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

FOR THE MINNESOTA PUBLIC UTILITIES COMMISSION
121 7th Place East, Suite 350, St Paul MN 55101-2147

In re the Matter of Sherco Unit 3 Energy Replacement Costs.	OAH Docket No. 65-2500-38476 MPUC Docket No. E-002/GR-12-961
In re the Application of Northern States Power Company for Authority to Increase Rates for Electric Service in the State of Minnesota, et al.	MPUC Docket No. E-002/GR-13-868
In re the Application of Northern States Power Company for Authority to Increase Rates for Electric Service in the State of Minnesota, et al.	MPUC Docket No. E-999/AA-13-599
In re the Review of the 2012-13 Annual Automatic Adjustment Reports for All Electric Utilities	MPUC Docket No. E-999/AA-14-579
In re the Review of the 2013-14 Annual Automatic Adjustment Reports for All Electric Utilities	MPUC Docket No. E-999/AA-16-523
In re the Review of the 2015-16 Annual Automatic Adjustment Reports for All Electric Utilities	MPUC Docket No. E-999/AA-17-492
In re the Review of the 2016-17 Annual Automatic Adjustment Reports for All Electric Utilities	MPUC Docket No. E-999/AA-18-373
In re the Review of the 2017-18 Annual Automatic Adjustment Reports for All Electric Utilities	

REBUTTAL TESTIMONY AND ATTACHMENTS OF RICHARD A. POLICH

ON BEHALF OF

THE MINNESOTA DEPARTMENT OF COMMERCE
DIVISION OF ENERGY RESOURCES

September 22, 2023

PUBLIC DOCUMENT

TABLE OF CONTENTS

Section **Page**

Schedules:

Schedule	Designation	Description
Schedule 1 (RAP-R-1)	Not Public	GE Litigation, Dep. Ex. 686 (Schultz Report)
Schedule 2 (RAP-R-2)	Not Public	GE Litigation, Dep. Ex. 718 (Brown Report)
Schedule 3 (RAP-R-3)	Public	GE Litigation, Trial Ex. 1064 (Navajo Generation Station Presentation)

Abbreviations Used in Testimony

Commission	Minnesota Public Utilities Commission
DOC	Minnesota Department of Commerce
EPRI	Electric Power Research Institute
GDS	GDS Associates, Inc.
GE	General Electric
HP	High-Pressure
hr	Hour
IP	Intermediate Pressure
lb	Pounds
LP	Low-Pressure
MPI	Magnetic Particle Inspection
MVa	Megavolt Amperes
NERC	National Electric Reliability Council
NSP	Northern States Power
O&O	Ownership and Operation Agreement
psig	Pounds per square inch gage pressure
RCA	Root Cause Analysis
SCC	Stress Corrosion Cracking
SHR	System Health Report
Sherco 3	Xcel Sherco Unit 3 Power Plant
SMMPA	Southern Minnesota Municipal Power Agency
TIL	General Electric Technical Information Letter

I. Introduction

Q. Are you the same Richard A. Polich that previously submitted direct testimony in this proceeding?

A. Yes.

Q. Has your role in this proceeding changed since your direct testimony was filed?

A. No. My assignment is to assist Department of Commerce personnel in conducting an evaluation of Xcel Energy's (Xcel) operation of its Xcel Sherco Unit 3 Power Plant (Sherco 3) generator, which experienced a catastrophic failure of a steam turbine on November 19, 2011, that forced the unit to be out of service until October 2013 (approximately 23-month outage).

Q. What is the purpose of your rebuttal testimony?

A. My rebuttal testimony will address issues raised in the testimony of Xcel Energy witnesses, including:

1. Xcel's reasons for not performing the LP turbine major inspection in 2011, as described by Xcel witnesses Mr. Kolb, Mr. Murray and Mr. Daniels, were not based on good industry practice. In addition, contrary to Xcel witness statements, if Xcel had properly performed the LP steam turbine major inspection, including bucket lift gap check, Xcel would have removed blades, performed MPI, and the extent of the SCC in the L-1 rotor disks would have been discovered and the 2011 event would have been avoided.

