will also be derates due to loss of other module components during times which we need to have two major cleans in progress at once due to the loss of reduncancy. We are persuing ways of minimizing the amount of time required to complete a major clean. When high voltage cleans are required, which typically is every thirty days on each module, we can normally wait until the weekend and perform multiple high voltage cleans during that time period.
SHERCO_G1	Forced	Wet Scrubbers	12/08/2018	12/10/2018	2	Scrubber Modules	Ash buildup on fields, spargers, and other components resulting in inefficient particulate removal and high stack opacity. Aging of equipment requires regular maintenance. Unit needed to be derated to perform other normal cleaning functions such as flushing, high voltage cleaning, and manual nightly cleaning. Upgrades to emissions control equipment have resulted in the need for more aggressive cleaning in addition to normal equipment maintenance. With 2 modules out for major clean at a time we lose our normal redundancy. In this instnace, 24 hour high voltage cleans needed to be completed.		Cleaning frequency for each scrubber module (12 total per unit) has increased from once a year to once every 8 months. This strategy will still require some smaller derates to complete all required cleaning evolutions but these smaller derates should be limited mainly to the spring and fall when energy prices are historically less. There will also be derates due to loss of other module components during times which we need to have two major cleans in progress at once due to the loss of reduncancy. We are persuing ways of minimizing the amount of time required to complete a major clean. When high voltage cleans are required, which typically is every thirty days on each module, we can normally wait until the weekend and perform multiple high voltage cleans during that time period.
JANUARY 2019									
BayFrnt_G4	Forced	Miscellaneous (Generator)	01/01/2019	01/31/2019	31	Unit 4 Generator Rotor	During unit overhaul multiple cracks were found (November 2018) during the boresonic inspection of the generator rotor		Awaiting approval for retirement of unit

Unit Outage Information

[PROTECTED DATA BEGINS

Unit	Outage Category	Primary Reason for outage	Outage Dates Start	End	Duration (Days)	Equipment that resulted in the forced outage	Description of Equipment Failure	Change in Energy Costs	Steps Taken to Alleviate Reoccurrence
SHERCO_G1	Forced	Loss of 12 Transfer Hopper Fee	01/02/2019	01/03/2019	1	12 Transfer Hopper Feeder Belt	Tensioner on 12 feeder belt failed causing the belt to run off the pulley, damaging the belt to an unusable state.		The belt and tensioner were replaced. Maintenance plans created to inspect feeder belts and tensioners on the units.
SHERCO_G2	Forced	Must remove 22 FD fan from se	01/07/2019	01/08/2019	1	22 Forced Draft Fan ductwork lagging	Large section of ductwork lagging was found hanging/loose in the Unit 2 fan room. Due to safety implications, 22 forced draft fan was removed from service so loose tin could be accessed by scaffold and removed.		Loose tin was removed. Permanent repair made during the Febuary 2019 maintenance outage.
SHERCO_G2	Forced	Sherco 2 derate due to Reheate	01/20/2019	01/31/2019	11	Reheat Tube leak	Unit 2 had a known reheat leak which was being monitored with the projection that we could operate until the 2/9/19 schedule maintenance outage. Unit 1 was forced off line for its own tube leak on 1/17/19. The rate of degradation on the Unit 2 reheater leak increased, so a management decision was made to conservatively derate the unit to lower reheat pressure to prevent a second Sherco Unit from being forced off line. Once Unit 1 was stabile following its return, the derate was terminated.		Tube #2 on assembly #1 was repaied during the scheduled maintenance outage along with minor repairs to the rear reheat, mainly leading edge tube shields. The failure was caused by sootblower tube thinning.
SHERC3	Forced	Derated due to max steam flow	01/24/2019	01/31/2019	7	Aux Steam header supply valve	PAS 2701, pegging aux steam supply valve from Unit 2 was inoperable. With Unit 1 off line for tube leak repair and extreme cold temperatures, building heating needed to be supplied by steam from Unit 3. This caused us to challenge our environmental administrative steam flow limit. The unit needed to be derated to maintain compliance until Unit 1 returned to service.		PAS 2701. aux steam header supply valve, was repaired during the Unit 2 overhaul.
Redwing_2	Forced	Repair rails on DC conveyor	01/21/2019	01/21/2019	1	Distribution Conveyor - Corrected date	Chain Derailment		Modified load rails for better chain tracking
CC Highbridge1	Forced	Circulating Water Systems Worl	01/18/2019	01/19/2019	1	Circ Water T-screens	Plugged with Frazil Ice		None
SHERCO_G1	Forced	Unit coming off line because of	01/17/2019	01/31/2019	15	Steam Cooled Wall Screen Tube	Vibration snubber originally installed on the unit had deteriorated through the years. This caused the initiating failure of both this and the 1/17/19 event to be the #5 steam cooled wall screen tube due to reverse bending fatigue failure. In addition, there was signifigant collateral damage to the finishing superheat assemblies.		Total of 23 tube replacements and 7 pad welds completed between the steam cooled wall screen tube and finishing superheat tube damage. A vibration snubber consiting of stainless steel angle iron affixed to the tubes with staninless steel U-bolts was completed to add rigidity to the tubes. Vibration snubber for Unit 2 was inspected during the 2019 overhauland found to be intact.
Wheaton_3	Forced	Turbine Heaters failed	01/25/2019	01/26/2019	1	Turbine heater	Turbine heater electric contractor coil failed.		Rebuilt the contactor for the heater.
Wheaton_3	Forced	GF STP VLV OPN TO NOT 20F	01/30/2019	01/31/2019	1	Stop Valve	Control air supply to purge valves contained water and froze which prevented valves from operating.		Constructed temporary structure and heating to thaw piping and blew down with nitrogen. Installing heat tape and insulation for long term correction.
FEBRUARY 2019									
King_G1	Forced	Feedwater	02/18/2019	02/20/2019	1	Feedwater line radiograph plug	Feedwater line radiograph plug leak		Repaired leaking plug, inspected piping and replaced section that was found to have areas that had thin spots to prevent future leaks.
BayFrnt_G4	Forced	Miscellaneous (Generator)	02/01/2019	02/28/2019	28	Unit 4 Generator Rotor	During unit overhaul multiple cracks were found (November 2018) during the boresonic inspection of the generator rotor		Awaiting approval for retirement of unit
SHERCO_G2	Forced	Boiler Tube Leaks	02/01/2019	02/05/2019	5	Reheat Tube leak	Unit 2 had a known reheat leak which was being monitored with the projection that we could operate until the 2/9/19 schedule maintenance outage. Unit 1 was forced off line for its own tube leak on 1/17/19. The rate of degradation on the Unit 2 reheater leak increased, so a management decision was made to conservatively derate the unit to lower reheat pressure to prevent a second Sherco Unit from being forced off line. Once Unit 1 was stabile following its return, the derate was terminated.		Tube #2 on assembly #1 was repaied during the scheduled maintenance outage along with minor repairs to the rear reheat, mainly leading edge tube shields. The failure was caused by sootblower tube thinning.
SHERC3	Forced	Other Operating Environmental	02/01/2019	02/03/2019	3	Aux Steam header supply valve	PAS 2701, pegging aux steam supply valve from Unit 2 was inoperable. With Unit 1 off line for tube leak repair and extreme cold temperatures, building heating needed to be supplied by steam from Unit 3. This caused us to challenge our environmental administrative steam flow limit. The unit needed to be derated to maintain compliance until Unit 1 returned to service.		PAS 2701. aux steam header supply valve, was repaired during the Unit 2 overhaul.
King_G1	Forced	Feedwater	02/20/2019	02/22/2019	3	Feedwater line radiograph plug	Feedwater line radiograph plug leak		Repaired leaking plug, inspected piping and replaced section that was found to have areas that had thin spots to prevent future leaks.
SHERCO_G1	Forced	Boiler Tube Leaks	02/01/2019	02/03/2019	3	Steam Cooled Wall Screen Tube	Vibration snubber originally installed on the unit had deteriorated through the years. This caused the initiating failure of both this and the 1/17/19 event to be the #5 steam cooled wall screen tube due to reverse bending fatigue failure. In addition, there was signifigant collateral damage to the finishing superheat assemblies.		Total of 23 tube replacements and 7 pad welds completed between the steam cooled wall screen tube and finishing superheat tube damage. A vibration snubber consiting of stainless steel angle iron affixed to the tubes with staninless steel U-bolts was completed to add rigidity to the tubes. Vibration snubber for Unit 2 was inspected during the 2019 overhauland found to be intact.

Unit Outage Information

[PROTECTED DATA BEGINS

Unit	Outage Category	Primary Reason for outage	Outage Dates Start	End	Duration (Days)	Equipment that resulted in the forced outage	Description of Equipment Failure	Change in Energy Costs	Steps Taken to Alleviate Reoccurrence
MARCH 2019									
SHERC3	Forced	Miscellaneous (Pollution Control	03/09/2019	03/16/2019	6	33 Baghouse	High dp and high opacity in 33 baghouse due to aging bags.		Capital project to begin bag replacement in 2020 was moved up to this year and is in progress.
King_G1	Forced	Exciter	03/18/2019	03/19/2019	1	Exciter	High vibrations on exciter		The exciter collector rings and brush assemblies were repairedr. Generator shaft bearings and associated seals were also repaired. The plant has limited ramp rate in an attempt to prevent future failure.
King_G1	Forced	Exciter	03/19/2019	03/31/2019	12	Exciter	High vibrations on exciter		The exciter collector rings and brush assemblies were repairedr. Generator shaft bearings and associated seals were also repaired. The plant has limited ramp rate in an attempt to prevent future failure.
Wilmarth_1	Forced	Ash building roof collapsed, can	03/10/2019	03/14/2019	4	Ash load out building/discharge from C-9	03/09/2019 - Heavy unseasonable rainfall following snow storms caused excessive weight on building roof causing it to colapse		Emergent capital project 2019 to replace structure. Continue structureal inspections per SAP maintenance plan 10012853.
Wilmarth_2	Forced	Ash building roof collapsed, can	03/09/2019	03/14/2019	4	Ash load out building/discharge from C-9	03/09/2019 - Heavy unseasonable rainfall following snow storms caused excessive weight on building roof causing it to colapse		Emergent capital project 2019 to replace structure. Continue structureal inspections per SAP maintenance plan 10012853.
APRIL 2019									
BayFrnt_G4	Forced	T4-Generator Waiting retiremen	04/01/2019	04/30/2019	30	Unit 4 Generator Rotor	During unit overhaul multiple cracks were found (November 2018) during the boresonic inspection of the generator rotor		Awaiting approval for retirement of unit. Retirement was approved and unit officially retired on 6/01/2019.
SHERC3	Forced	Boiler Fuel Supply from Bunkers	04/23/2019	04/26/2019	3	308 Coal Mill	306 Mill was out for major overhaul and 302 mill was out for a coal leak repair. 308 mill was removed from service for internal inspection. 3 bolts and welds on the rotating throat assembly had failed.		This was an upgraded design provided by the OEM installed after a previous failure, however, the bolts used were Grade 8. We have sweitched to a more ductile bolt, Grade 5 Heavy Duty.
King_G1	Forced	Unit Tripped due to excier, issue	04/01/2019	04/30/2019	30	Exciter	High vibrations on exciter		The exciter collector rings and brush assemblies were repairedr. Generator shaft bearings and associated seals were also repaired. The plant has limited ramp rate in an attempt to prevent future failure.
MAY 2019									
King_G1	Forced	Exciter	05/07/2019	05/16/2019	9	Exciter	High vibrations on exciter		The exciter collector rings and brush assemblies were repairedr. Generator shaft bearings and associated seals were also repaired. The plant has limited ramp rate in an attempt to prevent future failure.
SHERCO_G2	Forced	Boiler Air and Gas Systems	05/02/2019	05/03/2019	1	22 Primary Air Fan motor	Broken connection on the motor side of the A-phase connector.		Motor was meggered to ensure motor winding integrity and connector was replaced.
King_G1	Forced	Exciter	05/01/2019	05/07/2019	6	Exciter	High vibrations on exciter		The exciter collector rings and brush assemblies were repairedr. Generator shaft bearings and associated seals were also repaired. The plant has limited ramp rate in an attempt to prevent future failure.
SHERC3	Forced	Boiler Fuel Supply from Bunkers	05/23/2019	05/24/2019	1	306 Coal Mill	Excessive slag buildup was noted on the burners of 306 mill during the internal boiler inspection due to the long duration 306 mill had been out for overhaul.		Slag buildup was removed. Different options are being looked at to imporve mill overhaul turn around time.
SHERC3	Forced	Boiler Tube Leaks	05/27/2019	05/31/2019	4	Finishing Superheat Tube	Initiating tube failure was short term overheating due to oxide exfoliation pluggage. It is hypothesized that the source of this oxide is from the outlet headers downstream of the finishing superheat assemblies. This indicates the oxide traveled backwards from the headers into the pendants. It is theorized this could happen during boiler air tests, during shutdowns when the steam inside the pendants and header are condensing, or during boiler drains when vents and drains are manipulated.		Eight tubes were identified for replacement; tubes 10 through 15 on pendant 80 and tubes 10 and 11 on pendant 79. Ultrasonic thickness testing (UT) was performed on surrounding tubes to identify collateral damage that did not result in a tube rupture. Four tubes were identified for pad welding; tubes 16 and 17 on pendant 80 and tubes 9 and 12 on pendant 79. Changes to the startup procedure were made to incorporate a strategy of maximizing steam velocity to sweep debris from the pendants including runing at full load and steam flow for six hours following a startup.
JUNE 2019									
NONE					0				
JULY 2019									
Redwing_1	Forced	Unit 1 OFA fan motor failure	07/06/2019	07/09/2019	3	Over Fired Air Fan	Motor Failure		Replaced motor
CCRiverside1	Forced	Significant rain/river debris resu	07/15/2019	07/16/2019	1	#6 Debris Filter	Backwash discharge valve failed in closed position which prevented backwashing of the debris filter screen. The filter screen plugged to the point that #6 circulating water pump had to be removed from service. With 1 of 2 circulating pumps out of service, condenser vacuum could not be maintained and the steam turbine (unit 7) tripped off line. With the steam turbine not available, both combustion turbing units are also not available.		Valve plug was removed during this short forced outage to allow for continuous backwashing of the debris filter. The valve will be replaced during the next planned outage (October 14-18, 2019).

