BEFORE THE MINNESOTA OFFICE OF ADMINISTRATIVE HEARINGS
600 North Robert Street
St. Paul, Minnesota 55101

FOR THE MINNESOTA PUBLIC UTILITIES COMMISSION
121 Seventh Place East, Suite 350
St. Paul, Minnesota 55101-2147

In the Matter of the Petition of Northern States Power Company d/b/a Xcel Energy for Approval of Competitive Resource Acquisition Proposal and Certificate of Need	**MPUC Docket No. E-002/CN-12-1240** **OAH Docket No. 8-2500-0760**

DIRECT TESTIMONY
OF
DANIEL EWAN

Filed on Behalf of
Invenergy Thermal Development LLC

September 27, 2013

Direct Testimony of Daniel Ewan

MPUC Docket No. E-002/CN-12-1240
OAH Docket No. 8-2500-0760

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I. INTRODUCTION

Q. Please state your name, employer, business address, and current position.

A. My name is Daniel Ewan and I am Vice President, Development with Invenergy LLC (together with Invenergy Thermal Development LLC referred to as "Invenergy" or "Company"), One South Wacker Drive, Suite 1900, Chicago, IL 60606.

Q. What are your present responsibilities?

A. As Vice President, Development for Invenergy, I am responsible for thermal and cogeneration activities for Invenergy's development businesses. In this role I have responsibility for the business and project development of our thermal and cogeneration efforts, including oversight of project management, engineering, permitting, financing, equipment procurement and construction activities.

Q. Describe your educational background, as well as your business and professional experience.

A. I have 30 years of experience in the energy and utilities industry, including various roles in business and project development. In these roles, I have led the development, construction, and startup efforts of numerous energy centers throughout the United States. Before joining Invenergy, I served as Director of Project Development at Calpine Corporation, Project Manager at SkyGen Energy, LLC, Project Manager at ABB Impell Corporation, and various roles at Commonwealth Edison. I earned my Bachelor of Science of Mechanical Engineering from Iowa State University and my Masters of Business Administration from the University of Chicago.

Q. What is the purpose of your testimony?

A. I discuss the technical, economic and environmental aspects of Invenergy's Cannon Falls Peaking Expansion ("Cannon Falls Expansion") and Hampton Energy Center ("Hampton") proposals (collectively, the "Invenergy Proposals"). As such, I also sponsor Sections 4 through 13, 15 and 16 of each proposal, along with the Strategist template information submitted for each proposal, attached as Attachments 1 and 2, respectively.

In addition, together with Invenergy witness Mr. Shield, I discuss how the Invenergy Proposals best meet the need for new power identified by the Minnesota Public Utilities Commission ("Commission") in the recent Northern States Power Company, d/b/a Xcel Energy ("Xcel") Resource Plan docket, Commission Docket No. E-002/RP-10-825 ("825 Docket").

Q. How is your testimony organized?

A. My testimony is organized in the following sections:

- Descriptions of both the Cannon Falls Expansion and Hampton projects, including discussion of the combustion turbine technology proposed, associated facilities, delivery and interconnection issues and other topics;
- Invenergy's proposed capacity and energy pricing;
- Environmental information; and
- A summary of how the Invenergy Proposals best meet the need identified by the Commission.

II. PROJECT DESCRIPTIONS

A. Facility Locations and Related Facilities

Q. Can you describe the facility locations and the locations of related facilities?

A. The proposed Cannon Falls Expansion is located in an industrial park on the North end of Cannon Falls, Minnesota, in Goodhue, County – approximately 30 miles southeast of the Minneapolis St. Paul metro area. The proposed Hampton Energy Center will be located north of Hampton, Minnesota in Dakota County – approximately 20 miles southeast of the Minneapolis St. Paul metro area. Both sites have easy access to transmission services, natural gas services and water supplies. I have attached site layout maps for both the Cannon Falls Expansion and the Hampton facilities, including the relative location of gas and electrical interconnection facilities.

Cannon Falls Expansion Site Layout

Cannon Falls Expansion, Goodhue County, Minnesota

Rev. 02

August 09, 2013

Invenergy
One South Wacker Drive Suite 1900
Chicago, Illinois 60606
(312) 224-1400

Hampton Site Layout

Hampton Energy Center, Dakota County, Minnesota

Rev. 02

August 09, 2013

Invenergy
One South Wacker Drive Suite 1900
Chicago, Illinois 60606
(312) 224-1400

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B. Combustion Turbine

Q. Please describe the characteristics of the combustion turbine to be utilized by Invenergy at both Cannon Falls Expansion and Hampton.

A. Regarding the capacity and heat rate for the turbines, the capacity of each generating unit will range from approximately 155 MWs in the summer to 190 MWs in the winter. Actual available capacity will be determined by temperature and relative humidity. Each generating unit will have a Net Capability of 178.5 MWs at the point of interconnection at 40 degrees Fahrenheit (an estimate of the annual average temperature). Invenergy proposes to guarantee a predicted net heat rate of 10,900 Btu/kWh HHV when operating on natural gas at reference conditions of 95 degrees Fahrenheit and 30% relative humidity and at standard ambient pressure adjusted to the site elevation (new and clean).

Natural gas provides the primary fuel for both the Cannon Falls Expansion and the Hampton. In both cases, the facility will be connected to Northern Natural Gas's natural gas transmission pipeline via a dedicated 16" diameter lateral pipeline that is owned and operated by Greater Minnesota Transmission ("GMT") and which, in turn, connects to a Northern Natural Gas transmission pipeline. According to the Informational Postings on the Northern Natural Gas website through June of next year, the current unsubscribed capacity at the existing Cannon Falls interconnection is 60,800 MMBtu/day (Nov – Mar) and 55,160 MMBtu/day (Apr – Oct), meaning the facilities have ample access to adequate supplies of natural gas.