2. Mr. Daniels's conclusion that SCC in the L-1 dovetails was due to the turbine design and not chemical contamination is contrary to the available evidence.
3. Xcel's claim that it properly relied solely, if not exclusively, on the recommendation of GE regarding inspection of the turbine does not reflect prudent inspection and maintenance practices.
4. Inclusion of supposed Sherco 3 restoration work customer benefits claimed by Xcel witness Mr. Allen D. Krug, is a false benefit and the identified benefits claimed by Xcel should not be considered in this case because these benefits did not occur, if at all, during the period Sherco 3 was out of service, nor do theses supposed benefits affect the power supply costs in the years when Sherco 3 was out of service.
5. Xcel's claim of periodically performing the MPI inspection of the Sherco 3 was too expensive was not a prudent decision because the restoration costs and resulting replacement power costs would have paid for over 57 MPI inspections. Xcel could have performed MPI inspections every five years, and the cost would have been less than the replacement power costs.

II. Xcel Position on LP Major Deferral

Q. What reasons does Xcel assert were the reasons for its decision to defer the Sherco 3 LP steam LP turbine major overhaul?

A. According to Xcel witness Mr. Kolb, Xcel deferred the 2011 LP turbine major overhaul for the following reasons[1]:

1. Sherco 3's operational history;
2. Xcel wanted to replace the HP turbine and IP turbine rotors with new, higher efficiency rotors and could not both replace the HP and IP turbine rotors and perform the LP turbine major overhaul within the outage period;
3. Xcel had performed a Magnetic Particle Inspection (MPI) in 1999 (12 years prior to the 2011 outage);
4. Xcel had performed phased array inspection of the tangential dovetails in 2005 and had found no indications of cracking or concern;
5. The unit had been running efficiently; and
6. Xcel felt the GE inspection recommendation and technical advice did not require any inspection.

Q. Was the decision to defer the 2011 LP turbine major overhaul based on Sherco 3's operational history prudent?

A. No. As discussed by DOC witness Mr. Klotz, the water chemistry at Sherco 3 did not meet industry standards and likely contributed to the November 2011 event. In addition, Xcel ignored the following operational history: **[NOT PUBLIC INFORMATION BEGINS**

[1] Xcel Ex. __(MWK-1) (Kolb Direct) at 16.

[redacted]

4. [redacted] **NOT PUBLIC INFORMATION ENDS]**

Q. Was deferral of the 2011 LP turbine major overhaul to install new HP and IP turbine rotors a prudent decision?

A. No. Although HP and IP turbine upgrades could improve the fuel efficiency of Sherco 3, Xcel did not have to perform the HP and IP upgrades in 2011. The decision to perform the HP and IP turbine upgrades in 2011 versus the LP major overhaul was a gamble that the LP turbine did not have any critical problems. This decision was based on internal Xcel evaluations of the turbine health contained in Xcel's System Health Report ("SHR"). It is interesting that the SHR 2005 Report, Section (I), *"Description of condition(s) that substantiate a Green Yellow or Red Code"*, states:

[2] DOC Ex. 3, RAP-R-1 (Polich Rebuttal) (GE Litigation Dep. Ex. 686, Schultz Expert Witness Report) (Nonpublic) at 13, 15.
[3] Id. at 4.
[4] Id. at 28.

"*LP Turbines (Green): Contingent upon maintaining current levels of maintenance and 6-year T.B.O.* [i.e. Time Between Overhauls] *Also require that the L-0 covers be replaced in 2005. There is a potential industry-wide problem with rotor wheel cracking."*[5]

The 2010 report again notes industry problems with rotor wheel cracking:

"*These LPs also experience dovetail pin cracking problems, erosion damage and may suffer from an industry-wide problem with rotor wheel cracking. However rotor wheel phased array testing in 2005 did not detect any cracking issues."*[6]