Unit Outage Information

[PROTECTED DATA BEGINS

Unit	Outage Category	Primary Reason for outage	Outage Dates Start	End	Duration (Days)	Equipment that resulted in the forced outage	Description of Equipment Failure	Change in Energy Costs	Steps Taken to Alleviate Reoccurrence
CCRiverside2	Forced	Significant rain/river debris resu	07/15/2019	07/16/2019	**1**	#6 Debris Filter	Backwash discharge valve failed in closed position which prevented backwashing of the debris filter screen. The filter screen plugged to the point that #6 circulating water pump had to be removed from service. With 1 of 2 circulating pumps out of service, condenser vacuum could not be maintained and the steam turbine (unit 7) tripped off line. With the steam turbine not available, both combustion turbing units are also not available.		Valve plug was removed during this short forced outage to allow for continuous backwashing of the debris filter. The valve will be replaced during the next planned outage (October 14-18, 2019).
AUGUST 2019									
NONE									

PROTECTED DATA ENDS]

Xcel Energy		XES 2.600
Energy Supply Policy System		**Revision: 5.1**
TITLE:	*Event Assessment & Root Cause Analysis*	Page 1 of 13

1.0 PURPOSE

This policy establishes the requirements for Event Assessments and Root Cause Analysis (RCA), provides guidelines for conducting a RCA, establishes a forum for the dissemination and engagement in analysis, and an exchange of lessons learned throughout the Energy Supply Organization.

2.0 APPLICABILITY

All Energy Supply personnel

3.0 RESPONSIBILITIES

3.1 Business Area Management, General Managers, and Plant Directors are responsible to initiate and conduct Event Assessments, RCA and complete corrective actions, as required by this policy.

3.2 All Business Areas ***SHALL*** be responsible for assistance in analysis and lessons learned for incidents where they have expertise.

3.3 Plant Management ***SHALL*** notify the Hazard Insurance Department of any physical damage loss in excess of $100,000 or any fire involving activation or malfunction of a fixed fire extinguishing or detection system.

3.4 Plant Management and support organizations ***SHALL*** determine if a Generator trip was due to a generator Protection System misoperation. Generator trips will be investigated in accordance with EPR 5.730P01 Protection System Failure and Misoperation Reporting Procedure. The plant will forward the Corrective Action Plan for any Generator Protection System misoperation to the support organization who will forward to Transmission Operations.

4.0 REQUIREMENTS

4.1 Energy Supply Management reserves the right to initiate or exclude for analysis an incident based on perceived value to the organization.

4.2 All personnel injury and safety related near miss events shall follow the requirements for reporting and investigation specified in XES 4.103 Safety/Health Event Reporting and Investigation Policy. They will be entered into Meridium for tracking and records retention purposes.

4.3 The following events require an Event Assessment Report be completed:

4.3.1 All personnel injuries (regardless of severity)

4.3.2 All reported near-miss events

4.3.3 Unplanned unit outage or unit derate which limits the unit as required for GADS reporting

4.3.4 Any environmental non-compliance (including exceedances and reportable spills to outside agencies (i.e. NRC, EPA)) and

4.3.5 Any plant/equipment casualty or re-work (fire, catastrophic equipment failure, explosion, etc.)

4.4 The following events require an Event Assessment Report to be completed and a formal Root Cause Analysis be conducted to determine the cause of the event:

4.4.1 All personal injuries that are classified as an OSHA Recordable Injury and/or Lost Workday Injury

4.4.2 Unplanned unit outage or unit derates in which the unplanned loss of capacity exceeds 48 equivalent hours

4.4.3 Any environmental event in which a permit limit is exceeded and/or notification to a Regulatory Agency (e.g. Environmental Protection Agency, Minnesota Pollution Control Agency etc.) is required

4.4.4 Equipment and/or property damage that costs >$250,000 to repair or replace

4.4.5 Other off-normal events that warrant a formal root cause analysis as determined by Site Management

4.5 All Event Assessments required per section 4.3 of the policy ***SHALL*** be entered into the Meridium Event Assessment module.

4.6 Root Cause Analyses required per section 4.4 of the policy shall be entered into Meridium either as an extension or an attachment of the Event Assessment or in the Root Cause module. The Energy Supply Root Cause Investigation Report (XES 2.600_A02) is a tool that ***MAY*** be used to document the root cause investigation.

4.7 Initial Event Assessment Process

4.7.1 When an event assessment is required, the initial assessment ***SHALL*** be conducted by the assigned plant personnel as soon as practical following the event. The initial assessment ***SHALL*** include:

4.7.1.1 Interviewing personnel involved in the event to capture all pertinent information associated with the event (this information should be documented by writing employees statements, etc.)

4.7.1.2 Collecting all documentation associated with the event (e.g. log entries, Work Orders, etc.)

4.7.1.3 Inputting all collected information into the Event Assessment module in Meridium. Information can be changed at a later time.

4.7.1.4 Making the determination of any immediate corrective actions required to place the plant and/or personnel in a stable, safe condition and entering the information in the Event Assessment module on the Corrective Action datasheet

4.7.2 Once information is populated in the Event Assessment module, change the state from Pending to Request for Review. This will trigger an e-mail notification to the applicable department Manager that the Event Assessment is ready for review. Draft event assessments ***SHALL*** be completed by the responsible plant supervisor and ready for the applicable department Manager to review within 48 hours of initiating the investigation.

4.8 Upon receipt of the notification that the Event Assessment is ready for review, the applicable department Manager ***SHALL***:

4.8.1 Review the draft Event Assessment to ensure completeness and accuracy

4.8.2 Review any/all supporting documentation pertinent to the event

4.8.3 Determine if the event warrants a formal Root Cause Analysis, based on the complexity of the event and severity of the event consequences.

4.8.4 Initiate a 30-Day Event Assessment clock to ensure the Event Assessment is completed and submitted for review and approval within 30 calendar days.

4.9 If the event meets the criteria that requires a formal Root Cause Analysis, in accordance with the criteria in section 4.3 of this policy, the responsible Department Manager SHALL:

4.9.1 Assign personnel to a Root Cause Team; including personnel involved in the event, subject matter experts, system engineers and other resources to ensure the analysis and resulting conclusion and recommendations are as accurate as possible.

NOTE: The responsible department Manager may delegate the leadership of the RCA Team, although the Manager retains accountability for proper and timely completion of the analysis and Event Assessment Report.

4.10 The Root Cause Team SHALL:

4.10.1 Utilize proper assessment and analytical techniques which may include the following:

- Staircase (WHY) Analysis
- Barrier Analysis
- Task Analysis
- Failure Mode & Effects Analysis
- Change Analysis
- Fault Tree Analysis
- Pareto Analysis

4.10.2 Focus on the accurate determination of the root cause of the event and any contributing factors and

4.10.3 Determine appropriate corrective/improvement actions to prevent event recurrence

4.11 The result of the Root Cause Analysis ***SHALL*** be documented in Meridium, either as an extension or an attachment to the Event Assessment or in the Root Cause module. All completed root cause events ***SHALL*** include:

4.11.1 A complete and accurate description of the event including date and time

4.11.2 Identification of all personnel involved in the event

4.11.3 Identification of the person in charge of the activity at the time of the event

4.11.4 Identification of any/all procedures, Work Orders, etc., pertinent to the event

4.11.5 Identification of equipment (components, system, tools, etc.)

4.11.6 Identification of the personnel involved in the event assessment process

4.11.7 The problem statement or undesirable results of the event

4.11.8 The apparent cause and contributing factors

4.11.9 The root cause and contributing factors (required for all events that require a formal Root Cause Analysis) and

4.11.10 Identification of corrective/improvement actions recommended as a result of the event.

4.12 Report Review and Approval

4.12.1 Upon completion of the final Event Assessment, the responsible Department Manager ***SHALL***:

4.12.1.1 Forward the completed Event Assessment to the site Management and the Site Human Performance Team for review.

4.12.2 Following review of the final Event Assessment Report, the responsible Department Manager ***SHALL:***

4.12.2.1 Verify the completion of the Event Assessment Report by providing or obtaining a Site Management Team electronic approval status in Meridium.

4.12.2.2 Ensure the Site Human Performance team reviews and electronically acknowledges the Event Assessment in Meridium.

4.12.3 Following approval of the Plant Director or support organization Director the document(s) required in section 4.3 will be reviewed by the next level of management, including a peer member of that management level, to confirm that the accurate determination of the root cause and appropriate corrective/improvement actions have been identified to prevent reoccurrence.

4.13 Tracking Event Assessment Action Items

4.13.1 All Action Items assigned as a result of Event Assessments ***SHALL*** be tracked to completion though Meridium. Meridium will send electronic reminders via e-mail to those responsible for completion of action items.

4.13.2 The list of current open Event Assessment Action Items should be reviewed on a monthly basis. These items can be viewed in Meridium.

4.14 Environmental Permit Deviations

4.14.1 Plant directors will notify the General Manager of each region within 24 hours of a confirmed permit deviation.

4.14.2 The Plant Director of the facility with the permit deviation will contact the Plant Environmental Analyst (PEA) and determine a time in the immediate future (not to exceed 72 hours) to conduct a conference call with senior management to discuss the event. The Plant Director will schedule the call with senior management. Attendees, at a minimum, will include the Plant Director, PEA and other designated representatives from the facility. Other attendees must include the General Manager from each region, the Senior Director of Environmental Services and the Director of Environmental Services for the region.

4.14.3 The Plant Director, or designee, will complete the initial event assessment in accordance with Section 4.7 and send notification it is complete prior to the senior management call. During the call, staff will discuss the event to include deviation, potential cause, corrective actions and next steps to include completion of a RCA and timing. GMs from the other regions will assess whether the potential for a similar occurrence exists in their region and implement appropriate preventative measures commensurate with the risk.

4.14.4 The facility with the deviation will then complete a RCA for the event in accordance with Section 4.9. Additionally, the facility will develop a one page summary of the event using the designated template (Attachment 3) to include the following:

- Event Details
- Cause
- Corrective Actions
- Next Steps

4.14.5 The RCA will be entered into Meridium and tracked for completion of actionable items.

4.14.6 On a monthly basis, permit deviations will be discussed during the ES Performance Call administered by Energy Supply The discussion will include the following:

- The permit deviations for the previous month will be presented by the appropriate facility or group utilizing the one page summary (Attachment 3) of the event. The facility will answer questions and share any lessons learned.
- Actions items from previous RCAs listed in Meridium will be reviewed and tracked for completion.

Based on the information shared through this process, the GMs from the other regions will determine if preventative measures are needed to prevent a similar occurrence in their region and implement as needed or required.

4.14.7 Documentation for each monthly call will be maintained with ES Performance Call information.

4.14.8 This same process will be followed if the permit deviation is attributable to another group outside Energy Supply plant operations (Energy Supply support organizations). In this scenario, plant directors will be replaced by the Director in the area of responsibility.

5.0 REQUIRED RECORDS

5.1 All records ***SHALL*** be retained in Meridium. All Event Assessments will be entered into Meridium. All Root Cause Analysis reports will either be included with the Event Assessment in Meridium or entered into the Meridium Root Cause Analysis module.

6.0 DEFINITIONS & REFERENCES

6.1 Definitions

6.1.1 Root Cause Analysis is the process of determining, using facts, data, and logic, the cause and effect relationships that result in an undesirable event occurring and determination of effective and efficient corrective actions to break the cause and effect chain to prevent recurrence. It is a Management System tool to determine how to prevent those things that stand in the way of continuous improvement in business processes.

6.1.2 Net Maximum Capacity is defined by the North American Electric Reliability Council (NERC), Generating Available Data System, Data Reporting Instructions. ODMS Cause Code Impact and Event Summary reports provide calculation of Equipment Hours and Lost MWhs for forced outages, maintenance outages, and forced deratings. These calculations are after the fact, to provide for timely initiation of RCA and estimate should be used.

6.1.3 Generator Protection System Misoperations is 1) failure of a relay to operate for a fault when it should, 2) operation of a relay when it shouldn't operate either a fault outside of its zone of protection or when no fault exists (aka spurious trip).

6.2 References

6.2.1 XES 2.600_A02 - Energy Supply Root Cause Investigation Report

6.2.2 Event Assessment and Root Cause Assessment Development process flowchart – Attachment 1

6.2.3 Event Assessment Process Flowchart – Attachment 2

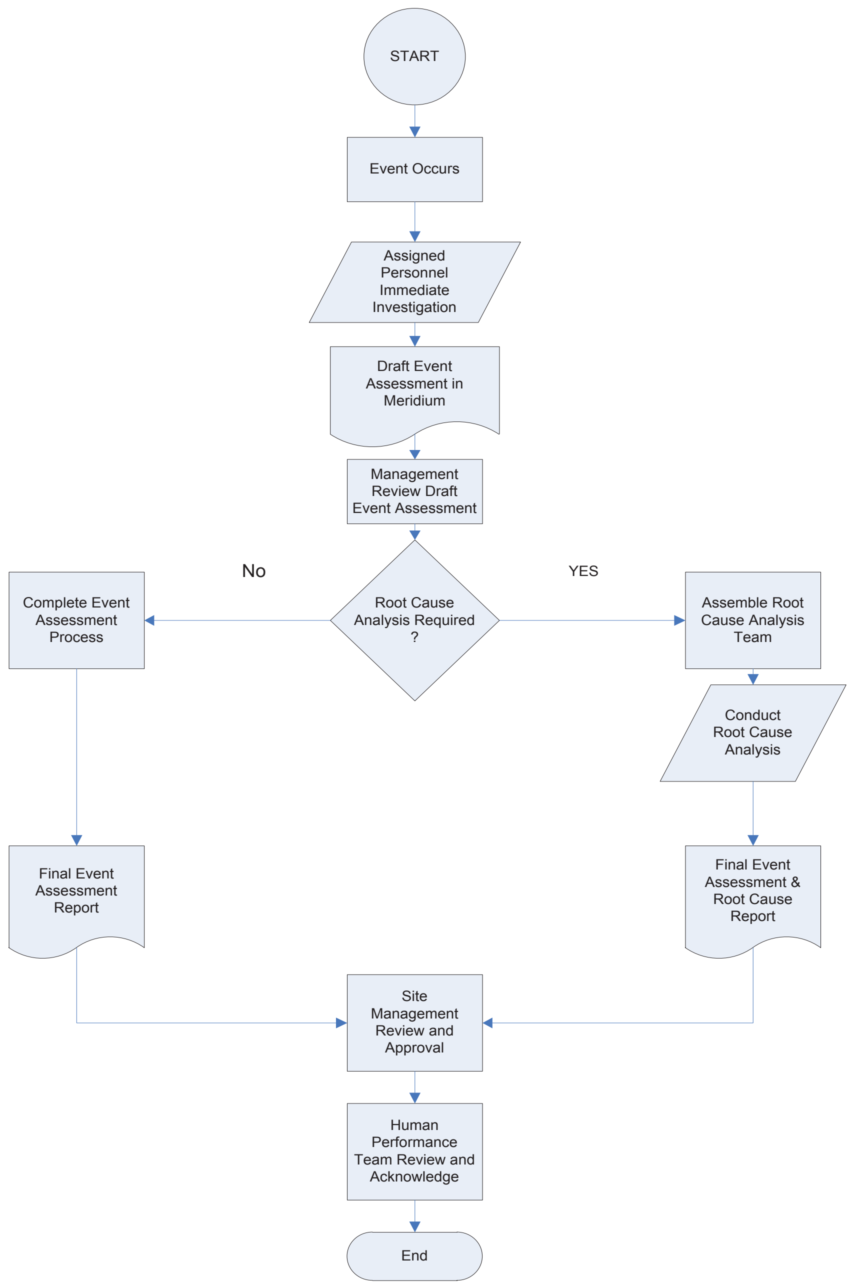
6.2.4 XES 4.103 Safety/Health Event Reporting and Investigation policy