In addition to natural gas, the Cannon Falls Expansion will be capable of operating with fuel oil as a back-up fuel. However, Invenergy did not include any incremental storage or unloading capacity in its proposal. Invenergy recognizes that the need to operate on fuel oil is not frequent and most runs are not for an extended period of time. Thus, at this time it does not seem prudent to add incremental storage capacity. In the event that Xcel prefers additional fuel oil storage capacity, that could be included for a modest increase in capacity price. Each individual unit will burn approximately 13,000 gallons of fuel per hour when operating at base load. Given the existing storage of approximately 750,000 gallons, the three units could be operated for 18-19 hours at base load without any additional fuel oil deliveries. In the event that Xcel prefers a natural gas only unit, Invenergy could eliminate all back-up capability and offer a lower capacity price.

Invenergy's proposal for the Hampton Energy Center includes fuel oil as a back-up fuel. Invenergy proposes to include a 750,000 gallon fuel oil storage tank of similar design as the tank included in the existing Cannon Falls facility. Each individual unit will burn approximately 13,000 gallons of fuel per hour when operating at base load. Given the existing storage of approximately 750,000 gallons, the two units could be operated for 28-29 hours at base load without any additional fuel oil deliveries.

With respect to its operating characteristics, the proposed combustion turbine starts quickly and can be ramped up and down to follow load as needed. The turbine can be started and achieve minimum load within approximately 20 minutes and full load within 30 minutes. Once shutdown, there is a minimum downtime of four hours before a restart. Given the

massive build-out of renewable resources occurring and projected in Minnesota and the upper Midwest, new flexible peaking resources such as these will become critical, to accommodate the intermittency of these additional wind and solar resources.

Following Commission approval in this docket, Invenergy will begin the permitting process for the Hampton and Cannon Falls Expansion in 2014 with construction to follow in 2015. The facilities should be capable of an in-service date as early as January 1, 2016 but no later than January 1, 2017. Invenergy will target an in-service date of either June 1, 2016 or June 1, 2017 to align with the MidContinent Independent System Operator ("MISO") capacity planning period and Invenergy will offer the same capacity price for any commercial operation date between those two dates. (See Invenergy Response to Xcel Information Request 29, included as Attachment 3.)

Invenergy has proposed a 20 year tolling agreement. However, the service life of the equipment would be significantly longer.

C. Delivery

Q. Can you discuss how the power will be delivered from these facilities and any MISO or transmission or natural gas interconnection issues related to these facilities?

A. Yes. Both Invenergy Proposals will be in MISO, with Xcel as the Market Participant. The Invenergy Proposals will be offered daily into the MISO markets.

The Hampton 345 kV Substation, being constructed as part of the CapX2020 transmission system upgrade throughout Minnesota and the other upper Midwest states, provides the delivery point for both the Cannon Falls Expansion and Hampton. The Hampton 345 kV Substation is located in the greater Twin Cities region, providing reliability support and counterflow on the transmission system.

Regarding the transmission interconnection for the Cannon Falls Expansion, an initial Feasibility Study (Queue #J280) to confirm adequate capacity of three potential interconnection locations has been completed. The study evaluated interconnection at the existing 115 kV substation at Cannon Falls, at a new 345 kV substation just north of Hampton, Minnesota, and at the existing Lake Marion 345 kV substation. The existing Cannon Falls facility is interconnected to the high voltage transmission system at a 115 kV voltage level via an existing adjacent 115 kV substation to Invenergy's Cannon Falls facility. Invenergy is familiar with the transmission system in the area and anticipates that interconnection to the 115 kV substation at the existing Cannon Falls facility may necessitate the need for substantial upgrades on either the 69 kV or 115 kV system or both. The initial Feasibility Study confirmed that a number of 69 kV and 115 kV lines would become overloaded in the Summer Peak condition. The Feasibility Study is not intended to determine proposed resolution of the overloads or associated costs.

Given these potential issues with overloads with a 115 kV interconnection, at Invenergy's request, the Feasibility Study also evaluated an interconnection at the new Hampton 345 kV Substation that will be installed approximately nine miles north of the project, just north of

Hampton, Minnesota as part of the CapX2020 Transmission Project. The initial Feasibility Study confirmed that there will be no overloads in the Summer Peak condition with the 345 kV interconnection at Hampton. Invenergy is proposing an interconnection to the new Hampton 345 kV Substation. The Hampton to Rochester 345 kV Transmission Project (also part of CapX2020) will be installed in a corridor that runs approximately one mile west of the existing Cannon Falls facility along Highway 52. Invenergy proposes to interconnect the new Cannon Falls Expansion generator to the grid via one mile of new transmission line to the Hampton to Rochester corridor, and then eight miles of transmission line that would be installed as a double circuit or underbuild on the proposed Hampton to Rochester line and one new breaker position at the new Hampton Substation. Design, implementation and operation of this nine mile interconnection will require the cooperation of Invenergy and Xcel. However, this configuration will benefit all parties by minimizing the impact to surrounding land usage, minimizing upgrades to the overall electrical system and minimizing the overall cost of interconnection to the parties and ratepayers. Since this proposed transmission configuration has not been agreed to by all parties at this time, Invenergy has included an initial estimate in the project budget to account for these interconnection costs and proposes an adjustment mechanism to the capacity price to the extent the interconnection costs can be completed for more or less, with adjustments to the capacity pricing above or below the initial estimate. Invenergy believes the initial estimate is reasonable given the proposed configuration.

Below is a table showing the expected milestone dates for the J280 interconnection request.

Definitive Planning Phase (DPP) Application Due:	1/6/2014
DPP Start:	2/6/2014
System Impact Study + Interconnection Facilities - Facilities Study:	5/15/2014
Network Upgrades (if any) Facilities Study:	8/15/2014
Tendered Interconnection Agreement (IA):	9/1/2014
IA Negotiations:	10/1/2014
IA Execution:	12/1/2014

The existing Cannon Falls facility receives natural gas by a 16" diameter lateral pipeline that is owned and operated by GMT. That lateral connects to Northern Natural Gas transmission pipelines approximately 13.5 miles northwest of the project site. Invenergy has contacted GMT and it has indicated that the existing pipeline can serve both the new unit and the existing units with only minor upgrades or operational changes. Invenergy has estimated direct interconnection costs for natural gas services and has included those costs in its proposal, without an adjustment mechanism in the event the final costs are higher or lower. That estimate does not include natural gas compression to meet the plant's 550 psig gas pressure requirement, given the facilities close proximity to these natural gas transmission pipelines.