The phased array ultrasonic examination was only on the tangential dovetail joints and Xcel had not performed any inspection of the L-1 or L-0 finger dovetail joints since 1999, 12 years prior to the 2011 outage and 15 years prior to the scheduled 2014 LP turbine major overhaul. As Mr. Murray acknowledged, Xcel's decision to defer the 2011 major inspection to 2014 meant that 8 1/3 years would elapse since the last major overhaul of the LP turbines in 2005,which was within Xcel's TBO criteria.[7] Xcel's TBO criteria provides for a longer amount of time between inspections than recommended by GE, EPRI, and others. The LP turbine time of 8 1/3 years between LP turbine inspections also exceeded Xcel's internal 6 year TBO stated in its 2005 SHR. With the increased frequency of finger dovetail failures in the industry, the distribution of information on those failures, and Xcel's poor water chemistry history, Sherco 3 was a prime candidate

[5] Xcel Ex. ___(HJS-1) (Sirois Direct) Schedule 14, page 1.
[6] Id., page 18.
[7] See Xcel Ex. ___ (TPM-1) (Murray Direct) at 18.

for cracking the L-1 finger dovetails. To delay a critical outage on a component such as the LP turbine, with known problems in critical areas, and whose failure could be catastrophic, was not a prudent decision.

Q. Was deferral of the 2011 LP turbine major overhaul because an MPI was performed on the L-1 finger dovetails in 1999 rotors a prudent decision?

A. No. A lot can happen to a steam turbine over a 12 year period. Sherco 3 LP turbine inspections had a history of finding chemical deposits on the various LP turbine components, including the L-1 blades. In addition, the L-1 blades and rotor attachment are more susceptible to condensation containing chemical deposits because it is near the Wilson Line in the steam turbine. The L-1 and L-0 blades experience some of the highest stresses in the steam turbine. The length of the blades, pressure drop from one side of the blades to the other, temperature profile, water droplets, all contribute to the stresses on the blades and the turbine rotor attachments. The higher stresses contribute to faster propagation of cracks from flaws or SCC in rotor blade attachments, pins and blade connection.

Q. Was it prudent for Xcel to defer the major overhaul of the Sherco 3 LP turbines scheduled for 2011 based on the 2005 multi-phased array ultrasonic inspection of the tangential dovetails?

A. No. The ultrasonic examination of the LP turbine tangential dovetails in 2005 should not have any bearing on the need to inspect the LP Turbine finger dovetails. The design of

the tangential dovetails is completely different from the finger dovetails and the stresses are very different. The tangential dovetail stresses impact the base of the barb holding the blades in place. Sherco 3's finger dovetails experience more of a bending stress due to the forces and sizes of the L-1 blades. In addition, the potential for chemical deposits from condensation is more probable in the L-1 blades due to the location of the Wilson Line in the Sherco 3 LP turbine. These differences render the tangential dovetail ultrasonic examination useless in determining the structural integrity or status of SCC in the L-1 blades.

Q. How should these facts have informed Xcel's decision-making?

A. Knowing the above conditions and the history of SCC in LP turbine finger dovetail joints, Xcel should have performed the LP turbine major overhaul in 2011 and removed the L-1 blades to perform MPI on the finger dovetail joints. It is prudent to know the condition of the Sherco L-1 dovetails and the power industry was well aware of how much damage SCC can do over a 12-year period. The industry has other instances in which components subject to SCC have set inspection intervals of ten years or less. To assume an MPI inspection performed in 1999 and that multi-phased array ultrasonic examination of tangential dovetails (not the L-1 or L-0 dovetails) in 2005 were sufficient to conclude the L-1 blade finger dovetails did not require MPI in 2011 was an imprudent decision.

Q. Was deferral of the 2011 LP turbine major overhaul because the unit was running efficiently a prudent decision?

A. No. Operational efficiency has no relationship to the structural integrity of a component. For example, a dragster engine will function properly in a quarter mile race with no engine cooling but would likely not survive a week in Atlanta traffic. Most dragster engines are rebuilt between races because of the stresses and operating conditions that occur in a race of less than 10 seconds. In the steam turbine HP, IP and LP sections, structural issues most times do not impact efficiency unless parts fail. Vibration is usually the first sign of structural problems or component failure. Efficiency reduction in a steam turbine is usually caused by erosion of components and deposits on blades. Xcel's decision to delay the LP turbine major outage because Sherco 3 was operating efficiently ignores that turbine overhauls are also intended to address preventative maintenance items and increase the probability that a steam turbine can operate without failure.