7.0 REVISION HISTORY

Date	Revision	Change Description
	1.0	Original Issue
01-06-2012	3.0	Major rewrite
04-06-2016	4.0	All safety events referred to XES 4.103 Safety/Health Event Reporting and Investigation policy. Several sections rewritten and process map updated to reflect change in process to enter all event assessments in Meridium and any RCA to be attached or entered into the Meridium RCA module.
01-22-2018	5.0	Revised to include for tracking and evaluating environmental permit deviations.
4-1-2019	5.1	Very minor grammatical changes added

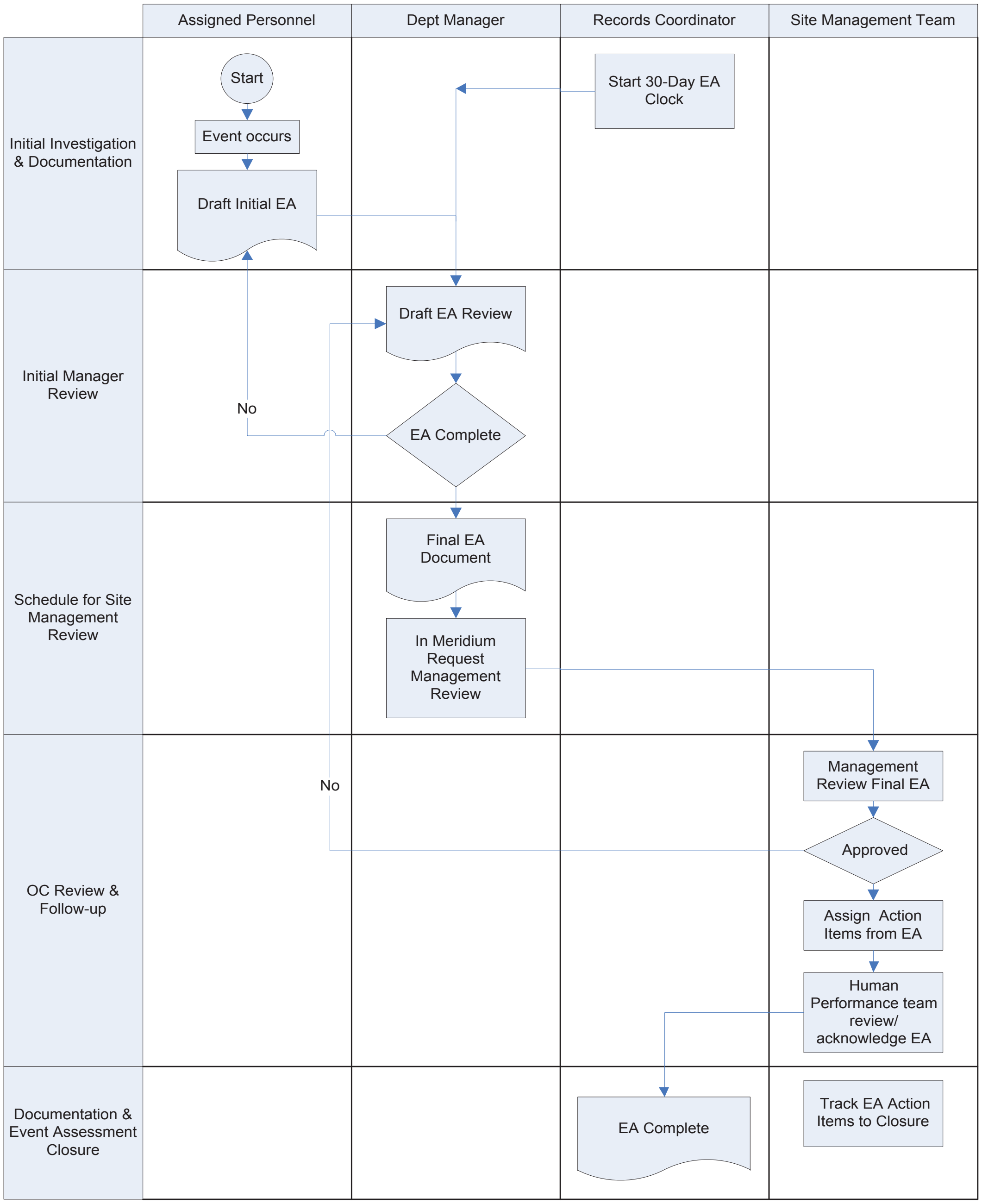
Xcel Energy	XES 2.600
Energy Supply Policy System	**Revision: 5.1**
TITLE: *Event Assessment & Root Cause Analysis*	Page 11 of 13

Attachment 1 Event Assessment and Root Cause Development Process



Author: Timothy Laplant	Revised by: Jeff West, Bryan Craig	Approved By: Teresa Mogensen (electronic approval on file)
Effective Date: 4/12/2012	Date: 4/1/19	Approved Date: 4/1/19

Attachment 2 Event Assessment Flow Chart



Attachment 3 – Environmental Permit Deviation Summary

Author: Timothy Laplant	Revised by: Jeff West, Bryan Craig	Approved By: Teresa Mogensen (electronic approval on file)
Effective Date: 4/12/2012	Date: 4/1/19	Approved Date: 4/1/19

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Responsible by Nature

Environmental Permit Deviation Review

Event: (enter title)

Event Details

Cause

Corrective Action(s)

Next Steps

Location: PSCo

Date:

Content Author:

Xcel Energy

Author: Timothy Laplant	Revised by: Jeff West, Bryan Craig	Approved By: Teresa Mogensen (electronic approval on file)
Effective Date: 4/12/2012	Date: 4/1/19	Approved Date: 4/1/19

Xcel Energy	XES 2.630P01
Energy Supply System	**Revision: 1.2**
TITLE: Human Performance Tools	Page 1 of **70**

1.0 PURPOSE

This policy establishes the expectations for use of the human performance error-prevention tools.

This policy also provides an understanding of error precursors and which human performance error prevention tools provide the best barriers to eliminate the potential for error.

2.0 APPLICABILITY

2.1 This policy is applicable to all Energy Supply personnel.

2.2 Use of the tools described in this policy is recommended. Studies and experience have shown that the use of error reduction tools will enhance the ability to minimize errors and thus reduce the frequency and severity of events. While the lack of use of the tools in this procedure may be identified as a contributor to an event, human error alone is rarely seen as a root cause for events. Organizational weaknesses persist that create error likely situations that lead to events. Consequently, the greatest potential for improvement in human performance lies with the identification and elimination of weaknesses in the organization and processes.

3.0 RESPONSIBILITIES

3.1 Managers, Superintendents and Supervisors SHALL:

3.1.1 Implement the requirements and expectations of this procedure within their departments.

3.1.2 Install the expectation to understand and use Human Performance Tools in their personnel.

3.1.3 Routinely participate in training, in-field observation and coaching with their personnel to reinforce use of the tools.

3.1.4 Effectively use the Individual and Leader/Supervisor Human Performance Tools described in this procedure.

3.2 Supervisors, Leads and Foremen SHALL:

3.2.1 Routinely observe work in progress and training to promote application of the Human Performance Tools.

3.2.2 Coach regularly to reinforce use of these tools through both positive and constructive feedback. For maximum impact, this feedback can refer to:

- Events that were avoided
- Instances where the ineffective use of these tools has caused or contributed to events.

3.2.3 Ensure that the specific application of the Human Performance Tools is identified and discussed during pre-job briefs.

3.2.4 Effectively use the Individual and Leader/Supervisor Human Performance Tools described in this procedure.

3.3 All Individuals SHALL:

3.3.1 Perform tasks in a thoughtful, conscientious manner.

3.3.2 Effectively use the Human Performance Tools described in this procedure.

3.3.3 Coach and reinforce the expectations for using Human Performance Tools with peers.

4.0 REQUIREMENTS

4.1 Guiding Principles of Human Performance Management

4.1.1 The following principles, when applied to programs, processes, and interpersonal relationships, encourage excellent human performance throughout the organization cultivating behaviors practiced by individuals to protect the safety/well being of personnel, as well as the reliability of the physical plant:

4.1.1.1 People are fallible and even the best make mistakes.

4.1.1.2 Error-likely situations are predictable, manageable, and preventable.

4.1.1.3 Individual behavior occurs within the context of organization processes and values, which serve as the principal influence on the choice of behaviors.

4.1.1.4 People achieve high levels of performance based largely on the encouragement and reinforcement received from leaders, peers, and subordinates.

4.1.1.5 Events can be avoided by understanding the reasons mistakes occur and applying the lessons learned from past events.

4.1.2 The basic purpose of these human performance tools is to help the individual worker maintain *positive control* of a work situation. That is, *what is intended to happen is what happens, and that is all that happens.* This is another way of saying, "Do the job right the first time." Before taking an action, a conscientious worker understands the significance of the action and its intended result. Such thinking takes time. Every human performance tool slows things down to ultimately speed things up by avoiding delays that accompany events triggered by active errors. When used thoughtfully and rigorously, human performance tools give the individual more time to think about the task at hand, about what is happening, what will happen, and what to do if things do not go as expected.

4.2 Principles of Human Performance Tool Implementation

4.2.1 This procedure does not address all possible Human Performance Tools, but is limited to the Xcel Energy adopted tools. The tools described in the procedure are applicable to all employees. These tools are most easily adapted to field activities involving written instructions or real time manipulation of equipment. However, the underlying principles and concept of using tools to enhance human behavior can improve performance in every workplace and in all settings.

4.2.2 Various tools/techniques have evolved that, when consistently and rigorously applied, can reduce the potential for human error. Some of these tools involve individual behaviors (i.e., self-checking, stop when unsure etc.) while others involve "team" behaviors (i.e., communications, peer-checking, pre-job briefings, etc.) Most of these tools are somewhat unnatural to the average person. For example, we don't routinely use three-way communications in our lives, and checking someone else's work (e.g., peer-checking) can be perceived as offensive to some people. Therefore, these behaviors need to be developed and reinforced in the workplace. If consistently and effectively applied, they help minimize human errors and make each of us more successful.

4.2.3 This procedure has been developed to provide tools to assist each of us in changing behaviors to improve human performance within our organizations. These tools include:

4.2.3.1 Tools that Individuals can use to prevent errors during task or activity performance (Attachment 1). These are broken down into two additional categories; fundamental tools that always apply, and conditional tools that depend on the work situation or risk involved.

4.2.3.2 Tools that Leaders and Supervisors can use to prevent errors during task or activity performance (Attachment 2)

4.2.3.3 A matrix that provides a cross-reference of human performance tools that can be used to address error likely situations (Attachment 3)

4.3 Accountability and Ownership

4.3.1 We recognize, acknowledge, and accept responsibility for the reality of work situations. Problems are identified and solved with commitment and follow-through.

4.3.2 Individual Accountability Definition

4.3.2.1 Doing what you said you would do to the required standard, and if you determine you will not be able to meet the expectation, notify your supervisor soon enough to allow an alternate plan to be developed.

4.3.3 Organization Accountability Definition

4.3.3.1 Develop clear standards and expectations

4.3.3.2 Communicating the standards and expectations in a manner that assures individuals are knowledgeable of them

4.3.3.3 Monitoring conformance to the standards/expectations and coaching when appropriate.

4.3.3.4 Implementing consequences in a manner that achieves behavior change and maintains a strong safety conscious work environment.

4.4 Risk Management and Conservative Decision Making

4.4.1 Risk management identifies and evaluates the risks created by human activities, inherent organizational/plant conditions, and external influences (e.g. weather or regulatory), and pinpoints ways to control them. A human performance risk assessment identifies the threats that human error potentially poses for a work activity that involves significant human interaction with important equipment, whether the physical plant (such as pipes, valves, and switches) or the paper plant (such as design documentation and procedures). It gives management insight into what controls and barriers are most appropriate to either eliminate or minimize those threats, especially for high-risk activities. High-risk activities have the potential to hurt people, impact the environment, trip the plant, damage equipment, or cause a regulatory violation.

4.4.2 Human performance risk combines the likelihood (probability) of an undesired action and its consequences.

Risk= Likelihood X Consequence

4.4.3 After the critical steps or phases of an activity are identified, the likelihood is evaluated by the identification of error precursors, complexity, and margins for error at one or more critical steps.

4.4.4 Conservative decision making is a close comparison to risk management. Conservative decision making does not mean making the most conservative decision. It means making an informed decision that carefully weighs the risk of the action against potential barriers. It is the basic principle behind risk management. The first goal should always be to implement a “no risk” option. If it is not possible or reasonable to eliminate the risk, then conservative decision making involves using barriers that either reduce the probability or cap the potential consequences such that the risk is appropriate for the situation.

4.4.5 Normally we tend to disregard the probability term of the equation. In other words, we usually understand what the potential consequences are, but dismiss that it will ever really happen. As examples, think of why people do not wear seal belts (“I’ve never been in an accident”, implying the probability going forward is zero). Or think of the Titanic (“unsinkable”, implying the probability that it can sink is zero). The Captain of the Titanic most likely understood that it could sink, but nevertheless acted as though the probability was extremely low (by maintaining speed through an area known to have icebergs). Therefore, a good way to craft the right conservative decision is to visualize that whatever **could** go wrong **will** go wrong, and then to figure out what the right set of barriers are to properly minimize the risk.

5.0 REQUIRED RECORDS

5.1 None

6.0 DEFINITIONS & REFERENCES

6.1 Definitions

6.1.1 **Behaviors**, observable (action) and non-observable (thought) activity by an individual; "what people do."

6.1.2 **Coaching,** The process of observing behaviors, comparing them to desired behaviors and providing feedback by reinforcing desired behaviors and correcting those that do not meet expectations.

6.1.3 **Contact Time,** The cumulative amount of time spent in the company of employees, observing and coaching their behaviors.

6.1.4 **Defense (or Barrier)** – Anything that protects a system or person from a hazard whether physical, administrative or human in nature. A measure including expected behavior that protects against various hazards or mitigates the consequences of a hazard.

6.1.5 **Error (general definition),** Human error is an action that exceeds some standard or limit of acceptability. Human error is a behavior that is caused by a variety of conditions related not only to unacceptable individual behavior but also to unsuitable management and leadership practices and organizational weaknesses.

6.1.5.1 **Active Error,** Errors that change equipment, system, or plant state triggering immediate undesired consequences.

6.1.5.2 **Latent Error,** An error, act, or decision that results in organization related weaknesses or equipment flaws that lie dormant until revealed either by human error, testing, or self-assessment.