The Hampton Energy Center will also interconnect to the new 345 kV Hampton Substation. An initial Feasibility Study (Queue #J284, with expected milestone dates the same as shown above) to confirm adequate capacity has been completed for the Hampton facility. The Feasibility Study confirmed that there will be no overloads in the Summer Peak condition

with the 345 kV interconnection at Hampton. Invenergy has estimated interconnect costs assuming that a short, generator tie-line will be built to interconnect the facility to the substation and an additional breaker position will be added to the substation. Invenergy has included those costs in its proposal, again without an adjustment mechanism. We do not anticipate that any network upgrades will be required.

Natural gas will be supplied to Hampton Energy Center by a 16" diameter lateral pipeline that is owned and operated by GMT that connects to Northern Natural Gas transmission pipelines approximately 3.5 miles northwest of the project site.

Based on estimates provided by GMT, the project has estimated direct natural gas interconnection costs. These costs have been included in the proposal and no adjustment mechanism has been proposed in the event the final costs are higher or lower. Again, Invenergy has assumed that gas compression will not be required to meet the plant's 550 psig gas pressure requirement, given the proximity of the natural gas transmission pipelines.

D. Construction

Q. How will construction of these facilities impact the local economies and environments?

A. Both of the Invenergy Proposals will provide substantial economic benefits to the communities and do so in an environmentally sound manner. The construction of the Cannon Falls Expansion will take approximately 12 months and will involve a peak labor force of approximately 100 workers. These jobs will include laborers, carpenters, pipe fitters, welders, electricians, iron workers, etc. Construction of Hampton is also expected

to take approximately 12 months and will also involve a peak labor force of approximately 150 workers. Once operational, the Invenergy Proposals will contribute to the local economy via taxes and payments in lieu of taxes of approximately $500,000 per generating unit annually.

E. Operational and Maintenance Considerations

Q. What operational and maintenance considerations should the Commission keep in mind when reviewing Invenergy's proposed facilities?

A. For both the Cannon Falls Expansion and the Hampton Energy Center, Invenergy proposes the same make and model of equipment as installed at the existing Cannon Falls facility. Given Invenergy's experience to date at the Cannon Falls facility, Invenergy expects the proposed units to have a very high availability and low forced outage rate. For example, the existing Cannon Falls facility has maintained an availability of 95.5%, scheduled maintenance outages of 3.8% and a low forced outage rate of 0.7% over the life of the facility.

For scheduling, the facilities will be equipped with automatic generation control for remote regulation and ramping of the combustion turbine.

The expectation for scheduled major maintenance activities is as follows:

Combustion Inspection	12,000 hours/400 starts	10 days
Hot Gas Path	24,000 hours/900 starts	21 days
Major Maintenance	48,000 hours/1,600 starts	28 days

In the absence of a scheduled combustion turbine major maintenance activity, the plant will require an annual 10 day outage for scheduled maintenance of the balance of plant systems. The existing Cannon Falls facility has averaged under 14 scheduled outage days per year over the life of the project.

Given MISO's economic dispatch, neither plant would be dispatched unless it was economic to do so or unless it was being dispatched to alleviate a congestion constraint (non-economic redispatch). Xcel would also have the ability to hedge congestion with Financial Transmission Rights ("FTRs").

III. CAPACITY AND ENERGY PRICING

Q. What capacity and energy pricing has Invenergy proposed?

A. The capacity and energy pricing for the Cannon Falls Expansion and Hampton facilities is as set forth in Invenergy's original proposals, submitted in April of 2013 and included as Attachments 1 and 2 to Mr. Shield's testimony.

Invenergy's pricing includes dual fuel operation which will increase price, but provides a more reliable generation source.

Q. Do you have observations on any other party's pricing in this docket?

A. Yes. It is important to note that Invenergy based its pricing on the projects' capability at average annual ambient conditions. In contrast, Calpine priced its Mankato project based

on output at winter conditions. Since the capability of the generating unit is greater at winter conditions, Calpine's pricing will appear lower.

Q. Have you been able to view Strategist results for the various combinations of resources proposed by the parties in this docket?

A. No. Neither Xcel nor the Department of Commerce were able to finalize their Strategist runs and results in time to distribute them to the other parties. Thus, Invenergy will not be able to comment in detail on this issue until after reviewing Xcel's and the Department's Direct Testimonies and Attachments.

Q. Do you have observations to share at this time regarding Strategist and its ability to identify the best resource or resources in this proceeding?

A. Yes. While Strategist results can be a useful tool, Strategist has limitations, particularly when comparing independent power producer ("IPP") proposals, such as Invenergy's, with a utility "self-build" option. For example, to the extent Strategist looks at an extended time horizon, Strategist will effectively penalize the IPP proposal, by only including that resource for the proposed term of any power purchase agreement – typically 20 years. At that point, Strategist will assume a new resource will be acquired to replace the IPP resource. In contrast, Strategist will assume a "self-build proposal is available throughout the expected life of the asset, with no need to incur "replacement" costs.

It is also unclear how Strategist can consider other important issues such as the cost-benefit impact of including or not including dual fuel capabilities at the facilities, such as those associated with the Invenergy Proposals.

Additionally, since Strategist reduces resource options to a net present value for comparison, the timing of resource additions becomes critical.

Finally, any sound analysis must be based on sound inputs. Invenergy will be analyzing these issues in greater detail after the filing of Xcel's and the Department's testimonies, looking at a number of potential input biases including: fuel charges, forced outage rates, current run hours assumptions, inflation charges, and assumptions regarding the true cost of any Xcel "self-build" options including operational expenses. The Administrative Law Judge ("ALJ") and Commission will need to carefully consider each of these aspects of the analyses in determining how much weight to give the results.