Q. Was deferral of the 2011 LP turbine major overhaul because the GE inspection or technical advice did not dictate to perform the inspection in 2011 a prudent decision?

A. No. As discussed in my direct testimony, Xcel had knowledge of SCC in steam turbines from multiple sources other than GE. Ignoring these other sources of evidence of SCC problems and evidence of finger dovetail joint failure in other steam turbines, contributed to Xcel's failure to properly maintain the LP turbine. Review of Xcel's testimony in this proceeding shows Xcel has not provided any evidence that Xcel acted prudently in not performing MPI on the finger dovetail joints during the 2011 outage.

Q. Do you agree with Mr. Kolb that Xcel prudently followed GE's instructions in TIL 1121-3AR-1[8]?

A. No. The Recommendations in TIL 1121-3AR-1, Section 2 state:

> *"Abnormal events or operational anomalies that cause concern for long term reliability of the unit may be reason to consider removal of buckets before normal replacement for MPI of the dovetail area. Abnormal events or operational anomalies are any out-of-the-ordinary occurrences during operation or maintenance which may increase the risk of stress corrosion and/or fatigue cracking such as but not limited to the following:*
>
> *a. caustic or chemical ingestion or contamination*
>
> *b. carryover from boiler*
>
> *c. leaking condenser heater tube*
>
> *d. overspeeds*
>
> *e. water ingestion"*

Sherco 3 experienced multiple abnormal events which subjected the LP turbine to conditions that promote SCC including: **[NONPUBLIC INFORMATION BEGINS**

1. [redacted]

[redacted]

[8] Xcel Ex. __(MWK-1) (Kolb Direct) at 35.

[9] DOC Ex.-3, RAP-R-1 (Polich Rebuttal) at 13.

[redacted]

3. [redacted]

[redacted] **NONPUBLIC INFORMATION ENDS]**

All **[NONPUBLIC INFORMATION BEGINS** [redacted] **NONPUBLIC INFORMATION ENDS]** of these instances are the type of abnormalities discussed in Section 2 of TIL 1121-3AR1 which should have triggered removal of blades for inspection of chemical contamination. Xcel ignored these instances in determining what maintenance to perform on the Sherco 3 LP turbine. Thus, Xcel did not follow TIL 1121-3AR-1.

III. Xcel's Position it Would Not Have Performed MPI of L-1 Blades in 2011

Q. What is Xcel's position on MPI inspection if the 2011 LP turbine overhaul had occurred?

A. Mr. Kolb states that Xcel would not have performed an MPI inspection of the finger dovetails during the 2011 outage because of the time requirements and cost of such an

[10] Id. at 13.
[11] Id. at 14.

inspection.[12] Mr. Kolb states the MPI inspection would have cost between $1- $2 million for each inspection.[13] At the same time, Mr. Kolb states the restoration work-related cost was around $138.4 million.[14] In addition, DOC's witness Mr. King has estimated the replacement power costs to be around $45.38 million.[15] This brings the total cost of the November 2011 failure to $183.78 million. Assuming each MPI inspection averages $2.0 million over the life of the plant, Xcel could have performed 91 MPI inspections during Sherco 3's life and broke even with the restoration costs. Even assuming a 60-year life of a coal power plant, Xcel could have performed an MPI inspection every year and incurred less cost than incurred with restoration and replacement power costs In fact assuming a 60 year Sherco 3 plant life, $3.0 million in MPI inspection costs, incurred to perform the MPI inspection every five (5) years, Xcel would have to do only 11 inspections (no inspection in year 60) at a cost $33.0 million, which is $150.78 million less than the combined restoration and replacement power costs. Xcel's position that avoiding the MPI inspection costs was a prudent economic decision did not include the economic risk of catastrophic failure of the LP turbine.

Q. Even if Xcel had not planned on performing the MPI inspection during the 2011 outage, might that inspection have occurred anyway?

[12] Xcel Ex. __ (MWK-1) (Kolb Direct) at 45.
[13] Exhibit __ (MWK-1) (Kolb Direct) at 34.
[14] Exhibit __ (MWK-1) (Kolb Direct) at 12.
[15] Exhibit DOC-2, MJK-D-7 (King Direct) at 13.