6.1.6 **Error-Likely Situation,** A work situation in which there is a greater opportunity for error when performing a specific action or task due to error precursors. An error- likely situation typically exists when task-related factors exceed the capability of the individual (mismatch) at the point of "touching" the physical or paper plant.

6.1.7 **Error Traps (Precursors),** An unfavorable condition at the job site or a characteristic of the task or an individual that increases the probability for error during a specific action. A matrix of error traps and tools is provided in Attachment 3.

6.1.8 **Fallibility,** A fundamental, internal characteristic of human nature to be imprecise or inconsistent.

6.1.9 **Human Performance Error Prevention Tools,** A collection of standard human error reduction tools intended to prevent events, reduce human errors and improve station performance.

6.1.10 **Latent organization Weakness,** Undetected deficiencies in the management control process (e.g., strategy, policies, work control, training and resource allocation) or values (shared beliefs, attitudes, norms and assumptions) creating workplace conditions that can provoke error (precursors) and degrade the integrity of defense (flawed defenses).

6.1.11 **Performance Mode,** One of the three modes human processes information based on one's level of familiarity and attention given to execute a specific task.

6.1.11.1 **Skilled-Based Task,** A task driven by stored patterns of pre-programmed instructions. When personnel make an error while performing familiar or well-practiced tasks, it is a skill-based error.

6.1.11.2 **Rule-Based Task,** A task performed following stored rules accumulated via experience and training. A rule-based error is made when a rule (from training, procedure, etc.) is misapplied or a shortcut is taken.

6.1.11.3 **Knowledge-Based Task,** A task with no pre-programmed instructions or rules. An example is problem solving. When an error is made in a situation where rules do not exist or are not known it is a knowledge-based error.

7.0 References

7.1.1 XES Policy 2.630 - Human Performance Program

8.0 ATTACHMENTS

8.1 Attachment 1 - Individual Tools

8.1.1 STAR

8.1.2 Procedure Use and Adherence

8.1.3 Stop When Unsure

8.1.4 Co-Worker Coaching

9.0 REVISION HISTORY

Date	Revision	Change Description
8/8/2011	1	Original Issue
4/30/2014	1.1	Changed in 3.1 Department Managers to Managers, Superintendents and Supervisors; Changed in 3.2 Department Supervisors to Supervisors, Leads & Foremen; Triennial Review complete
3/07/2017	1.2	Minor grammar and format corrections

ATTACHMENT 1
INDIVIDUAL TOOLS

The standard set of Individual Human Performance Tools is listed below. Based on the nature of the activity or task, use of these tools should be required:

Fundamental

Conditional

This attachment provides the following generic element of each of the Individual Human Performance Tools

1. **Basis** - A description of the tool and why it is important
2. **When to use the tool** - A statement on when the tool should be used (while this cannot address every situation it should allow the typical worker to understand when to use the tool)
3. **How to do it** - A discussion of how the tool is implemented
4. **At-risk behaviors to avoid**- A set of behaviors, beliefs, assumptions, or conditions that tend to diminish the effectiveness of the tool.

ATTACHMENT 1
INDIVIDUAL TOOLS

FUNDAMENTAL

SELF- CHECK (STAR)

1. **Basis**

Self-Check (STAR) is a Human Performance Tool that helps the individual methodically focus his/her attention on the details of the task at hand. The individual consciously and deliberately reviews the intended action and expected response before performing the task. This includes distinct thoughts and actions designed to enhance an individual's attention to detail in the moment just before performing the task.

S STOP
T Think
A ACT
R Review

Proper use of self-checking will improve the ability of all personnel at all levels to detect potential problem situations before an undesirable situation occurs.

Knowing how to self-check is important. Knowing when to self-check is just as important. Self-checking techniques must be emphasized continuously and positively reinforced when used. Good self-checking can be an effective tool in avoiding many of the common human performance traps, making it the single most important Human Performance Tool. These traps include; time pressure, distraction/interruption, overconfidence, multiple tasks, vague guidance, first shift/late shift, peer pressure, change/off normal, physical environment, and stress.

2. **When to Use the Tool:**

Simply stated, self-checking must be used for every task or job that has a potential to impact the physical plant. Some examples include:

- Manipulating plant components
- Components disassembly/reassembly/routine maintenance
- Determining design requirements
- Performing calculations
- Revising drawings and procedures

- Reviewing and approving documents, regardless of whether or not additional verification is performed

3. How to Do It:

Self-checking is performed as follows:

STOP
This is the most important step of any self-checking technique. Pause before performing a task to enhance attention to detail. Eliminate current or potential distractions.

THINK
Understand specifically what is to be done before performing a task. Identify the information necessary to correctly perform the task. Understand the expected results of the action. Do not proceed in the face of uncertainty.

ACT
Identify the correct item by physically pointing at the component, before taking any action.

Read the document that directs manipulation of the component. The best technique is to read this aloud, even if alone, to use the additional human attributes of speaking and listening

Perform the intended action. For physical actions, ensure hand contact is not lost.

REVIEW
Verify that the actual response is the expected response.

If an unexpected response is obtained, take action as previously anticipated/determined.

Ensure all actions are conservative.

For non-physical tasks, step back and perform a “sanity” check of the task results.

4. <u>At-Risk Behaviors to Avoid:</u>

- Not understanding the intent of an action or procedure step before performing it.
- Performing several manual actions in rapid succession
- Performing more than one action at a time
- Performing the action when uncertainties or discrepancies exist

- Talking with another person while performing the action
- Looking at something other than the component being manipulated
- Not self-checking again after losing visual or physical contact
- Not knowing if the action is a critical step
- Feeling sleepy or fatigued while performing a critical step
- Not taking the time to verify that results are correct

ATTACHMENT 1
INDIVIDUAL TOOLS

FUNDAMENTAL

PROCEDURE USE & ADHERENCE

1. **Basis**

Procedures help users perform activities correctly, safely, consistently, and in accordance with established requirements. Procedures direct people's actions in a proper sequence and minimize reliance on one's memory. Procedure use and adherence means understanding the procedure's intent and purpose and following its direction. The user performs actions as written in the sequence specified by the document. However, if it cannot be used as written, then the activity is stopped, and the procedure is corrected before continuing. Following the procedure without question does not guarantee safety because procedures sometimes contain hidden flaws. But, understanding the overall purpose and strategy of the procedure promotes a safer outcome.

How we use procedures is the most fundamental Human Performance Tool we have to perform work without error. Industry experience has shown that not properly following procedures is a large contributor to human error and many consequential events. A well-intentioned worker can find themselves in a variety of situations where uncertainty exists in using a procedure. Clear guidance covering these situations will produce more consistent and error-free performance.

2. **When to use the tool**

- When manipulating, altering, monitoring, or analyzing equipment
- When a procedure exists for a work activity
- When no procedure exists, but there should be (STOP and get help)
- When required by technical documents

3. **How to do it**

- Verify the procedure being used is the correct revision. Procedures are corrected and approved before use.
- Review prerequisites, limits, and precautions before starting

- An effective place keeping method should be used for procedures that do not require sign-offs. Initial or check each step complete after the action is performed, before proceeding with the next step.
- Procedures shall be followed as written without deviating from the original intent and purpose
- Do not deviate from the sequence of steps, unless approved
- Do not N/A steps, unless approved.
- IF a procedure is incorrect, will result in damage to equipment as written, cannot be performed as written, or is otherwise unsafe, STOP the task and contact a supervisor
- IF desired or anticipated results are not achieved, do not proceed and contact a supervisor

4. <u>At-risk behaviors to avoid</u>

- Assuming a procedure is well written and accurate
- Not reviewing a procedure before performing a job.
- Commencing a procedure without establishing initial conditions
- Performing a procedure step without understanding its purpose
- Not submitting feedback (technical accuracy and usability)
- Performing a procedure without knowing the critical steps
- Using an attachment or data sheet in place of the procedure
- Using a procedure for a task that the user is not qualified for
- Believing “A good operator doesn’t need a procedure.”
- Using multiple procedures at the same time
- Skipping steps or segments of a “routine” procedure, because those steps have been “unnecessary” in the past
- Using a previous, superseded revision of a procedure
- Marking steps “N/A (not applicable) without authorization
- Following a procedure knowing it will cause harm if followed as written
- Using a procedure, or segment of a procedure, for a task other than that intended by the procedure.

ATTACHMENT 1
INDIVIDUAL TOOLS

FUNDAMENTAL

STOP WHEN UNSURE

1. **Basis**

Stopping when unsure is a tool to be used when a person is uncertain about how to proceed, or when it is first recognized that the plan or conditions have changed. Stop when unsure includes questioning attitude.

Stop when unsure is a subtle tool, as many times we convince ourselves we are sure. A better name for this tool might be stop when you should be unsure, which reinforces the need to be alert to job conditions that indicate an event is imminent.

Significant events have occurred when legitimate questions regarding plant evolutions were insufficiently resolved before work proceeded. In some cases, the people raising the questions did not adequately advocate their positions, or they deferred to the judgment of others. In other instances, questions were not adequately addressed because the urgency of accomplishing the task took precedence. When confronted with uncertainly the chances for error are high (1 in 10 to 1 in 2), therefore, it is crucial to apply this tool when called for.

Personnel must have confidence that the questions they raise will be valued and properly evaluated. Consideration of worst case scenarios is a routine part of the pre-job briefs. A questioning attitude is especially important when time pressure is present and the focus is on efficiently implementing the plan. Management must strengthen and foster a strong questioning attitude culture on a daily basis for this tool to prevent events.

A questioning attitude promotes a preference for facts over assumptions and opinion. Questions such as "What if…," or "Why is this acceptable?" help improve recognition of improper assumptions and possible mistakes. The structured approach described below promotes the discovery of facts. Facts depend on the reliability of the information source and the accuracy of that information. Facts are verifiable and visible expressions of behaviors and information. Without sufficient facts, the performer stops the activity to address an unpredictable work situation that could lead to either a serious mistake or a significant event.

2. **When to use the tool**

Times to consider using Stop When Unsure include, but are not limited to, the following situations:

- If you are not confident that the action you are about to take is appropriate.
- If the task or work scope has changed and you are outside of the plan, procedure, or policy.
- If the work flow is interrupted because of a change and requires refocusing on the task.
- When a "gut feeling" tells you that something is not right.
- Unexpected results
- Unfamiliar situations
- When hearing words such as assume, probably, I think, we've always, etc.
- Questions about the job that you have no answers for
- Uncertain that you are in compliance with expectations, procedures, regulations
- You are unclear what successful job completion is

3. **How to do it**

- Stop the activity
- Place the equipment and the job site in a safe condition.
- Do not answer your own question. Notify your supervisor.
- Obtain help from someone who possess the appropriate expertise
- Base decision on facts from valid information source or person

4. **At-Risk behaviors to avoid:**

- Dismissing contrary evidence or points of view
- Discounting the concerns of less experienced individuals
- Not asking for help from more knowledgeable persons
- Not asking for help for fear of embarrassment
- Feeling inadequate if you have to ask for help
- Emphasizing "who's" right instead of "what's" right
- Thinking the task is "routine" or "simple"
- Believing nothing bad can happen
- Assuming "skill of the craft" is sufficient to address a situation
- Not having clear abort criteria
- Answering one's own questions regarding a critical step

ATTACHMENT 1
INDIVIDUAL TOOLS

FUNDAMENTAL

CO-WORKER COACHING

1. **Basis**

Co-Worker Coaching is a situation in which co-workers remind, advise, or assist each other to ensure the task is done correctly. Co-Worker Coaching is the process where an individual observes, questions and corrects (if necessary), or compliments the actions of another person.

Co-Worker Coaching is distinguished from peer checking primarily by the source of the request. With peer checking, the performer requests or a procedure directs the action, whereas co-worker coaching is typically unsolicited.

Coaching is a necessary element in achieving and maintaining the desired workforce behaviors. Coaching is a proactive means of improving human performance and preventing events. Coaching is most effective when it is regular and heavily weighted with positive reinforcement of the desired behaviors. To be effective, coaches must be very knowledgeable of the desired behaviors and able to identify subtle flaws in the implementation of Human Performance Tools. Identifying and correcting these subtleties ensure the tools will work when the workforce is challenged by latent organization weaknesses, flawed defenses or error-likely situations.

Ways you benefit from being coached:

- Heightened awareness of your own behaviors
- Receive feedback to reinforce safe behavior.
- Allows you to learn about safe and potentially hazardous behavior through feedback.
- Helps develop a questioning attitude.
- Develops an increased commitment to helping the site become an industry leader.
- Builds trust and teamwork.

When the culture exists in which personnel are able to coach their co-workers without retribution during daily activities in regards to safety, human performance, misunderstanding, etc., then overall organization performance will climb to new levels.

2. **When to use the tool**

   Co-Worker Coaching should be considered on all tasks. A questioning and caring attitude regarding the overall organization, which includes the physical plant, co-worker, work processes and work tasks, is essential and required to be used at all times. Personnel should always be on the lookout for situations that may be unsafe, abnormal or error likely; e.g. complex procedure, a change in plant conditions during an activity, inexperienced personnel, vague guidance, etc. Also, remember to let people know when they have done something well.

   Co-Worker coaching is not just a tool to be used in the field. Managers and supervisors using co-worker coaching with one another is a good practice. Co-worker coaching at critical points in a decision making process or implementation process can prove to be a valuable tool in avoiding future errors.

3. **How To Do It**
   - Immediately correct unsafe behaviors.
   - Recognize that while it is uncomfortable to approach others, people genuinely want to know if they are making a mistake.
   - If at all possible, reinforce good behaviors or correct undesired behaviors as they occur.
   - If the activity does not allow immediate feedback, do it at a break in the activity or as soon as the activity is complete.
   - Ensure feedback is specific and address behaviors not individuals.
   - Timely feedback corrects undesired behaviors allowing positive reinforcement once the desired behavior is demonstrated.
   - Take every opportunity to positively reinforce desired behaviors. It is the most effective method to ensure consistent performance.
   - Be sure positive reinforcement is specific and addresses the behavior and the standard.

4. **At-risk behaviors to avoid**

   - Convincing yourself that the person will not be receptive to your message
   - Approaching someone with a “you’re at fault” attitude.

ATTACHMENT 1
INDIVIDUAL TOOLS

FUNDAMENTAL

"ARE YOU READY?" CHECKLIST

1. **Basis**

   The "Are You Ready?" Checklist is a tool used as a personal pre-job briefing, immediately preceding the work activity and upon arriving at the work site. It consists of several questions to gauge the worker's preparedness for the job.

   While this tool is a personal pre-job brief for work activities with a low level of risk on industrial or plant safety, do not get it confused with a formal pre-job brief. This tool is important for individuals to refocus themselves immediately before performance of a work activity to ensure they understand the task and everything that needs to occur for successful performance.