IV. ENVIRONMENTAL INFORMATION

A. Cannon Falls Peaking Expansion

Q. Please provide a summary of the relevant environmental considerations related to the Cannon Falls Expansion.

A. I will discuss these considerations as set out in the relevant Commission rules, below.

1. Visual Impacts

The proposed Cannon Falls Expansion would have a minimal visual impact to the surrounding area. The additional turbine would be of the same size and height of the existing units. The tallest structure is the facilities stack at approximately 75 feet above grade. The facility is located in an industrial park and is not visible from any of the residential areas of the Cannon Falls community. The facility is bordered by a berm on two sides of the property that further minimize any visual impact.

2. Land Use and Requirements

The expansion turbine will be installed on 9.3 acres of vacant land that is directly north of the existing Cannon Falls units and is presently under the control of Invenergy's Cannon Falls entity. The land is in an industrial park on the north side of the City of Cannon Falls and is zoned as I-2, General Industrial District. No re-zoning will be required. The expansion itself will require 3 to 4 acres.

3. Water (Both Supply and Discharge)

The facility will require a modest amount of water for evaporative cooling on hot summer days and for emission controls when firing back-up fuel. Water for the existing facility is supplied by agreement with the City of Cannon Falls via infrastructure that was constructed with the facility. The water required for the expansion can be supplied via the existing infrastructure.

4. Emissions and CO2

The proposed expansion will be configured as a simple cycle combustion turbine and thus operate a limited number of hours on an annual basis. Facility emissions will be minimized

by the combustion of pipeline quality natural gas with dry low NOx burners, by the use of a water injection system in the rare use of the emergency backup fuel and by a limitation of the number of operating hours that the unit is allowed to operate on a 12 month rolling basis.

5. Traffic (Construction and Operations)

The impact to traffic during construction will be fairly minor. At the peak of construction, we would expect to have less than 100 construction workers at the site. The site is within a mile and a half of State Highway 52, a major four lane highway running north and south from the project site. Access to the site from the highway is via rural/industrial county roads. The proposed Cannon Falls Expansion will have no adverse impact to traffic during operations.

6. Noise

The existing facility was designed and tested to demonstrate compliance with applicable sections of Minnesota Administrative Rule 7030 for Noise Pollution Control. The expansion unit will be of similar make and model to the existing units and the noise characteristics will be similar. We anticipate that we will show continued compliance with the addition of a third unit.

7. Solid Waste

The facility does not produce solid waste.

8. Permitting requirements

The Cannon Falls Expansion requires the following permitting:

- Site Permit for Large Electric Generating Facility
- Modification to existing Air Quality Permit No. 04900088-01
- NPDES/SDS General Stormwater Permit for Construction Activity
- FAA Notice of Proposed Construction or Alteration

- Building Permit as required by local codes
- Exemption to allow burning of natural gas for power production

For any related transmission line, the following additional permits are required:

- Routing Permit
- NPDES/SDS General Stormwater Permit for Construction Activity

B. Hampton Energy Center

Q. Please also provide this information for the Hampton Energy Center.

A. Again, as set out in the Commission's rules, I provide the following information with respect to the Hampton Energy Center.

1. Visual Impacts

The proposed Hampton Energy Center would be of the same size and height of the existing Cannon Falls facility. The tallest structure will be the combustion turbine stacks at approximately 75 feet above grade. The site layout will optimize the distance from neighboring properties. There are four rural residences within one half mile of the proposed site. The local topography will minimize the visual impact of the facility to these residences. During the detailed site layout process, we will consider berms and landscaping to further minimize any visual impact.

2. Land Use and Requirements

The proposed Hampton Energy Center will be installed on a 20 acre parcel of land north of Hampton, Minnesota on 215th street one quarter mile west of State Highway 52. Invenergy

has secured an option to purchase the property. The land is adjacent to a new 345 kV electrical substation that is under construction. The project proposes to interconnect to this new substation thus there will be no further land use for transmission facilities. The facility itself will require approximately 8 acres. The balance of the property would allow for reasonable setbacks to existing roads and neighboring properties.

3. Water (Both Supply and Discharge)

The facility will require water for evaporative cooling on hot summer days and for emission controls when firing the back-up fuel. We anticipate that two industrial wells would be drilled to supply the anticipated water needs for the facility. The water system would include a raw water storage tank and a demineralized water storage tank. Any necessary water treatment would be accomplished through the use of temporary trailer based demineralizers or onsite equipment. The facility would also require a small supply of potable water to serve the needs of an operating staff of five people.

4. Emissions and CO2

The proposed expansion will be configured as a simple cycle combustion turbine and thus operate a limited number of hours on an annual basis. Facility emissions will be minimized by the combustion of pipeline quality natural gas with dry low NOx burners, by the use of a water injection system in the rare use of the emergency back-up fuel and by a limitation of the number of operating hours that the unit is allowed to operate on a 12 month rolling basis.

5. Traffic (Construction and Operations)

The impact to traffic during construction will be fairly minor. At the peak of construction, we would expect to have approximately 150 construction workers at the site. The site is within a half mile of State Highway 52, a major four lane highway running north and south from the

project site. Access to the site from the highway is via 215th street, a county road that intersects with state highway 52. The proposed Hampton Energy Center will have a staff of five or less and will share staff with the existing Cannon Falls facility and thus will have no adverse impact to traffic during operations.

6. Noise

The Hampton units will be of similar make and model to the existing units at Cannon Falls and the noise characteristics will be similar. The facility will be designed and tested to demonstrate compliance with applicable sections of Minnesota Administrative Rule 7030 for Noise Pollution Control.

7. Solid Waste

The facility does not produce solid waste.