A. Yes. The minor inspection that Xcel actually performed in 2011 was significantly more limited than the major inspection that had originally been scheduled. According to Mr. Murray, at every major inspection overhaul Xcel performs thorough inspection of the L-0 and L-1 finger attachments including MPI of externally visible surfaces and ultrasonic examination of dovetail pins.[16] In contrast, the minor inspection that Xcel ended up performing in 2011 involved "a thorough visual inspection of the L-0 blades from inside the LP turbine exhaust hoods to look for damage or unusual conditions that might indicate a problem with the L-0 rows, blade rows upstream of the L-0 rows, or operation of the unit."[17] In other words, a minor inspection does not involve any inspection of the L-1 dovetail blade pins and attachment of the buckets to the rotor , which is the portion of the turbine most susceptible to SCC. A major inspection, which Xcel chose to defer, would have included a much more detailed inspection of the LP turbine L-1 row external surfaces, pins blade attachment points, blade gaps and other components.

Xcel cannot confidently say what it would have done had it performed a major inspection in 2011 because, having decided to not do that inspection, it does not know what it would have found.

Q. Why do you disagree with Mr. Kolb's position that MPI inspection would not have occurred if Xcel had performed the LP turbine major inspection in 2011?

[16] Xcel Exhibit __ (TRM-1) (Murray Direct) at 11.
[17] Xcel Exhibit __ (TRM-1) (Murray Direct) at 19.

A. Mr. Kolb's position that MPI would not have been performed is incorrect for multiple reasons. First, the level of SCC in the L-1 finger dovetails would have resulted in some of the L-1 buckets partially separating from the base of the L-1 rotor disk. Part of the LP turbine major inspection should include measuring the clearance between the rotor disk and the attached blades, called a "bucket lift check" or a "wheel gap check". This check is performed without removing the buckets. A bucket lift check uses a simple "feeler gauge" to measure the gap between the turbine bucket attachment and the rotor wheel. A feeler gauge is used to measure or set very small gaps, normally under 1 mm (see Figure 1 for example feeler gauge). An example of use of a feeler gauge use in measuring gaps between two parts is shown in Figure 2. The bucket lift check would measure the gap between the L-1 buckets and the rotor at the point shown in Figure 3. The feeler gauge is slid into the gap and can be used to measure the gap all around the LP turbine L-1

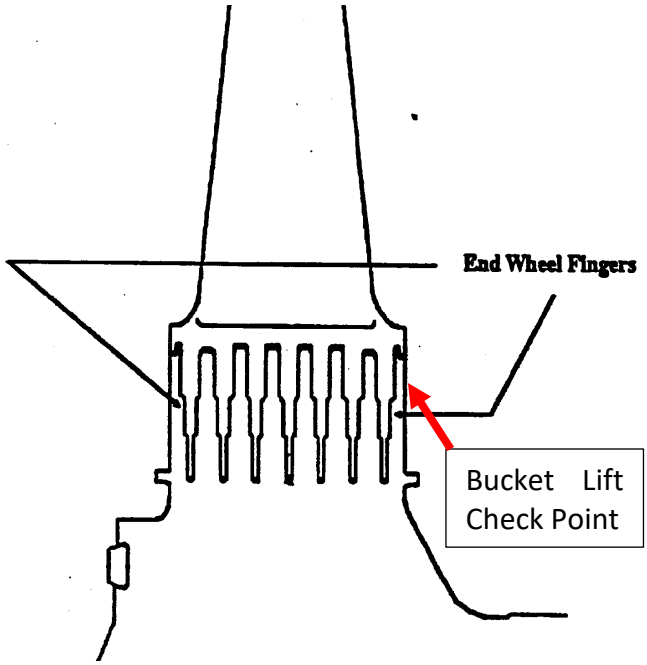

Figure 3 - Bucket Lift Check Measurement

Figure 1 - Example Feeler Gage

Figure 2 - Example Feeler Gauge Use

rotor. If the gap exceeds five thousandths of an inch, (0.005 inches) the blade buckets have moved away from the turbine rotor, indicating degradation of the attachment of the blades to the turbine rotor. The excessive bucket lift gap would have indicated a need for further investigation, and as a minimum the removal of at least one set of L-1 turbine blades for inspection of the finger dovetails. Assuming Xcel would have removed the set of blades with the largest gap, it is likely the SCC would have been visually observed and, if not, Xcel would have performed the MPI and would have found the excessive cracking in the L-1 rotor dovetails.