2. **When to use the tool**

   This tool is used prior to performing any task that includes an error-likely situation and may be used during any task performance. This tool is used for self-briefings in which the frequency of the work activity is monthly or more frequent. Any job that appears routine should incorporate the use of this checklist prior to start of the job to ensure complacency and overconfidence is not present. This tool can also be used by a supervisor as a limited pre job brief, when a full pre job brief is not required.

3. **How To Do It**

   This checklist is used by answering the following questions prior to starting a job:

   Am I qualified to perform the task:
   - *Have you received training and completed qualification for the task you are about to perform?*
   - *Have you recently done this or a similar type task?*
   - *Do you feel comfortable performing the task independently?*

   Am I Fit For Duty?
   - *Do I have any issues or conditions that could hamper my job performance?*

Do I understand the task?
- *Have you reviewed the procedures and/or work orders for the job?*

Can I do it safely?
- *Are PPE requirements understood and are PPE available?*
- *Have you applied the job site hazards analysis/risk assessment?*

Will my activity generate foreign material?
- *Are there Foreign Material Exclusion (FME) requirements listed on the work order?*
- *What level and controls are needed to prevent foreign material intrusion?*

What error likely situations do I have?
- *Have you considered task demands, work environment, individual capabilities, and human nature for potential error-likely situations?*

What error reduction tools will I use?
- *What error reduction tools will you use to ensure event free operation considering the error-likely situations?*

What can go wrong?
- *What's the worse thing that can happen if an error is made?*
- *How can my work tasks affect plant safety?*
- *What risk level is this job?*

What conditions stop this task?
- *What abort criteria will you use to stop the task?*

Am I ready to start work?
- *Have you resolved all concerns related to proceeding on with the task?*

At the Job Site (e.g. two minute drill)
- *Are conditions consistent with my expectations?*
- *Do I understand my surroundings?*
- *What job site hazards exist?*

4. **At-Risk behaviors to avoid**
   - Not allowing workers time to review procedures/work documents
   - Participants not prepared for the task
   - Addressing human performance tools in generalities versus specifics
   - Workers failing to express concerns they may have
   - Not using lessons learned from previous activities for the task
   - Hurrying, not taking the time to look around the job site

- Thinking that "routine" or "simple" means "no risk"
- Believing nothing bad can happen
- Not talking about hazards or precautions with coworkers
- Not talking about "gut feelings"

ATTACHMENT 1
INDIVIDUAL TOOLS

CONDITIONAL

PEER-CHECKING

1. **Basis**

Peer-checking is a verification process that involves a verbal agreement between two individuals prior to a specific action and/or task, such that one individual will observe or check the behavior of the other to prevent an error by the performer.

Peer-checking is merely two persons (performer and checker) self-checking in parallel, agreeing together that the action is the correct action to be performed and on the correct component. Peer-checking augments self checking, but it does not replace it. This tool takes advantage of a fresh set of eyes not trapped by the performer's task focused mind-set. The checker may see hazards or potential consequences that the performer does not see.

It is a well-know fact that human beings make mistakes. It is an equally well-know fact that teams are consistently more successful than individuals. Peer-checking simply builds upon that fact and provides a "team of two" to better ensure important activities are performed without error.

Peer-checking is typically uncomfortable for people to do. There are many natural human barriers to effective peer-checking. These include

- Senior workers may not like to be checked by junior workers
- Junior workers may not like to be checked by senior workers
- Co-workers that do not routinely interact with each other
- Some think it may slow the work process
- Some think it makes self-checking less effective. (This is a myth. In fact, because most of us would rather that others not see us make a mistake; we do a more effective job of self-checking.)
- Workers may not want to challenge or question another person's technical or professional abilities

When peer-checking becomes engrained in the work force, an intangible secondary benefit occurs. That intangible benefit is overall teamwork improves and error-rates go down. When the barriers that prevent effective interaction are broken down through regular peer-checking, it becomes second nature for all levels of the organization to challenge/check on each other in non peer-checking situations. Peer-checking also allows us to learn from each other, the interaction of workers helps exchange knowledge, skill and experience. This benefit improves culture and personnel performance.

2. **When to use it**

Unless the guiding document already specifies a higher verification method (concurrent verification or independent verification) work activities involving tasks or situations such as the following could benefit from the use of peer-checking:

- Critical Steps
- Irreversible or otherwise unwanted actions
- Comparisons of test data with acceptance criteria
- Start or stop of major components
- Return to or removal from service
- Identification of correct parts or correct component before maintenance
- During installation of similar components or parts that could be interchanged or installed incorrectly
- Error-likely situations related to important actions
- First time performance for the individual
- Individual is uncomfortable performing the task
- Task is infrequently performed or complex in nature
- Task has been a challenge in the past

3. **How to do it**

a. The **performer** self-checks the correct component.
b. The **peer** self-checks the correct component.
c. The **performer** and the **peer** agree on the action to take and on which component.
d. The **peer** observes the **performer** before and during execution, to confirm the **performer** takes the correct action on the correct component.
e. The **performer** executes the intended action on the correct component.
f. If the **performer's** action is inconsistent with the intended action, the **peer** stops the **performer.**
g. If the **performer's** action is consistent with the intended action, the **peer** informs the **performer** that the action taken is correct.

4. **At-risk behaviors to avoid**

- Peer is inexperienced with the task.
- Peer is not paying close attention to the performer.
- Peer is unable to view the component.
- Peer is significantly junior to the performer and may be reluctant to correct the performer.

- Peer is not prepared to prevent an error by the performer.
- Peer assumes the performer will not make a mistake.
- Performer acts before the peer is ready to perform the peer-check.
- Performer and peer swap roles during the task.
- Performer or peer does not self-check rigorously, assuming the other person will.
- Performer or peer uses verbal cues or observed actions of the other individual instead of personal confirmation or self checking.
- Performer is less attentive to the action, believing the peer will catch any problems.
- Performer asks another person to peer-check, when that person is already engaged in a risk-important activity.
- Peer-checking is over-used, eventually leading to complacency by both parties.

ATTACHMENT 1
INDIVIDUAL TOOLS

CONDITIONAL

CONCURRENT-VERIFICATION PRACTICES

1. **Basis**

Concurrent-verification focuses on confirming the correct configuration, or status of equipment.

Concurrent-verification is used, while maintaining as much independence as possible. For the sake of convention, the term "verification" refers to the confirmation of the condition of equipment consistent with the status required by a procedure. On the other hand, "checking" refers to the confirmation of a correct action, prevention of an error by a performer. From a timing standpoint concurrent-verification occurs before the action is taken.

For concurrent-verification, the performer and verifier creates *freedom of thought* between them as much as practical. Freedom of thought requires the verifier, to the extent possible, to be mentally objective, without relying on the other person as to what has or has not been done. Because concurrent-verification requires both individuals to work together, side by side, true independence cannot be achieved. But, each person attempts to be as objective and unbiased as possible during each step of the concurrent-verification process.

Concurrent-verification is usually reserved for an action of a critical nature, when an error with the action could result in immediate and possibly irreversible harm. When used thoughtfully and rigorously, Concurrent-verification provides a means to prevent an error in the act of establishing the new equipment or component conditions. This aspect of concurrent-verification is very similar to peer-checking, which aims to prevent an active error during a task.

2. **When to use it**

Consider using concurrent-verification for actions that could lead to irreversible consequences such as the following

- Industrial safety:
  - Death
  - Injury
- Environmental safety:
  - Uncontrolled discharge or emission of harmful substances

- Plant safety (including productivity):
  - Plant trip or unintended significant power de-rate
  - Equipment damage and/or property loss

3. **How To Do It**

a. Prior to execution, the **performer** and **verifier** mutually agree on the action to take, referencing the guiding document separately, and the equipment condition to achieve.
b. The **performer** self-checks the correct component.
c. The **verifier** separately self-checks the correct component.
d. The **performer** and the **verifier** agree, once more, on the action to take, on which component, and the final condition of the component.
e. The **verifier** observes the **performer** before and during execution, to confirm the **performer** takes the correct action on the correct component.
f. The **performer** executes the correct action on the correct component.
g. If the **performer's** action is inconsistent with the guiding document, the **verifier** directs the **performer** to stop the action. The **performer** places the equipment in a safe condition and notifies the **supervisors.**
h. By one or more of the following methods, the **performer** and the **verifier** separately confirm that the condition and the expected response are correct:
   - Hands-on check (preferred)
   - Remote indication
   - If multiple remote indicators are available, use as many as possible.
   - If possible, perform at least one check locally to confirm the validity of the remote indication
   - System response
i. The **performer** and **verifier** sign or initial the guiding document to record the verification.

4. **At-risk behaviors to avoid**

- **Verifier** is inexperienced with the task.
- **Verifier** is not paying close attention to the performer.
- **Verifier** is unable to view the component.
- **Verifier** is significantly junior to the performer and may be reluctant to correct the performer.
- **Verifier** is not prepared to prevent an error by the performer.
- **Verifier** assumes the performer will not make a mistake.
- Performer acts before the verifier is ready to perform the peer-check.
- Performer and verifier swap roles during the task.
- Performer or verifier does not self-check rigorously, assuming the other person will.

- Performer or verifier uses verbal cues or observed actions of the other individual instead of personal confirmation or self checking.
- Performer is less attentive to the action, believing the verifier will catch any problems.
- Performer asks another person to verify, when that person is already engaged in a risk-important activity.

ATTACHMENT 1
INDIVIDUAL TOOLS

CONDITIONAL

INDEPENDENT-VERIFICATION PRACTICES

1. **Basis**

Independent-verification entails the highest degree of independence, which is important for the effectiveness of the verification process. Independent-verification occurs after the action is taken.

The independent-verification process confirms the conditions of equipment required to be in a particular condition to maintain the plant's physical configuration required for safe operation. Otherwise, adverse consequences could result later if the improper conditions remain undetected. Independent-verification can be used when an immediate, adverse consequence of a mistake by the performer cannot occur, because independent-verification catches errors after they have been made, not before or during.

The independent-verification process tends to have a higher probability of catching an error than peer-checking or concurrent-verification, because the verifier's knowledge of the system, component, or work situation is unaffected by the performer. The verifier physically checks the component's condition without relying on observation of or verbal confirmation by the performer. Preferably, the verifier is not directly involved in the activity the performer is involved in.

Independence exists when the verifier has freedom of thought from the performer. Separating the acts of the performer and verifier in time and by distance promotes freedom of thought for independent-verification. Separation in time exists such that the verification occurs after initial alignment of the component (or initial verification). Separation by distance is established when audible or visual cues of either person are not detectable by the other person. That means the performer, while establishing the desire condition, does not communicate with the verifier, or the verifier is not in a position to either observe or hear the performer.

2. **When to use it**

- During system alignments of safety-related or important equipment
- During placement and removal of clearance tags
- Verification of calculations
- During restoration of equipment to service after maintenance

- During alignment of fire protection systems or components
- During installation and removal of temporary modifications such as jumpers, hoses, and so forth

3. **How to do it**

The **performer** performs the following actions:

- Self-check the correct component
- Perform the action specified in the guiding document.
- Confirm the expected results
- Sign or initial the guiding document
- Inform the **supervisor** upon completion of the task or notify the assigned **verifier.**

When notified, the **verifier** performs the following actions:

a. Self-check the correct component.

Caution: use verification methods specified in approved instructions to verify the condition of various component types.

b. Determine the as-found conditions, without changing it, using one or more of the following means
   - Physical hands-on check (preferred)
   - Remote indication:
     - o If multiple remote indicators are available, use as many as possible.
     - o If possible, perform at least one check locally to confirm remote indication.
   - System response

c. Compare the as-found condition with the guiding document.
d. Notify the **supervisor** if the component condition does not agree with the guiding document
e. Sign or initial the guiding document if the component condition agrees with the guiding document.
f. Notify the **supervisor** or **performer** upon completion of the independent verification.

4. **Risk Practices to Avoid**

- Verifier is in close proximity at the time the performer acts.
- Verifier uses the same indicator(s) of system status as the performer.
- Verifier used only process parameters to determine component status. (Possible alternate flow paths could render process indicators unreliable.)

- Performer and verifier walk to the component location together before the initial act.
- Performer informs the verifier of what has or has not been done before the independent-verification.
- Performer and verifier are coworkers on the same job or evolution.
- Performer is less attentive to the action, believing the verifier will catch any problems.

ATTACHMENT 1
INDIVIDUAL TOOLS

3-WAY COMMUNICATION

1. **Basis**

Proper communications ensure that both the sender and receiver have a consistent understanding of the information contained in the message.

Consistent safe and effective maintenance and operation of the plant, during both normal and emergency situations, necessitate accurate verbal communications. Humans routinely use informal and imprecise forms of conversational communication that are prone to error or misinterpretation. These forms of communication are comfortable and acceptable when the consequences of communication errors are insignificant. However, many of the daily activities at a power plant can, if not performed properly, result in unacceptable consequences. Effective verbal communication in these activities reduces the likelihood of an error; therefore, this is an essential human performance tool.

2. **When To use it**

3-way communications should be applied whenever miscommunication can result in a consequential error. This includes face-to-face, radio, and phone communications. More specifically, this tool is used when;

- Communicating an important plant condition or parameter value which may require some action by the recipient
- Communicating instructions to operate or test plant equipment
- Communicating instructions from a formal work document, such as a procedure, work plan, task instructions, work order, work package, etc.
- As directed by departmental specific guidance

Effective communication principles can be used to improve any communication; even when there is not a potential for a consequential error. Experience has shown that regular use (practice) of this principle/technique will result in effective application during critical stressful situation.

3. **How To Do It**

The responsibility for proper communication is assigned to the originator or sender, who must verify the receiver understands the message as intended. Each message that is directive in nature must use 3-way communication and begins when (1) the sender gets the attention of the intended receiver, using the person's name and speaks the message. Then (2) the receiver repeats the message in a paraphrased form, which helps the sender verify that the receiver understands the intended message. Finally (3) the sender acknowledges that the receiver heard and understood the message. Proper communications ensure that both the sender and receiver have a consistent understanding of the information contained in the message.

Commonly Accepted Practices

- Using the person's name, establishing eye contact with receiver if possible, the SENDER states the message
- The RECEIVER acknowledges SENDER by paraphrasing the message in his/her own words; repeating back equipment name and specific data verbatim.
- SENDER verifies and acknowledges the RECEIVER'S response is correct.
- If incorrect, repeat the process

4. **<u>At-Risk Practices to Consider Avoiding: General Rules and Insights</u>**

- Sender not using receiver's name to get receiver's attention
- Sender speaking from behind the receiver or not making eye contract when it is practical to do so.
- Sender not taking responsibility for what is said and heard
- Sender or receiver not stating his or her name and work location when using a telephone or radio
- Sender attempting to communicate with someone already engaged in another conversation
- Sender stating too much information or multiple actions in one message
- Sender not giving enough information the receiver needs to understand the message
- Sender not verifying receiver understood the message
- Receiver reluctant to ask for clarification of the message
- Receiver taking action before the communication is complete
- Receiver not writing the message on paper if there are more that two items to remember
- Receiver given information unrelated to the immediate task
- Receiver mentally preoccupied with another task
- Overusing the tool for non-operation communications
- Not using three-way communication in order to expedite the task
- Message not being stated loudly enough to be heard
- Enunciating words poorly
- Conflict between *what* is said (content) and *how* it is said (feelings)

ATTACHMENT 1
INDIVIDUAL TOOLS

PHONETIC ALPHABET

1. **Basis**

   When the only distinguishing difference between two component designators is a single letter, then the phonetic alphabet form of the letter should be substituted for the distinguishing character.