8. Permitting Requirements

Hampton requires the following permits:

- Site Permit for Large Electric Generating Facility
- Air Quality Permit
- NPDES/SDS General Stormwater Permit for Construction Activity
- FAA Notice of Proposed Construction or Alteration
- Subsurface Sewage Treatment System (septic)
- Well Permit Preliminary well construction application approval
- Water Appropriations Permit
- General Permit for Temporary Water Appropriations

- Building Permit as required by local codes
- Exemption to allow burning of natural gas for power production

Any related natural gas line will also require the following:

- Routing Permit
- NPDES/SDS General Stormwater Permit for Construction Activity

V. CERTIFICATE OF NEED CRITERIA

Q. Can you discuss how the Invenergy Proposals best fit the Certificate of Need criteria that will guide the ALJ and Commission in this proceeding?

A. Yes. I will address each of the four main criteria in turn.

A. The Probable Result of Denial of the Invenergy Proposals Would be an Adverse Effect Upon the Future Adequacy, Reliability, or Efficiency of Energy Supply

Q. Has the Commission already determined the need for resource additions such as those proposed by Invenergy?

A. Yes. In the 825 Docket, the Commission determined "need for an additional 150 MW in 2017, increasing up to 500 MW in 2019." The Commission further determined that this need should be met by "peaking resources, intermediate resources, or a combination of the two."

Q. What advantages do the Invenergy Proposals provide for meeting this identified need?

A. The Invenergy Proposals offer numerous advantages as testified to by me and Mr. Shield. Among those advantages is the fact that the Invenergy Proposals offer peaking resources. As developments since the Commission's order in the 825 Docket continue to make clear, the Xcel service area (the "Xcel System") has a need for Capacity Resources, not Energy Resources.[1] This is evidenced by (1) a declining load factor on the Xcel System (e.g., increasing peak load intermittency); (2) low existing utilization of combined cycle generators on the Xcel System; and (3) industry-leading system wind penetration levels coupled with lagging levels of peaking resources.

Q. Why do you state that Xcel has a declining load factor on its system?

A. I base this observation on publically available information, including Xcel's own filings before the Commission. An electrical system's load factor measures the uniformity of load across time. In general, a high load factor is indicative of a system in which electric demand is relatively stable throughout days, months, and seasons; conversely, a low load factor is indicative of a system in which electric demand fluctuates throughout days, months, and seasons. All else being equal, a lower load factor indicates a system where many supply resources will need to sit idle a greater amount of time until peak conditions

[1] In this testimony, "Capacity Resources," refers to dispatchable (i.e., controllable) quick-start thermal peaking resources (e.g., natural gas-fired General Electric 7FA or equivalent technology) and "Energy Resources" refers to baseload (e.g., coal-fired and hydroelectric) and intermediate (e.g., natural gas-fired combined cycle) resources. In contrast to these types of resources are wind or solar resources, from which Xcel must accept power deliveries unless curtailment events arise. Consequently, Xcel must also balance the rest of the system (including thermal resource deployment) around their intermittent nature.

are hit and, thus, indicates a system needing relatively more Capacity Resources than Energy Resources.

Annual system load factors across the U.S. have been on a downward trajectory since approximately 2004, falling from approximately 59% in 2004 to approximately 54% in 2012. The Xcel System has followed a similar trajectory, with annual system load factors falling from approximately 58% in 2004 to 55% in 2011. In order to put these percentage point declines into perspective, the implied impact on Xcel System Capacity Resource needs can be derived on a MW-basis. As seen in the table below, a one (1) percentage point decline in July[2] load factor on the Xcel System, holding average energy demand constant, equates to an approximate 150 MW increase in implied Capacity Resource needs on the Xcel System. As noted previously, Xcel System load factors declined approximately three (3) percentage points between 2004 and 2011; based on the aforementioned MW-basis conversion methodology, this equates to an approximately 450 MW increase in Capacity Resource needs (vis-à-vis Energy Resources), all else equal, over this seven year period.

[2] July is typically the peak energy and demand month on the Xcel system, and is forecasted by Xcel to be the peak energy and demand month on the system going forward.

F: Impact of One (1) Percentage Point Decrease in July Load Factor on Xcel System

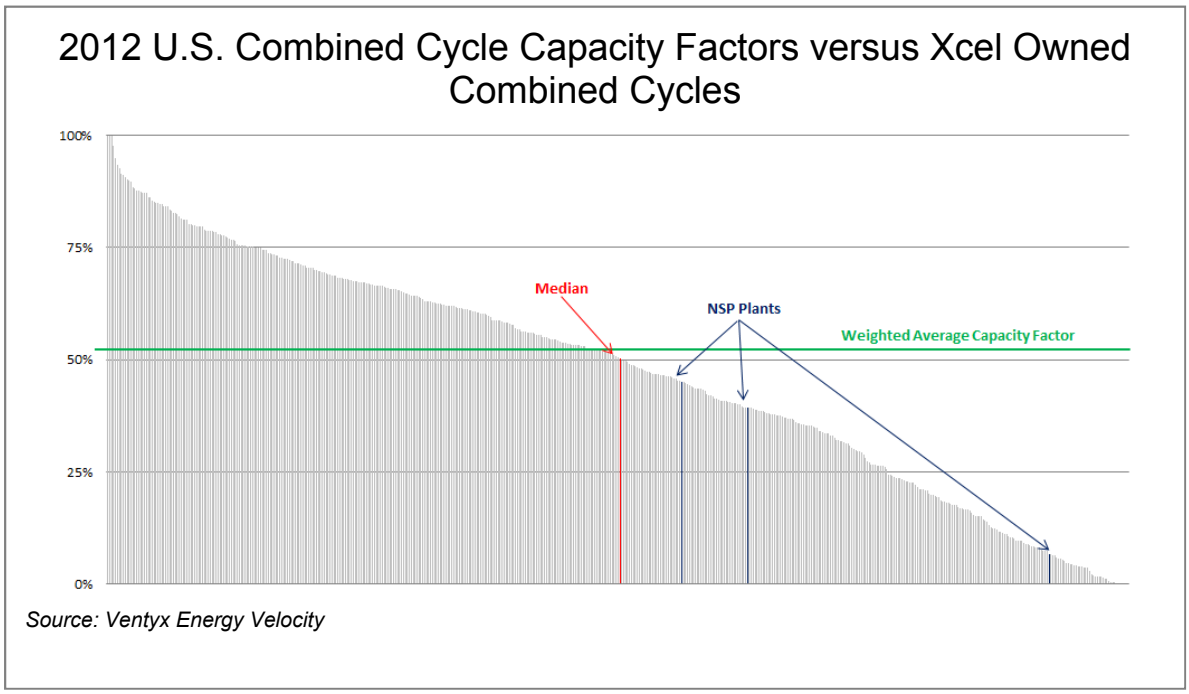
Row		Units	Formula [Source]	Result
A	Jul'14 NSP Total System Native Requirements	MWh	['14 Budget]	4,326,814
B	Jul'14 NSP Total System Average Load	MW	A / Hours in July	5,816
C	Jul'14 NSP Total System Peak Load	MW	['14 Budget]	9,203
D	Jul'14 Load Factor	%	B / C	63.2%
E	Jul'14 Load Factor - 1 Percentage Point Reduction	%	D - 1%	62.2%
F	Jul'14 Implied Increase in Peaking Needs	MW	(B / E) - C	148