Q. Are there other reasons why Xcel might have decided to perform MPI of the L-1 row if it had done a major inspection of the LP turbines in 2011, as originally planned?

A. Yes. If the deposits that Thielsch found on the LP steam turbine were present during the LP inspection, it should have triggered a more detailed inspection of the LP turbine blades and finger dovetails. Deposits on exterior surfaces such as turbine blades, are an indicator of similar chemical deposits on areas that cannot be visually inspected, such as the dovetail joints. Chemical deposits should have caused Xcel to perform the MPI on the finger dovetail joints since it would have been 12 years since the last MPI inspection. This would have provided Xcel knowledge on the condition of the finger dovetails. With the history of finger dovetail failures and SCC caused cracking in those dovetails, it would have been prudent for Xcel to have removed the L-1 blades to perform MPI to ensure there was not any cracking of the dovetails.

Q. Was Xcel's decision to not perform MPI during the originally scheduled 2011 LP turbine major overhaul a prudent decision?

A. No. The time since the last MPI performed on the LP turbine finger dovetails was over 12 years and with the history of SCC in the L-1 finger dovetails, the age of Sherco 3 steam turbine, the increase in cyclic operation, history of water chemistry issues, and other operational occurrences, Xcel should have planned to perform MPI in 2011. Performing the MPI would have provided Xcel with concrete knowledge of the finger dovetail condition and eliminating the risky guess-work Xcel had employed over the years prior to 2011.

IV. Cause of SCC in the Sherco 3 LP Turbine L-1 Blades

Q. Do you agree with Xcel witness Daniels that SCC in the Sherco 3 LP Turbine L-1 dovetails was not due to chemical contamination of the in the joints between the L-1 dovetails and the blades?

A. No. Mr. Daniels states:

> "*While it has been shown time and again that elevated concentrations of sodium hydroxide in steam have contributed to turbine rotor failures by SCC, the literature also states that, in the presence of sufficiently high stresses, SCC can occur in "pure water" – in other words, water (or steam) where the concentration of sodium hydroxide is so small that it could not be measured."*[18]

[18] Xcel Ex. __ (DGD-1) (Daniels Direct) at 13.

Mr. Daniels's supposition ignores the history of SCC in GE turbines. Mr. Daniel's implies that the SCC was solely attributable to the turbine's design. However, if that were the case, then the rate of failures of finger dovetails in GE LP turbines would be much greater. Stuart B. Brown, who was an expert retained by GE in the GE Litigation, discussed the frequency of SCC in GE LP steam turbines similar to Sherco 3.[19] Mr. Brown's review found **[NONPUBLIC INFORMATION BEGINS** [redacted] **NONPUBLIC INFORMATION ENDS]** If material defects and rotor stress were the dominate cause of SCC in the GE LP turbines similar to Sherco 3, then the SCC frequency of occurrence would be much higher and support Mr. Daniels's position.

Q. Do you agree with Mr. Daniels that Sherco 3 did not experience any significant acute or chronic contamination events to warrant a full inspection of Sherco 3 LP steam turbine in 2011[20]?

A. No. Mr. Daniels states that Sherco 3 ***"… did not experience any significant acute or chronic contamination events that produced contaminated steam triggering a full inspection of the low pressure (LP) turbine finger-dovetail rotors between 2001 and the steam turbine failure on November 19, 2011***." This assertion ignores the various events Sherco 3 experienced which I identified earlier in my testimony. Any one of these

[19] DOC Ex.-3, RAP-R-2 (Polich Rebuttal) (Brown Expert Report, GE Litigation Dep. Ex. 718) (Non-public) at page 22-23.
[20] Xcel Ex. __ (DGD-1) (Daniels Direct) at 3.

events were of sufficient magnitude under GE TIL 1121- 3AR1, page 3, Section 2, to trigger Xcel to perform an MPI inspection of the LP steam turbine finger dovetails in 2011. Good utility practice would have been to perform the LP turbine major inspection in 2011 or earlier based on these events, coupled with Xcel's poor water chemistry control.