2. **When to use the tool**

   When communicating alpha-numeric information to plant equipment noun names.

   - For component, train, channel, or procedure step designators.
   - When the sender of receiver feels there is a possibility of misunderstanding such as sound alike systems, high noise areas, radio/telephone reception is poor.
   - Phonetics are unnecessary when referring to standard approved acronyms (i.e. ID fans, FD fans etc)

3. **How to use the tool**

A – ALPHA	H – HOTEL	O – OSCAR	V – VICTOR
B – BRAVO	I – INDIA	P – PAPA	W – WHISKEY
C - CHARLIE	J – JULIET	Q – QUEBEC	X – X-RAY
D – DELTA	K – KILO	R – ROMEO	Y – YANKEE
E – ECHO	L – LIMA	S – SIERRA	Z – ZULU
F – FOXTROT	M – MIKE	T – TANGO	
G – GOLF	N – NOVEMBER	U – UNIFORM	

4. **At-risk behavior to avoid**
   - Not using phonetics for equipment label designations
   - Using phonetic words other that those designated, e.g. BAKER vs. BRAVO
   - Using phonetic designators when writing

ATTACHMENT 1
INDIVIDUAL TOOLS

CONDITIONAL

FLAGGING

1. **Basis**

Flagging involves highlighting a component in such a way to improve the chances of performing actions on the correct component. If a component is physically near other similar-looking components and is handled multiple times during an activity, flagging helps the user consistently touch the correct component. Using self-checking, an individual distinctly marks the correct component with a flagging device that helps a worker visually return to the correct component during the activity or after a distraction or interruption.

Workers can also use flagging to shield components from inadvertent touching or manipulation, such as "trip-sensitive" equipment in the vicinity of the manual activity. Flags denoting components not to be touched during a work activity are commonly referred to as "operational barriers" by some utilities.

Several events have resulted from an individual starting an activity on one component, taking a break or being distracted from the component, and subsequently working on an adjacent, similar component. Wrong unit, wrong train events have decreased dramatically with improved labeling, color-coding, and better procedures. However, to ensure workers perform actions on the correct equipment, some stations have implemented "flagging" that either denotes the correct component to work on or highlights those not to touch during an activity.

Managers are encouraged to approve the flagging devices. Devices such as colored adhesive dots, ribbons, colored tags, rope, chains, magnetic placards, and red electrical tape have been used. Flagging devices that remain securely in place during the work activity are used exclusively for the job that should not interfere with plant equipment, including indications for operation.

In general, if flagging is used, it would most commonly entail identifying the equipment to be manipulated. It also may be appropriate to only identify equipment to be avoided. Flagging both equipment to be manipulated and avoided may be appropriate, but must be done with caution. ***In all cases, it is crucial to correctly communicate exactly which type of flag is being employed on the job.*** Use of green and red flags fosters this communication.

2. **When to use it**

- When handling a component near similar-looking components multiple times
- While working on multiple trains in close proximity
- While working on a component that will be manipulated multiple times
- During work near "trip-sensitive" or otherwise risk-important equipment
- When the need for flagging is identified during the pre-job briefing

3. **How To Do It**

   a. **Identify** the component to be flagged using self-checking
   b. **Flag** the designated component to be handled or worked on using an approved devise (green colored device recommended)
   c. **Flag** components to be avoided using an approved device (red colored device recommended)
   d. **Perform** work assignment or equipment manipulation
   e. **Remove** flagging device(s) when work is complete.

4. **At-risk behaviors to avoid**

- Using similar flags for components to handle and for those not to handle
- Flagging a component to be handled only once
- Flagging both components to be manipulated and to be avoided during the same activity, using the same type of flags
- Not self-checking or peer-checking before applying flagging
- Using a flagging that does not remain securely attached
- Using a flagging device that obscures indicators or interferes with equipment
- Using unapproved flagging devices
- Not removing a flagging device after completing the task
- Using electrically conductive material for flagging devices

ATTACHMENT 1
INDIVIDUAL TOOLS

CONDITIONAL

TURNOVER

1. **Basis**

Turnover is the orderly transfer of work-related information, tasks, and responsibilities between individuals, one off-going and the other on-coming.

A turnover provides time for the on-coming individual to establish an accurate mental model of the work activity, situation awareness, before assuming shift responsibilities or commencing work. A good turnover helps every individual understand where things stand at the beginning of the shift and what is expected to occur during the shift. Turnovers occur during major plant activities, such as outages, for the permanent transfer of project responsibilities between two individuals, between off-going and on-coming shifts, or for maintenance tasks exceeding one shift in length.

2. **When to use it**
   - Prior to shift change
   - When responsibilities are transferred between people, work groups, or departments (handoffs)
   - When responsibilities for on-going progress tasks/activities change
   - When work extends beyond one shift.

3. **How To Do It**
   a. **Maintain an accurate turnover log.** Accurately recorded information relevant to the job during the shift in a log or relevant procedure. Before the turnover, the off-going individual compiles information such as the following for the on-coming individual's review:
      - Status of the job(s): work completed, work remaining, and equipment status, plus specific parameters and related values
      - Schedule requirements, changes, and parallel activities
      - Objectives/tasks in progress and milestones to be accomplished
      - Procedures being used and last step(s) completed
      - Problems, unusual conditions or system lineups and resolution or status

- Critical steps, possible error-likely situations, countermeasures, and contingencies
- Availability and location or resources for planed tasks
- Key contacts, support personnel, and organization interfaces

b. **Review the turnover log, and walk down the work area.** The on-coming individual independently reviews the turnover log, relevant work documents, status boards, and logs, checking for consistency and accuracy on information prior to assuming responsibility. Additionally, he or she examines the work location(s), including controls, components, tools, and equipment. Preferably, the on-coming and off-going individuals walk down the work location together.

c. **Discuss the information.** The principal individuals conduct a meeting face to face using formal three-way communication on critical information and responsibilities. Each person listens for and challenges assumptions asking questions as needed.

d. **Transfer responsibility.** Transfer responsibility for work activities from the off-going individual to the on-coming individual. The off-going person is confident that the on-coming person is fully capable of assuming the duties and responsibilities of the work station and planned tasks before handing over responsibility for the job.

Turnovers must be thorough and accurate, as well as brief and simple. Individuals conduct turnovers visually, verbally, and in writing. A walkdown of the work locations(s) offers visual confirmation of work and equipment status. Both parties talk about the work situation. As a backup, individuals use three-way communication for risk-important information. Verbal information, while more convenient, is prone to distortion and may be forgotten. The most common error in a turnover is inadvertent failure to pass along important information - a poor handoff. Therefore, a written log guided by a checklist is important to the safe continuation of the work in progress. Finally, the off-going person should be confident that the on-coming person is fully capable of assuming the duties and responsibilities of the work station and planned tasks before handing over responsibility for the job.

4. <u>**At-risk behaviors to avoid**</u>
   - Conducting a turnover while the off-going individual is in the midst of an important activity requiring full attention.
   - Not talking face to face; no verbal explanation
   - Leaving out critical information or the bases for decisions
   - Not documenting activities and important information

- Performing the turnover in a distracting environment
- Interrupting the turnover
- Transferring responsibilities to an on-coming individual who is not fit for duty, or who is otherwise unprepared.
- Conducting a turnover in a hurry
- Not enough time allowed for a turnover; turnovers not accommodated in the schedule
- Off-going individual unable to communicate with on-coming individual after turnover, if something was overlooked.

Attachment 2
Leader/Supervior Tools

The standard set of Leader/Supervisor Human Performance Tools are listed below. Based on the nature of the activity or task, use of these tools should be required during the performance of normal duties:

ATTACHMENT 2
LEADER/SUPERVISOR TOOLS

PRE-JOB BRIEF

1. **What Is It**

   A pre-job briefing is a meeting of workers and supervisors conducted before performing a job to discuss the tasks involved, hazardous, operating experience, and related safety precautions. This meeting helps individuals to better understand what to accomplish and what to avoid. Pre-job briefings help participants avoid surprises in the field and reinforce the idea that there are no "routine" activities.

   Participants clarify the task's objectives, roles, responsibilities, resources, and what to accomplish. Knowing clearly what you are trying to do improves error recognition. Similarly, precautions, limitations, hazards, critical steps, controls, contingencies, and relevant operating experience address what to avoid.

   The effectiveness of a pre-job briefing depends greatly on the preparations of the workers and supervisors. People come to the pre-job briefing prepared to discuss the work. This promotes a quality dialogue that helps everyone understand what they are to accomplish and what to avoid, providing an opportunity to raise everyone's awareness of critical activities and to mentally rehearse performance of critical steps.

   The most important thing a supervisor can do is to ensure expectations and standards are well communicated and understood by all participants involved with a job just prior to starting a job. The Pre-Job Brief is a formal process to reinforce expectations.

2. **When to use it**

   This tool should be applied prior to the start of any job with the extent and detail of the Pre-Job Brief based on the potential or actual risk and or consequences to personnel or the plant if an error is made. Pre-Job Briefs for jobs in-progress should also be done at the start of the shift when a job takes longer than one shift to complete.

   How to do it

   - Ensure the workers and job leads have completed a review of the job including a review of the work document or procedures used in the job.

- Obtain and review the applicable Pre-Job Brief Checklist and ensure all relevant information needed for the brief is obtained, including applicable operating experience.
- Gather all participants in a briefing location that has ample room and is free of distraction. This ensures everyone has a chance to listen and participate in the discussion.
- Ensure all personnel involved with the job are in attendance and are participating in the briefing.
- Evaluate the job error precursors, error-likely situations, identify critical steps, and determine defensive strategies.
- Encourage each individual to express any concerns they may have with performing the job.
- Ask each worker if they feel prepared enough to complete the job error free.

Pre-Job briefs are more then getting together to review the job before starting. Most of the work of conducting a Pre-Job Brief is in the preparation. A thorough review of the procedure or work instruction along with a review of previous internal and external operating experience should be factored into what is most important to emphasize. The task analysis done on the job should result in contingency measures or additional barriers put into place to prevent the error or mitigate the consequence of an error. More complex jobs should typically involve a more thorough Pre-Job review prior to the brief.

Data from the industry has shown that use of reverse briefs can lead to better task execution. Reverse briefs are Pre-Job Briefs lead by an individual contributor using the standard guidelines and procedures. By having an individual contributor prepare and lead the Pre-Job Brief they are much more likely to be engaged with the work and create and environment of better engagement of others involved with the job,

3. **<u>At-risk behaviors to avoid</u>**

- Discussing human performance tools in generalities
- Conducting the meeting as a monologue, without active participation by the assigned worker(s)
- Workers failing to express their concerns or ask questions.
- Holding separate briefings from principal workers
- Using a “cookbook” approach to the briefing covering every item on the pre-job briefing checklist regardless its applicability.
- Being insensitive to how mind-sets or expectations may disguise problems and warning signals
- Not assigning individual-specific responsibilities for contingencies and abort decisions

- Conducting the meeting in a noisy, distracting environment
- Holding briefings longer than 30 minutes, which could promote inattention and lack of interest
- Not considering equipment work history or the worker's personal experience as relevant sources of operating experience
- Not considering the worker's proficiency with the task to determine if the task is performed infrequently
- Covering operating experience irrelevant to the task

ATTACHMENT 2
LEADER/ SUPERVISOR TOOLS

POST-JOB CRITIQUE

1. **Basis**

A post-job critique is a regular self-assessment method conducted after a work activity to solicit feedback from the worker. Usually, the feedback involves a face-to-face meeting between workers and supervisors, but the method is not limited to a meeting. Meetings should be brief and concise, and give workers the opportunity to submit feedback. Regardless of the feedback method used, workers can reliably submit feedback in key aspects of work preparation and work performance.

Post-job critiques provide workers and their supervisor a forum to document or discuss what went well and to identify potential enhancements. Workers review the work activity just completed to identify opportunities for improvement. An effective post-job review identifies lessons learned to improve future task performance and aids closure of the paperwork related to the job. The principal participants could meet after work is done, preferable after taking a break. Breaks give the participants an opportunity to wind down. Such breaks give people time to think about the work accomplished.

Errors that trigger significant events are organization failures. Therefore, feedback on work preparation and work performance is very important for management. Procedure and equipment problems and minor human error require management's attention. Such conditions tend to be latent in nature and accumulate within the organization if uncorrected. If workers do not communicate the information, managers miss an opportunity to improve. Post-job critiques provide management an opportunity to eliminate weaknesses with processes, programs, policies, and so forth that could challenge event-free plant performance.

2. **When to use it**

This tool should be applied after the completion of a job. It can also be used to review and capture lessons learned in the middle of a job that are complex or longer in duration. The depth and duration of the Post-Job Critique should be based on the complexity and risk of the job.

3. **How to do it**

- Verify the review is done as soon as practicable after the job is complete. Critiques can also be done after completion of a high risk activity or a longer term job.
- Be brief and to-the-point. Post-Job Critiques should not be longer than 10 to 15 minutes
- Identify what went well, and what could be improved.
    - Surprises, unexpected error traps, industrial safety hazards, equipment conditions, or personal issues.
    - Procedure or work order quality, i.e. technical accuracy and usability.
    - Quality of supervision, planning, and scheduling
    - Tools, parts, resources
    - Obstacles to performance
    - Training related to the job requirements
- Determine method to follow up on problems and successes

The two most important outcomes of the Post-Job Critique is the dialog among workers and leaders on the challenges associated with the job, and the collection and documentation of the problems or enhancements.

4. **At-risk behaviors to avoid**

- Not performing a post-job review or documenting feedback after working on risk-important plant equipment
- Principal workers not involved in the post-job review
- No time allotted for the post-job review, or done in a hurry
- No method of follow-up identified to address issues
- No follow-up with principal workers for high-interest issues
- Post-job review of follow-up not done face to face
- Important issues not documented for reference for future per-job briefings

ATTACHMENT 2
LEADER/SUPERVISOR TOOLS

OBSERVATIONS

1. **Basis**

Through field observations, managers and supervisors can see firsthand what is happening in the plant. The quality of individual performance and supervision, the adherence to standards and expectations, the effectiveness of administrative processes, procedures, and training, as well as the material condition and the strength of the organizations values and safety culture require continual scrutiny. Field observations also provide managers and supervisors with the ability to gauge the effectiveness of performance improvement efforts.