Q. You also stated that there is low existing utilization of combined cycle generators on the Xcel System. Can you elaborate on this observation?

A. Yes. Precipitous declines in natural gas prices over recent years due to shale gas economics and liquids production have created an environment where efficient natural gas combined cycles have, from a purely economic dispatch perspective, replaced many coal generators in their traditional baseload role. As a result of these dynamics, the short-term power market environment has increasingly favored natural gas power generation on a variable cost basis and, during 2012, natural gas combined cycle capacity factors increased toward the levels that many of the initial developers of natural gas combined cycles built in the early 2000s originally envisioned.

However, combined cycle utilization on the Xcel System has historically lagged utilization of combined cycle facilities elsewhere in the U.S. This was especially evident during 2012 when, even as Xcel owned and contracted combined cycle operations increased from

historical levels, capacity factors among combined cycles on the Xcel System still lagged behind peers, as shown below.



Xcel System Historical Combined Cycle Capacity Factors

Plant	Xcel Owned/ Contracted	2009	2010	2011	2012
Black Dog	Owned	17%	14%	14%	7%
Riverside	Owned	11%	23%	14%	45%
High Bridge	Owned	15%	18%	17%	39%
Mankato	Contracted	12%	19%	11%	17%

Source: Ventyx Energy Velocity

To be sure, Xcel's combined cycle capacity factors are influenced by a myriad number of factors, including the underlying relationship of fuel commodity (e.g., coal and natural gas) prices, regional installed capacity mix, load, and market structure. However, the relative

capacity factor level of Xcel's combined cycle facilities can provide an indication of the type of ancillary services (e.g., regulation up/down, spinning) that can regularly and economically be provided by the facilities given the way Xcel historically has chosen to operate these facilities.

Q. And how do Xcel's wind penetration levels, coupled with lagging levels of peaking resources, impact the type of resource needed?

A. Because of wind generation's intermittent and, at times, unpredictable nature (e.g., wind ramp-down events, where large amounts of wind generation can drop off quickly), an electric system needs to maintain sufficient amounts of flexible and efficient generation that is capable of quickly responding to changes in wind generation and other system changes, in order to maintain reliability. Compared with PSCo (another subsidiary of Xcel's parent company Xcel Energy, Inc. with similar wind concentration as a percentage of peak demand), Xcel has relatively less peaking capacity that can be used to address fluctuations in intermittent generation. In fact, PSCo has nearly twice as much peaking capacity than wind capacity. In contrast, Xcel has less peaking capacity than wind capacity, which, in the event of a major loss of wind generation, may pose a risk to reliability. Of course, Xcel's announced plans to acquire an additional 750 MW of wind and its new obligations to acquire significant solar resources only heighten the importance of this issue.

By providing Capacity Resources, the Invenergy Proposals best meet the identified needs and the circumstances presented by Xcel's system going forward. Moreover, the Invenergy

Proposals make efficient use of resources by relying on existing (Cannon Falls) and planned and existing (Hampton) natural gas and transmission resources. Finally, as demonstrated by Invenergy's experience at Cannon Falls, Invenergy offers a highly reliable resource to fill this need.

B. A More Reasonable and Prudent Alternative to the Invenergy Proposals Have Not Been Submitted

Q. Based on the information available to date, in your opinion does any other party offer a proposal that is more reasonable and prudent than the Invenergy Proposals?

A. No. I will discuss each of these proposals briefly below and may provide additional analysis after reviewing other parties' Direct Testimonies.

Q. What type of resource does Calpine offer and what disadvantages do you see in its proposal?

A. Calpine offers a combined cycle facility – an Energy Resource. As I have discussed, however, the Xcel System has a Capacity Resource need, not an Energy Resource need. Xcel's need is best filled by dispatchable peaking resources, especially given the high degree of current and future forecasted supply and demand intermittency on the Xcel System. In addition, as I have already noted, Xcel has already made significant investments in self-owned and contracted combined cycle generation, which are only lightly utilized. To the extent energy needs on the Xcel system do materialize faster than currently anticipated (i.e., energy growth rates expand more quickly than currently anticipated, and the need for Energy Resources outpaces Capacity Resources), Xcel has

self-owned and contracted combined cycles that are currently underutilized on the system, and which can likely be more heavily utilized at a lower incremental cost to Minnesota ratepayers than Calpine's Mankato expansion (i.e., the "capital investment" associated with existing self-owned and contracted facilities is already sunk versus the non-sunk "capital investment" of any Mankato expansion).

In addition, Xcel has indicated in its competitive acquisition proposal in this docket that the development of peaking resources would allow better utilization of existing combined cycles in the Xcel fleet. As previously discussed, increased utilization of these resources would likely provide a greater return for Minnesota ratepayers in terms of "recovering the cost" of existing steel in the ground versus contracting for new combined cycle capacity.