V. Industry Practice Includes Information Provided by Experts Beside OEM

Q. Did Xcel properly consider other sources of information on SCC in LP turbines in its decision process on maintenance of Sherco 3 LP turbine?

A. No. The testimony submitted by Xcel's witnesses make it clear Xcel relied extensively on GE for guidance on the LP turbine inspections.[21] In relying primarily on GE, Xcel failed to heed the warning signs of other information sources, some of which documented finger dovetail joint failure on other steam turbines. Xcel was well aware of the information contained in other sources on the potential for SCC in the LP turbine. Although Mr. Murray's testimony references other sources of information,[22] Mr. Sirios states Xcel only used GE information as the source for determining Sherco 3 steam turbine minor and major inspections. Mr. Sirois testimony only references two GE documents, TIL 1121-3AR1 and TIL 1277-2 as being the sources of information for performing inspection of the LP turbine blades. [23] As an engineer, reliance on a single source of information is not prudent and not a common practice. As engineers, we are taught to question

[21] See Xcel Ex. ___ (MWK-1) at 14.
22 See Xcel Ex. ___(TPM-1) at 5.
[23] See Xcel Ex. ___(HJS-1) at 9.

information, to verify that information is accurate, and contains the most up to date information available. Prudent decision processes need to include use of data from multiple sources to ensure that critical details are not missed or overlooked. Xcel's decision process did not appear to include any probabilistic risk assessment nor consider the potential for catastrophic failure. Xcel did not review the water chemistry history nor upset conditions at Sherco 3 in an objective manner. If Xcel had prudently incorporated the information available on the finger dovetail potential for SCC, and all the other factors surrounding past inspections, and Sherco 3's history, they should have come to the conclusion to perform the LP turbine major inspection in 2011 and included MPI on all LP finger dovetails.

Q. Why is the extensive reliance on GE for determining how and when inspections of the Sherco 3 LP steam turbine a problem?

A. As discussed above, information from other sources provides additional data points that can identify potential problems. For example, it is common practice in the utility industry to use information from other utilities that have the same type of equipment, which have equipment with the same design characteristics, and have similar operating characteristics. Utility personnel often contact personnel at the operating units with equipment similarities, to discuss equipment problems or failures and to obtain critical information on causes. Xcel had this type of information on the Navaho Generating

Station (NGS) which had SCC in the L-1 finger dovetails in 1995[24]. This document includes L-1 wheel/rotor inspection plans and SCC cause determination. Extensive reliance on GE for determining LP steam turbine inspection timing and methods can cause this type of real-world information to be ignored. There is evidence of this in Mr. Kolb's testimony in that he states the SCC in the LP steam turbine L-1 rotors would not have been found if Xcel had performed the inspection in 2011 because the inspection would not have removed the blades. If Xcel had used the inspection information contained in the NGS report, it would have performed a bucket lift check on the L-1 blades, found the gaps to be excessive, and prudently removed blades to investigate the cause of the excessive gaps. This type of information is not contained in the GE documents identified as the sources of information Xcel used in determining the scope of the LP turbine major and minor inspections.

VI. Xcel Position on Customer Benefits of Sherco 3 Restoration Work

Q. What benefits is Xcel claiming the Sherco 3 restoration work provides to customers?

A. Xcel's witness, Mr. Allen D. Krug, claims that the Commission should credit $16.2 million to Xcel against replacement power costs to account for the supposed benefits to Xcel customers from work necessary to bring Sherco 3 back to service following its catastrophic failure. Xcel's witness, Mr. Schottler discusses Xcel's claim that customers realized benefits as a result of the catastrophic failure at Sherco 3, as follows:

[24] DOC Ex.-3, RAP-R-3 (Polich Rebuttal) (Navajo Generating Station LP Turbine Stress Corrosion Cracking).

"…the extent of the damage to multiple components, requiring significant amounts of inspections, repairs and replacement parts, provided benefits that included: (1) the avoidance of costs for future work that was necessarily performed as part of the restoration and therefore no longer needed to be performed in the future; (2) the reduction of future planned outage time; (3) improved performance and efficiency of the unit; and (4) reduction of the future risk of failure events."[25]

Q. Should the customer benefits that Xcel claims resulted from the Sherco 3 restoration work be part of this fuel cost adjustment proceeding?