Real-time field observations provide managers and supervisors with opportunities to do the following:

- See, first hand, actual job-site conditions and worker practices.
- Provide performance feedback to workers through face-to-face reinforcement, coaching, and correction.
- Detect organization and programmatic weaknesses related to the support to the in-field work activities.
- Enhance organizational alignment on expectations and values.
- Document (organization factors) key aspects, including immediate action taken (to improve organization effectiveness).

When mangers and supervisors devote time to observations, workers are reassured that their managers and supervisors actually know what is going on and that they have an opportunity to express their opinions, feelings, and concerns about work. Personal involvement raises the credibility of the manger and supervisor in the eyes of the worker. Direct involvement in work activities improves and promotes the real-time correction of unsafe/at-risk practices and the prompt reinforcement of expectations.

2. **When to use it**

Observations should be considered anytime a consistent use of expected behaviors is needed to successfully perform a task. More consideration should be given to higher risk tasks and jobs. Frequently performed, lower risk jobs should also be observed to reinforce use of the right behaviors. This will serve to reduce the chance of the worker using the wrong behaviors in a higher risk job.

3. **How to do it**

The observation process contains four steps/phases including:

- Preparation
- Conduct
- Follow-up/ Feedback
- Documentation

Behaviors seen in the workforce are there because they are being reinforced by some type of consequences as it relates to the individual. The job of the leader is to identify when behaviors do and do not meet expectations, and to understand how those behaviors are being reinforced. Observations provide the means to see what workers do and to provide specific consequences (positive reinforcement or coaching) to either increase or decrease the frequency of the behavior reoccurring.

4. **At-risk behaviors to avoid**

- Performing a cursory observation (drive-by) to satisfy a quota
- Performing several quick observations at the end of a reporting period to satisfy a quota
- Not incorporating the results of observations into performance improvement process
- Being insufficiently critical, being overly polite
- Limiting observations to a narrow range of work activities, such as complex versus simple tasks, repetitive versus infrequently performed activities, technician versus knowledge workers, employees versus supplemental personnel.
- Being unfamiliar with related work documents
- Being unaware of critical phases or critical steps of an activity
- Overlooking the use of human performance tools during risk important phases or actions of the activity
- Not being intrusive enough to see behaviors important to good human performance
- Interrupting a worker at risky points during a task
- Using untrained observers
- Not providing immediate feedback
- Believing that observations are punitive in nature or offer no useful feedback to workers
- Observing only the task and disregarding the total work situation
- Not following up to investigate *why* what was observed occurred
- Not communicating pertinent information back to the work group's management

ATTACHMENT 2
LEADERS/SUPERVISOR TOOLS

TASK ASSIGNMENT

1. **Basis**

   Whether a task involves work in the plant or in the office, managers and/or supervisors assign or delegate tasks to people who are able to do the job effectively and safely. The degree of manager involvement varies depending on the task, its risk and environmental factors, as well as factors relevant to the performer. High levels of involvement are necessary for complex, high-risk tasks and for tasks that involve considerable change to important processes or systems.

   This tool provides a means to analyze the potential pitfalls and traps associated with a particular job and to determine and deploy defensive strategies to prevent workers from falling into those traps.

   Matching the right person to the job is an opportunity to evaluate the risk, complexity, and frequency of performance of the task in light of the individual considered for the job. Qualification for the task is first and foremost but not the only factor to consider. Talent, recent experience, proficiency, and attitudes are other important factors to consider. In some cases tasks are assigned for developmental purposes. Other factors related to a person's mental, physical, and emotional readiness to do the work include personal preferences, fatigue, illness, disabilities, and stress. Comparing these individual factors with the demands of the task improves the supervisor's ability to assign the right person to the task.

2. **When to use it**

   Task assignment should be applied during Pre-Job Briefs with the workers to make everyone aware of the location of the error traps and to jointly develop strengthened barriers (defense) to ensure the job will be successful.
   - When assigning a job or task to a person who will have direct contact with plant equipment, potentially altering the status of equipment important to safety.
   - When selecting persons to perform a project that is relevant to the configuration of plant structures, systems, or components.

3. **How to do it**

   - Review the work package or procedure to understand the details of the job.
   - Identify any potential vulnerabilities (traps) associated with the job.

- Discuss the error prevention tools or other defensive strategies (contingencies) that can be used to prevent an error.
- Ensure expectations for error reduction tools the contingencies and are clearly communicated to the workers involved with the job.

Worker Factors - Consider the worker's qualifications, proficiency (frequency of performance), experience, fitness, attitude, ingrained work habits, personal distractions, and even personal preferences in light of the demands the task.

Task Factors - Verify that the person(s) assigned to the task understands the task's purpose, goals, and success criteria. Consider the potential impact of the work setting on performance; for example, the physical workload, availability of procedures, schedule pressure, supervision, hazardous conditions, tools, and coordination.

Risk Factors - Assign an individual(s) considering the task's risk importance and complexity. Consider the degree of discretion the person will have to make decisions without other's input.

Environmental Factors - Consider the time of day, habitability, interruptions, distractions, and accessibility, among other factors.

Other Factors - Consider the need for additional (just-in-time) training; operating experience; the availability of other qualified and experience personnel; the development of other personnel during the job, task, or project; and whether a walkdown was conducted, if applicable.

The task assignment should be applied for every job with a quick review and discussion of the error traps for the job. The value from the analysis is the discussion with the workers involved with the job and the customized application of the most relevant error prevent tools. Some sites identify their Most Error Likely Task (MELT) for each shop or crew and apply a rigorous analysis of error precursors and strategies to mitigate or prevent the error.

4. **At-risk behaviors to avoid**

- Having insufficient qualified staff for the amount of work required by the organization
- Using only task qualifications as factor for task assignment
- Regularly assigning the *best* performers to the riskiest jobs
- Not consulting with experienced workers or supervisors when assigning a task, if the supervisor or manager is not personally familiar with the task.

- Not having a face-to-face discussion between the supervisor and the subordinate assigned to important or complex tasks.
- Assigning inexperienced personnel, or those without proficiency, to high-risk jobs without additional support or contingency plans
- Assigning jobs to people unsuitable to the task because of resource constraints
- Assigning supervisors to a work group when they have no experience with the jobs the work group performs
- Over relying on a single expert and not developing bench strength in the task, should the expert be unavailable.
- Not having a clear picture of success
- Not considering a worker's recent work history when assigning him or her to a job that involves more than one unit, train, or component.

ATTACHMENT 2
LEADER/SUPERVISOR TOOLS

VENDOR/CONTRACTOR OVERSIGHT

1. **Basis:**

Vendors and contractors need the same coaching and mentoring as plant personnel when they supplement the plants workforce. Supplemental personnel must understand that their work practices, especially regarding human performance must meet the same standards required of the plant staff.

2. **When to use it**

- During the preparation of the contract for vendor services
- When purchasing new equipment
- When obtaining vendor services for on or off site work
- During actual vendor/contractor performance
- When returning equipment to a vendor/contractor for repair, troubleshooting or maintenance
- Following job completion
- When there is evidence, or suspicion of improper execution or results

3. **How to do it**

VENDOR is a mnemonic device to aid in the recall of those attributes, principles, and standards needed to effectively oversee the work of supplemental personnel.

Validation of vendor supplied data and assurances with objective evidence (trust but verify)

Expectations related to equipment/product specifications, personnel training and qualifications and plant processes; especially industrial safety and error prevention are clearly communicated

iN-terdependency between vendor and plant personnel; develop a close working relationship that generates cooperation and an appreciation for safety and quality

Documentation related to the product or service is clear, detailed, and understandable. Vendor problems are properly documented.

Oversight of office and in-field vendor activities; assignment of a responsible individual to coach and mentor the vendor; development of a monitoring plan consistent with the level of risk associated with the vendor's activities and past performance.

Review and evaluation of vendor deliverables, documentation, and other products. Were expectations met?

4. **At-risk behaviors to avoid**

- Assuming the vendor is "expert" and will not make mistakes
- Assuming vendors have the same work standards as your employees
- Insufficiently verifying vendor supplied specifications, drawings, and work processes
- Providing insufficient oversight of vendor in-progress activities
- Assuming the vendor recognizes the effects of changes to his/her standard product

ATTACHMENT 2
LEADER/SUPERVISOR TOOLS

PERFORMANCE ANALYSIS

1. **Basis**

   Managers and supervisors need a tool that helps them develop a clear understanding of a performance discrepancy and why it exists. Performance gap analysis identifies the difference between what *is* happening and *should* be happening and what is *causing* the problem. Performance gap analysis helps define the performance problem or opportunity by contrasting current performance with desired performance and by systematically identifying the factors that contribute to the performance gap. Using a systematic approach to diagnose performance problems provides a means of identifying organizational vulnerabilities, whether they are technical, administrative, or cultural.

   Performance analysis helps determine the right fix for a performance problem. Training can be an effective solution, but only if the cause of the performance problem relates to a lack of knowledge or skill. Training is also a solution that entails considerable resources. Performance analysis helps us match the optimum action to the cause of the performance gap.

   Performance analysis does not pre suppose that training is the right solution, and allows a more in depth analysis of the performance gap than the Needs Assessment.

2. **When to use it**

   - After identifying a performance gap
   - When recognizing an adverse trend or recurring human performance issue
   - When operating experience reveals a gap to excellence
   - During causal analysis of an event triggered by human performance
   - When an external agency identifies a human performance issue.

3. **How to do it**

   - Complete an Energy Supply Performance Analysis Worksheet (attachment 5)

4. **At-risk behaviors to avoid**

- Assuming that a lack of proper motivation or training is the cause of an individual performance problem
- Assuming that the plant environment and technical systems are basically safe
- Using an unsystematic approach to analyzing the cause of performance problems
- Defining the performance gap without noting the difference between *what is* (actual) and *what should be* (desired)
- Choosing corrective actions that have the least leverage on closing the performance gap
- Providing training when inadequate procedural guidance exists

ATTACHMENT 2
LEADER/SUPERVISOR TOOLS

HUMAN PERFORMANCE EVENT INVESTIGATION

1. **Basis**

An analysis can build the context of people's decisions and actions by identifying the following for each individual:

- What he or she was trying to accomplish (goal)
- What he or she was paying attention to (object of focus)
- What he or she knew at the time of the decision or action (situation awareness)

This information is available from the individuals through interviews and by a review of the job-site conditions for each individual (procedures, recorded traces, logs, computer printouts, and so forth).

Most investigations of events triggered by human error are distorted by hindsight by knowledge of facts known to the analyst, after the event, that the principal individual(s) was unaware of at the time. Such hindsight tends to bias the analysis to search for data that confirms the individual's shortcomings. Explaining what people could or should have done explains nothing about why they did what they did. To error or not to error is not a conscious choice. Therefore, the challenge for the root cause analysis is to discover why the decisions and actions of the principal individuals appeared reasonable to them at the time. A well-structured investigation facilitates this discovery by collecting data on and analyzing the interaction among people as well as their interactions with the system or process and the immediate work environment.

2. **When to use it**

- After a significant event that requires a root cause analysis
- When an apparent cause analysis is performed

3. **How to do it**

See XES.2.600 Root Cause Analysis (RCA) for the requirements and expectations for conducting event analysis.

A common pitfall to root cause analysis is prematurely denoting the root cause of an event as *inattention to detail or not following procedures.* Inattention to detail and not following procedures are not root causes, because there are no reliable corrective actions that can absolutely prevent recurrence of human error. There are usually several reasons the error and the event occurred. Post-event analysis helps expose latent weaknesses in the organization. Shifting one's thinking from "who causes.." to "what could have prevented.." is important for effective causal analysis of human performance events.

4. **At-risk behaviors to avoid**

- Denoting individual shortcoming as root causes
- Explaining why people erred by what they *failed* to do, such as failure to follow procedure or failure to self-check
- Using labels, such as "complacency" of "loss of situation awareness" to explain human error, which obscures factual data important to understanding why people did what they did.
- Assuming that people are not appropriately motivated to perform safety
- Assuming that people have a choice between making errors and not making them
- Believing that human error is disconnected from features of the task, the work setting, the culture, and the organization
- Presuming a cause and then selecting the facts that best support this cause
- Looking for fragments of information to confirm a theory about what happened, which erroneously guides the search for evidence (confirmation bias)
- Explaining the cause of an event by focusing only on the frontline worker, without considering the job-site and organizational factors that set the stage for performance
- Believing there is one root cause
- Assuming that technical systems are basically safe, and that safety is achieved by simply protecting them from unreliable people.

ATTACHMENT 3

ERROR LIKELY SITUATIONS VS ERROR REDUCTION TOOLS MATRIX

These error likely situations do not include all possible error likely situations and error precursors, but is limited to the Xcel Energy adopted error likely situations.

Time/Schedule Pressure

Time pressure is when a sense of urgency associated with finishing a task causes people to feel anxious or stressed. Schedule pressure is the pressure that comes from sense of urgency to adhere to a schedule.

Distractions/Interruptions

A distraction or interruption is a condition of either the task or work environment that diverts one's attention from the task and requires the individual to stop and refocus on the task sequence before proceeding.

Multiple Tasks

Performance of two or more tasks simultaneous, either physical or mental, that results in divided attention, mental overload, or reduced focus on the tasks.

Unfamiliar Task

An unfamiliar task is a task performed by an individual or crew that has:

- Never been performed or
- Has not been performed within the past six months

Body Rhythm

Body rhythm is the normal physiological affect caused by life patterns, such as sleep/awake cycles, digestion, and to retuning to work after time off.

Vague or Incorrect Guidance

Vague or incorrect guidance is primarily written guidance that does not effectively define the task or guidance that contains technical errors.

Ineffective Communication

Ineffective communication is primarily verbal communication in which the sender and receiver do not have a consistent understanding of the information being exchanged.

ATTACHMENT 3

ERROR LIKELY SITUATIONS VS ERROR REDUCTION TOOLS MATRIX

Over Confidence

Over confidence is not making prudent decisions because of under estimating the risk i.e., the likelihood as well as consequences of making an error.

Stress (Work and Home)

Stress is the feeling of anxiety when a situation of concern is not within the individual's control. Regardless of the source of stress, the affect on the individual is similar.

Physical Environment

Physical Environment is the physical condition under which the task is to be performed. These conditions include: lighting, noise, cramped space, temperature, contamination, as well as the human-machine interface, such as labels, the shape or location or controls, indicators, etc.

Task/Scope Change

Task/scope change is the situation when workflow is interrupted because of a change in specific task or scope of job. Work flow interruption requires a re-focusing on the revised task.

Peer Pressure

Peer pressure is the situation when the individual's actions are negatively impacted by the group's stated or perceived opinion.