Finally, I would note that Xcel already has a contract with Calpine's existing Mankato combined cycle facility through 2026, and which is only lightly utilized by Xcel. It is questionable whether Xcel should expose Minnesota ratepayers to incremental capital expenditures for another combined cycle that may be likewise underutilized, and which may be incrementally more expensive than alternative peaking options. In addition to the potential repercussions of "doubling down" on underutilized Mankato combined cycle capacity, Xcel would potentially expose Minnesota ratepayers to increasing levels of "resource concentration" risk by contracting for incremental capacity that will be incorporated into, and interconnected with, the existing plant facility (i.e., greater risk to ratepayers if the entire facility is forced off by an outage or other deleterious plant event). This "resource

concentration" risk is less of a concern at peaking installations with multiple, largely independent, combustion turbines.

Q. Have you also examined the proposal by Great River Energy ("GRE")?

A. I have. However, by the date of writing this testimony, GRE has refused to provide any specifics of its proposal to any party other than Xcel or the Department of Commerce. Thus, my review has been limited.

Q. Recognizing that limitation, what observations do you have regarding the GRE proposal?

A. GRE's proposal implies that there is only a "generic" capacity shortfall to be filled on the Xcel System, and that the impact of this capacity shortfall on Minnesota ratepayers is limited to ensuring MISO system reliability (and, by proxy, Xcel System reliability). As such, Great River's proposal fails to address specific issues facing the Xcel System (for example, the need for controllable peaking resources to provide a physical backstop for increasing intermittency on the system).

GRE's proposal is just a MISO system reliability "compliance instrument" under Module E, MISO's resource adequacy construct, versus a product that provides direct value and/or benefits to the Xcel System and Minnesota ratepayers (other than potential cost savings vis-à-vis other submitted competitive acquisition proposals). Given its nature, GRE's proposal creates incremental MISO wholesale market price exposure for Minnesota ratepayers. Without the physical hedge of capacity in the ground, Xcel will need to rely on the MISO market for energy purchases when the GRE "capacity" must be relied upon (for example,

during high demand, plant outage events and/or low wind generation hours). It is possible that the hours in which Xcel would need to rely on the wholesale market would coincide with higher energy price hours in the wholesale market (e.g., high demand hours and/or low wind generation during daytime hours). In addition, increased reliance on the wholesale market structure puts Xcel ratepayers at greater risk for adverse changes to the broader MISO market (e.g., higher-than-anticipated coal-fired retirements).

Q. Do you also have observations regarding Geronimo's proposal?

A. Geronimo offers an intermittent solar resource, rather than a peaking or intermediate resource as identified by the Commission as needed. While Invenergy supports development of sound solar energy projects and looks forward to participating in the solar energy market in Minnesota, in my opinion Xcel's solar energy needs would be best considered in a separate docket.

Q. Can you discuss a few of the reasons that Xcel's "self-build" proposals do not provide a more reasonable and prudent alternative?

A. First, I would note that Xcel has proposed up to a total of 645 MW of potential peaking capacity, while the MPUC has found that only up to 500 MW of capacity is needed on the system.

Second, I would note that two of Xcel's proposed projects would be located in the state of North Dakota, providing no direct economic impacts to the state of Minnesota, including no in-state jobs and no increase in tax base. In addition to direct economic impacts, there could

be negative indirect impacts on in-state ancillary construction jobs, in-state service and maintenance industry activity, etc.

Third, Invenergy's off-take contract (20 years) allows Xcel's Minnesota ratepayers the benefit of a re-evaluation of the Xcel System's going forward resource needs, which could ultimately be in the form of a combined cycle, peaker, and/or yet-to-be developed flexible demand side resources (e.g., battery storage, etc.), among other options. In contrast, Xcel's self-build peaking facility options would lock Minnesota ratepayers into a long-lived asset of at least 30-40 years.

Moreover, the Invenergy Proposals offer Xcel ratepayers the benefit of a fixed price, fixed duration contract. As such, ratepayers are not exposed to the risk of cost overruns when compared to an Xcel "self-build" option.

C. Invenergy's Facilities will Provide Benefits to Society in a Manner Compatible With Protecting the Natural and Socioeconomic Environments

Q. Will Invenergy's Projects provide benefits to society in a manner compatible with protecting the natural and socioeconomic environments?

A. Absolutely. As shown above, the Invenergy facilities meet Minnesota's overall energy needs, as already determined by the Commission. In fact, Xcel's recent announcement of significant new wind additions and its new solar energy requirements further emphasize the need for Capacity Resources, such as those offered by Invenergy. In addition, the Invenergy Proposals will not adversely impact the natural environment, as discussed

above. Notably, the Invenergy Proposals provide for efficient use of existing infrastructure. Along with these benefits, the Invenergy Proposals, if approved will also bring jobs to the communities as well as other financial benefits.

D. Will Comply With Relevant Policies, Rules, and Regulations of Other State and Federal Agencies and Local Governments

Q. Will Invenergy comply with the relevant policies, rules, and regulations of other State and Federal Agencies and Local Governments?

A. Absolutely. Invenergy places a high priority on regulatory compliance and is committed to acquiring all necessary permits related to its proposals and to compliance with the permit terms.

Q. Does this conclude your Direct Testimony?

A. Yes, it does.

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ATTACHMENT 1

PUBLIC DOCUMENT - TRADE SECRET INFORMATION REDACTED

Invenergy Thermal Development LLC

Strategist Assumptions Documentation -Unit PPA Performance & Cost Estimate

Project: Cannon Falls Expansion **Prepared by** MTHORNTON 5/8/2013

Project/Unit Description and Source Documentation:

In-Service Date: 6/1/2016
Retirement Date:

Net Capacity
MW

	Summer	Average	Winter	Notes
Ambient Conditions Assumptions				
Minimum Capacity				
Load Point 2				
Load Point 3				
Load Point 4				
Load Point 5				
Maximum Capacity				
Maximum With Ducts				
Emergency Capacity				

Heat Rate
MMBtu/MWh

	Average	Notes
Minimum Capacity		
Load Point 2		
Load Point 3		
Load Point 4		
Load Point 5		
Maximum Capacity		
Maximum With Ducts		
Emergency Capacity		

Continued on Page 2.