ATTACHMENT 3

ERROR LIKELY SITUATIONS VS ERROR REDUCTION TOOLS MATRIX

NOTE: Try to eliminate the situation first. Any tool may work depending the situation				
Error Likely Situations	Possible Error Reduction Tools to Use for the ELS Vs. Individual and Supervisory Human Performance Tools			
	Individual	Individual	Individual	Supervisory
Time/Schedule Pressure	STAR	Procedure use and Adherence	Peer Checking	Observations Task Assignment
Distraction/Interruptions	Procedure use and Adherence	Are You Ready Checklist	STAR	Observations
Multiple Tasks	Peer Checking	Are You Ready Checklist	STAR	Task Assignment
Unfamiliar Task	Stop When Unsure	Are You Ready Checklist	Co-Worker Coaching	Task Assignment
Body Rhythm	STAR	Peer Checking	Are You Ready Checklist	Observation
Vague or Incorrect Guidance	Stop when Unsure	Flagging		Pre-Job Brief
Ineffective Communication	3-Way Communication	Stop When Unsure		
Over Confidence	Procedure use and Adherence	Conservative Decision Making		Task Assignment
Stress (Home & Work)	Peer Checking	Procedure use and Adherence	STAR	Task Assignment
Physical Environment	STAR	Peer Checking	Peer Checking	Task Assignment
Task/Scope Change	Are You Ready Checklist	Stop When Unsure	Conservative Decision Making	Post Job Critique Pre-Job Brief
Peer Pressure	Stop When Unsure		STAR	Observation

ATTACHMENT 4

INPO HUMAN PERFORMANCE MODEL

Human Performance System. A system in a network of elements that function together to produce an outcome. **Human performance is a system- the organizational nature of human performance.** Though it may seem intangible, forces within the station environment, the social system, incentive and disincentive systems, and shift scheduling system are examples of systems that typically function behind the scenes.

System Thinking. Understanding organizational systems and the impact of station processes and leadership dynamics on job-site human performance is important to effective management of human performance. System thinking involves “thinking” through the multiple causes and effects, the variables that come to bear on the employee at the point of touching plant equipment. A simple model of these interdependencies is provided below, referred to as the performance model.

Organization Processes and Values. These are processes and shared values that support work in the plant - for good or bad. Together, theses set the stage for work in the plant through the planning of work and the preparation of human resources to perform work.

Job-Site Conditions. This is the unique set of job-related conditions associated with specific task and a particular employee.

Employee Behaviors. Theses are the actions by an individual employee at the job site during the performance of a task.

Physical Plant Results. These represent the outcomes to the physical plant, design bases, or personnel safety - value-added or unfavorable. Examples of plant results include capacity factor, heat rate, loss time accident rate, equipment reliability, outage effectiveness, and trips or transients. The effect of plant performance determines how well plant results achieve station objectives - organization effectiveness.

Leadership. This refers to positions that influence employee beliefs, values, and behavior but also plant performance and organization processes. Anyone can take on the role of leader.

Defenses, Barriers, and Safeguards. These are intended to protect against hazards in the plant. A healthy set of defenses such as pre-job briefings, radiological postings and personnel protective equipment makes the plant immune to isolated error.

ATTACHMENT 4(CONTINUED)
INPO HUMAN PERFORMANCE MODEL

Attachment 5
PERFORMANCE ANALYSIS WORKSHEET

Date Performed: Date analysis performed

Names of individuals performing the Analysis (Include a training department person if possible): Names of individuals performing analysis

NOTE:	This form is used to address performance gaps. If you suspect an individual conduct issue, do not complete this form. Instead, conduct separate investigation.

1.0 ***WHAT IS THE PERFORMANCE ISSUE?***

Define the PERFORMANCE (or behavior) that is not meeting expectations and /or standards. Identify the level of performance that is currently occurring and the level of performance that is expected so that there is a clear understanding of the performance discrepancy (gap between actual and expected performance). By definition, a performance gap exists when the measure (standard) used to determine a 'job well done' is not being met.

If there is no clear standard or procedure used to determine the performance or behavior of concern then exit this analysis and perform the following: Establish a standard, procedure or performance indicator for the task or behavior of concern, inform workers of the standard or indicator, and monitor the workers. If the established standard is not met after monitoring, then conduct this analysis. (Monitoring time will vary depending on the nature and criticality of the performance issue.)

Provide the **PROBLEM STATEMENT** in the space below. When providing the **Problem Statement,** clearly state the job or title of the person(s) whose performance is of concern, the level of performance that is occurring and the standard that is not being met.

Problem Statement

Provide Problem Statement in this space.

Briefly state the existing procedure or standard, performance indicator goal, or expectation for this behavior, job, or task. If available, include the procedure or source document number and title. Clearly indicate how the level of performance differs from the expected standard or level of performance.

1.1 **IS THE PROBLEM WORTH SOLVING?** What are the potential (or actual) adverse consequences to the station or performer if the current performance issue is allowed to continue, and how severe are the consequences?

Explain how the current level of performance is, or could result in an adverse or negative consequence to the station or performer and then identify the degree of the consequence(s) in your opinion. Consider consequences relative to plant operation EAF impact, personnel safety, Environmental and Regulatory Compliance, etc.

Adverse Consequences-

List Adverse Consequences in this space.

☐ Minor Consequences ☐ Moderate Consequences ☐ Severe Consequences

1.2 Do the potential or actual adverse consequences noted in Step 1.1 pose a risk to plant operation (EAF)?

☐ Yes...If YES, provide explanation below ☐ No

Analysis/basis (as needed)

1.3 Could the potential or actual adverse consequences noted in Step 1.1 negatively impact Xcel Energy relative to personal safety?

☐ Yes...If YES, provide explanation below ☐ No

Analysis/basis (as needed)

1.4 Do the potential or actual adverse consequences noted in Step 1.1 pose a risk to Environmental or Regulatory Compliance?

☐ Yes...If YES, provide explanation below ☐ No

Analysis/basis (as needed)

For the step below, consider the overall consequences noted in step 1.1 and the risks identified in steps 1.2 through 1.4. Taken as a whole, are the potential or actual consequences of allowing the existing performance to continue significant enough that performance must improve? In addition, considering the overall risk, are the actual or potential consequences great enough **to justify the resources and cost necessary** to address the performance issue?

1.5 All things considered, is the performance deficiency **REALLY WORTH FIXING?** (Is it worth doing something about the performance issue in order to bring performance up to the existing expectations and standards?)

☐ Yes, it is worth fixing ☐ No, It is not worth fixing…If NO, provide explanation below.

Analysis/basis (as needed)

If Step 1.5 was answered YES, then continue with this analysis at Section 2.0, P*erformance Standard / Expectations Clear*

If Step 1.5 was answered NO, then no further analysis is required. Go to Section 9.0, *Approval*

2.0 ***Performance Standard / Expectations Clear***

2.1 Is the performance standard or expectation documented in an Xcel Energy policy, directive, procedure, or department key performance indicator?

☐ Yes. Record document number and title:

☐ No…If No answer question below.

If a plan were implemented would performance improve?

☐ Yes ☐ No ☐ Not Sure

Analysis/basis (as needed)

Proposed New Procedure or Performance Standard

Provide Proposed New Procedure or Performance Standard in this space.

2.2 If the proposed new procedure or standard is implemented, would the performance gap (difference between expected and actual performance) identified in Step 1.0 still exist? (e.g. does the existing level of performance fall below the revised procedure or standard?)

☐ Yes, the gap will still exist because the current performance DOES NOT meet or exceed the proposed new performance standard. If yes, then go to step 2.4.

☐ No, the gap will not exist because the current performance meets or exceeds the proposed new performance standard. Go to Section 8.0.

Analysis/basis (as needed)

2.3 Are expectations for acceptable performance routinely and clearly communicated (from supervisors, manager and others) to the performers, and do they understand them? (Can the performers tell you what a good job 'looks' like?)

☐ Yes

☐ No…If No, answer the question below

If a plan were implemented such that the performers received regular and clearly communicated expectations regarding job performance requirements (from supervisor, managers, and others), would performance improve and likely remain improved?

☐ Yes ☐ No ☐ Not Sure

Analysis/basis (as needed)

3.0 ***Resources Adequate***

3.1 Are resources, tools, equipment and other assistance adequate?

☐ Yes

☐ No…If NO, answer question below

If a plan were implemented *to provide adequate, resources, tools, equipment or other assistance*, would performance improve?

☐ Yes ☐ No ☐ Not Sure

Analysis/basis (as needed)

3.2 Are the procedures / work documents accurate and usable by the performers? Are directions and standards (between procedures, supervisors and managers, or departments) in agreement? Is a useable/simple process available to the performers to enable them to be successful performing this task or job? Consider potential human performance error traps that may exist within the current process. (Do the performers have the right instructions to do the job?)

☐ Yes

☐ No…If No, answer the question below

If a plan were implemented *to provide adequate, procedures, work documents, instructions or processes*, would performance improve?

☐ Yes ☐ No ☐ Not Sure

Analysis/basis (as needed)

4.0 ***Feedback Adequate***

4.1 Is regular and critical feedback on their performance consistently provided (from supervisors, managers, and others) so that the performers know if/when performance is NOT meeting expectations? (Performers are routinely coached or provided feedback so that they know how they are performing relative to the expectations.)

☐ Yes

☐ No…If No, answer the question below

If a plan were implemented *to provide regular and critical feedback* consistently to the performers (from supervisors, managers and others), would performance improve?

☐ Yes ☐ No ☐ Not Sure

Analysis/basis (as needed)

5.0 ***Consequences Appropriate***

5.1 Is the desired performance punishing to the performer (more work, delays, anxiety, ridicule, or fatigue)

☐ No

☐ Yes…If Yes, answer the question below

If a plan were implemented *to reduce or eliminate negative consequences*, would performance improve?

☐ Yes ☐ No ☐ Not Sure

Analysis/basis (as needed)

5.2 Is substandard performance rewarding to the performer(s)? Are the performer(s) rewarded for not performing to standards or expectations?

☐ No

☐ Yes…If Yes, answer the question below

If a plan were implemented *to reduce or eliminate positive rewards for substandard performance*, would performance improve?

☐ Yes ☐ No ☐ Not Sure

Analysis/basis (as needed)

5.3 Does the performer(s) experience positive consequences for good performance? Are the rewards immediate and certain? Are the rewards valued by the performer(s)? Does desired performance matter to the performer(s) (for example perceived unsafe, morale, work ethic, self-esteem, and peer pressure)?

☐ Yes

☐ No…If No, answer the question below

If a plan were implemented *to provide immediate, certain, and valued positive consequences for performing up to standards and expectations,* would performance improve?

☐ Yes ☐ No ☐ Not Sure

Analysis/basis (as needed)

6.0 *Other Obstacles*

6.1 Are ergonomic challenges present in the workplace for example, workarounds and problems with labeling, habitability, equipment accessibility, clothing, PPE, human-machine interface, or lighting)?

☐ No

☐ Yes…If Yes, answer the question below

If a plan were implemented *to reduce or eliminate ergonomic challenges,* would performance improve?

☐ Yes ☐ No ☐ Not Sure

Analysis/basis (as needed)

6.2 Are there inappropriate distractions or interruptions in the workplace? Are there obstacles to communication between the performer(s) and supervision?

☐ No

☐ Yes…If Yes, answer the question below

If a plan were implemented *to reduce or eliminate distractions, interruptions, or obstacles to effective communication,* would performance improve?

☐ Yes ☐ No ☐ Not Sure

Analysis/basis (as needed)

7.0 *Performer(s) Capable*

7.1 Are the job/task performance requirements beyond the performer's capabilities (strength, dexterity, potential to change, ability to learn what needs to be learned)?

☐ No

☐ Yes…If Yes, answer the question below

If a plan were implemented *to reassign the work to someone capable,* would performance improve?

☐ Yes ☐ No ☐ Not Sure

Analysis/basis (as needed)

7.2 Do the performer(s) have ample opportunity to perform the job/task to stay proficient?

☐ Yes

☐ No. If No, Determine Training Gap

Analysis/basis (as needed)

8.0 *RECOMMENDATION*

8.1 Summarize the performance improvement interventions that could improve performance identified in Sections 2.0 through 7.0 above.

☐	**REVISE the PERFORMANCE STANDARD** Develop or Revise the current standard to the proposed revised standard from Step 2.1 or Step 2.2.	☐	**COMMUNICATE PERFORMANCE EXPECTATIONS** Management or supervision communicates expectations for 'what a good job looks like' (from Step 2.4).

☐ **PROVIDE ADEQUATE RESOURCES**
Provide resources, tools, equipment or assistance from Step 3.1

☐ **REVISE PROCESS/PROCEDURES**
Provide adequate, procedures, work documents, instructions or processes from Step 3.2

☐ **PROVIDE FEEDBACK**
Management or supervision develop and implement a plan to provide regular feedback regarding performance (from Step 4.1).

☐ **PROVIDE APPROPRIATE CONSEQUENCES**
Reduce or eliminate negative consequences from Step 5.1

☐ **PROVIDE APPROPRIATE CONSEQUENCES**
Reduce or eliminate positive rewards for substandard performance from Step 5.2

☐ **PROVIDE APPROPRIATE CONSEQUENCES**
Provide immediate, certain, and valued positive consequences for performing up to standards and expectations from Step 5.3

☐ **REMOVE OBSTACLES**
Reduce or eliminate ergonomic challenges from Step 6.1

☐ **REMOVE OBSTACLES**
Reduce or eliminate distractions, interruptions, or obstacles to communication from Step 6.2

☐ **ENSURE CAPABLE PERFORMERS**
Reassign the work to someone capable from Step 7.1

☐ **ENSURE CAPABLE PERFORMERS**
Perform training needs assessment from Step 7.2

OTHER (Explain)

9.0 *Performance Improvement Intervention*

9.1 What specific work group(s) or target audience should be designated to be included in the intervention? For example, Mechanical Maintenance, Chemistry, Engineering Subgroup, Supervisory Personnel, etc. Consider all possible workgroups or individuals that would benefit from the intervention (cross discipline) not just the group(s) that may have been in the original problem identification.

<u>Target Audience is</u>

Provide Target Audience in this space.

9.2 How will the intervention improve performance?

Upon completion of the intervention, it is expected that performance would improve in the area targeted for improvement. Review Step 1.0 to define a specific and measurable metric, indicator, or goal that should be monitored to indicate improved performance.

Performance Improvement Metric or Goal

Provide Performance Improvement Metric or Goal in this space.

10.0 *SUMMARY*

Provide a brief summary of the results of the analysis (solution), including the actions that will be implemented or that are required in order to address this performance issue in the space provided below. NOTE-If a combination of non-training and training solutions are recommended, it may be prudent to implement the non-training solutions first and monitor performance before implementing the more expensive training solutions. It is possible that the non-training solutions resolve the performance gap.

Solution

Provide Solution in this space.

APPROVAL

10.1 Signature (electronic signature is acceptable) - Supervisor reviewer (or designee).

____ Date: ____________________

10.2 Signature – (electronic signature is acceptable) - Department Manager approving the results of the analysis (or designee).

____ Date: ____________________