Variable Payment

2016 Dollars
Escalation Index $2016

$/MWh	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8
	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -

Start Charges

2016 Dollars
Escalation Index $2016

$/Start	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8
	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -

Capacity Price

2016 Dollars
Escalation Index $2016

$/kW-mo	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8
	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -

Maintenance Schedule

Weeks/Year

Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8

Forced Outage Rate

Emissions
lbs/MMBtu

	Average	Notes
SOx		
NOx		
CO2		
Hg		
PM_10		
CO		
VOC		
Pb		

Water Usage
gallons/MWh

	gallons/MWh
Water Consumption	

Expected Fuel Mix
%

Fuel 1:	
Fuel 2:	
Fuel 3	

PUBLIC DOCUMENT - TRADE SECRET INFORMATION REDACTED

Invenergy Thermal Development LLC

Continued from Page 1.

Year 9	Year 10	Year 11	Year 12	Year 13	Year 14	Year 15	Year 16	Year 17	Year 18	Year 19	Year 20
$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -

Year 9	Year 10	Year 11	Year 12	Year 13	Year 14	Year 15	Year 16	Year 17	Year 18	Year 19	Year 20
$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -

Year 9	Year 10	Year 11	Year 12	Year 13	Year 14	Year 15	Year 16	Year 17	Year 18	Year 19	Year 20
$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -

Year 9	Year 10	Year 11	Year 12	Year 13	Year 14	Year 15	Year 16	Year 17	Year 18	Year 19	Year 20

ATTACHMENT 2

PUBLIC DOCUMENT - TRADE SECRET INFORMATION REDACTED

Invenergy Thermal Development LLC

Strategist Assumptions Documentation -Unit PPA Performance & Cost Estimate

Project: Hampton Corners **Prepared by** M. Thornton

5/8/2013

Project/Unit Description and Source Documentation:

In-Service Date: 6/1/2016

Retirement Date:

Net Capacity

MW

	Summer	Average	Winter	Notes
Ambient Conditions Assumptions				
Minimum Capacity				
Load Point 2				
Load Point 3				
Load Point 4				
Load Point 5				
Maximum Capacity				
Maximum With Ducts				
Emergency Capacity				

Heat Rate

MMBtu/MWh

	Average	Notes
Minimum Capacity		
Load Point 2		
Load Point 3		
Load Point 4		
Load Point 5		
Maximum Capacity		
Maximum With Ducts		
Emergency Capacity		

Continued on Page 2.

Variable Payment

2016 Dollars
Escalation Index $2016

$/MWh

Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8
$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -

Start Charges

2016 Dollars
Escalation Index $2016

$/Start

Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8
$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -

Capacity Price

2016 Dollars
Escalation Index $2016

$/kW-mo

Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8
$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -

Maintenance Schedule

Weeks/Year

Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8

Forced Outage Rate

2%

Emissions

lbs/MMBtu

	Average	Notes
SOx		
NOx		
CO2		
Hg		
PM_10		
CO		
VOC		
Pb		

Water Usage

gallons/MWh

	gallons/MWh
Water Consumption	

Expected Fuel Mix

%

Fuel 1:	
Fuel 2:	
Fuel 3	

PUBLIC DOCUMENT - TRADE SECRET INFORMATION REDACTED

Invenergy Thermal Development LLC

Continued from Page 1.

Year 9	Year 10	Year 11	Year 12	Year 13	Year 14	Year 15	Year 16	Year 17	Year 18	Year 19	Year 20
$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -

Year 9	Year 10	Year 11	Year 12	Year 13	Year 14	Year 15	Year 16	Year 17	Year 18	Year 19	Year 20
$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -

Year 9	Year 10	Year 11	Year 12	Year 13	Year 14	Year 15	Year 16	Year 17	Year 18	Year 19	Year 20
$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -

Year 9	Year 10	Year 11	Year 12	Year 13	Year 14	Year 15	Year 16	Year 17	Year 18	Year 19	Year 20

ATTACHMENT 3

PUBLIC DOCUMENT:
TRADE SECRET INFORMATION EXCISED

☐ **Non Public Document – Contains Trade Secret Data**
☒ **Public Document – Trade Secret Data Excised**
☐ **Public Document**

Xcel Energy			
Docket No.:	E002/CN-12-1240		
Request To:	Invenergy	Information Request No.	029
Requestor:	Xcel Energy		
Date Issued:	September 12, 2013		

Question:

Please refer to Section 4 of the Invenergy Hampton Energy Center and Goodhue County proposals in this matter, which each state in part:

[Begin Trade Secret:

End Trade Secret]

Please provide any price adjustments for each of Invenergy's proposals if there was an option in a signed Power Purchase Agreement to delay the commercial operation date to:

A.) June 1, 2018, and
B.) June 1, 2019.

Please note that portions of this request are marked "Non-Public" and should be treated as confidential. The marked area contains information which Invenergy considers to be trade secret data as defined by Minn. Stat. §13.37(1)(b).

Preparer:	James R. Alders
Title:	Strategy Consultant
Department:	Regulatory Affairs
Telephone:	612-330-6732
Date:	September 12, 2013

PUBLIC DOCUMENT:
TRADE SECRET INFORMATION EXCISED

Response:

In the event of revised Commercial Operation Dates Invenergy proposes the Capacity Prices set forth below.

Cannon Falls Expansion Capacity Price for the first year of commercial operation would be as follows:

[Begin Trade Secret:

Commercial Operation Date	Capacity Price
June 1, 2017	
June 1, 2018	
June 1, 2019	

All other pricing terms including proposed escalation rates are unchanged.

Hampton Energy Center Capacity Price for the first year of commercial operation would be as follows:

Commercial Operation Date	Capacity Price
June 1, 2017	
June 1, 2018	
June 1, 2019	

End Trade Secret]

All other pricing terms including proposed escalation rates are unchanged.