A. No. First, the supposed customer benefits Xcel claims did not occur, if at all, during the restoration period or any other period being addressed in this proceeding. Xcel's supposed customer benefits should be addressed, if at all, by Xcel in a future regulatory proceeding for the period in which the customer benefits occur and in which Xcel can provide proper documentation of the actual benefits.

Second, some of the cost benefits claimed by Xcel are not associated with costs addresses in fuel cost adjustment proceeding. The issues before the Commission in this portion of the 2013 – 2018 fuel cost adjustment proceeding is focused on costs for the replacement power Xcel incurred during the extended Sherco 3 outage that occurred between November 2011 through October 2013 (the "Restoration Period"). Any benefits to Xcel customers of future changes in fuel costs and associated adjustments in

[25] Xcel Ex. __ (DWS-1) (Schottler Direct) at 11.

fuel recovery would be part of future fuel cost recovery proceedings. Fuel cost adjustment proceedings are intended to ensure that utilities recovery fuel costs, replacement power costs, and other included fuel-related variable costs that were prudently incurred and that customers are not charged for costs in excess of those prudently incurred costs, ***for the year in which those costs occur***. Mr. Schottler and other Xcel witnesses are attempting to claim that Xcel should be compensated for future reductions in fuel costs based upon a calculation that cannot be verified, contains variables with wide range of possible answers, and that are likely to be part of other regulatory proceedings. The Commission should completely reject the concept Xcel is proposing because it does not follow the fundamental rate making and regulatory principles.

Third, Xcel's claimed benefits for improved plant operation, and reduction in future outages or derates cannot be calculated in the manner advocated by Xcel. Even assuming any reduction is appropriate to reflect supposed customer benefits from the disaster, to determine the operational benefits Xcel witnesses would need to perform an evaluation of historical Sherco 3 operations to the same *actual* operating parameters after the restoration. The assessment would need to be performed over a minimum of five years but for accuracy should be a ten-year period to properly capture the benefits.

Fourth, Xcel is claiming benefits from restoration work that was necessary because of Xcel's imprudently performed maintenance of the Sherco 3 LP turbine. The cost of this restoration work was not funded by Xcel but paid by Xcel's insurance company. In addition, Xcel customers paid the insurance expense through their base

rates, and the insurance company paid the majority of the restoration work. Any additional costs incurred by Xcel for the restoration work also would be recoverable through base rates. As Mr. Schottler asserted:

"*Direct costs for future work were avoided in cases where the insurance proceeds covered the cost of planned future work, including inspections, repairs, replacements, and/or upgrades."*[26]

Xcel did not incur any capital costs, maintenance costs, or operating costs to produce the benefits Mr. Schottler is trying to claim in this portion of his testimony; rather, these costs were paid by insurance proceeds.[27] Allowing a reduction in purchase power costs in this proceeding equates to paying Xcel $7.4 million[28] twice for restoration work, once by the insurance company and once through the reduction in replacement power cost.

Q. Should a reduction in future maintenance costs be part of this proceeding?

A. No. First, maintenance costs are addressed in general rate cases and should not be considered in this proceeding. Maintenance costs are set as part of base rates in general rate cases in which test year maintenance costs are used as the basis for setting maintenance cost in base rates. Second, once the maintenance costs are set in base rates, Xcel would be able to keep any unused maintenance costs because there is not a

[27] See Xcel Ex. __ (DWS-1) (Schottler Direct) at 14 ("Direct costs for future work were avoided in cases where the insurance proceeds covered the cost of planned future work, including inspections, repairs, replacements, and/or upgrades.").
[28] Id. at 15.

true-up process on maintenance costs. If Xcel's future maintenance costs are reduced as the result of the restoration work, then Xcel may be able to benefit from those reductions because they would not have to refund the maintenance costs reduction to ratepayers. Second, Xcel is trying to claim a benefit for reduction in future costs which the customers are entitled to and was the result of Xcel's own poor decisions in the maintenance of the Sherco 3 steam turbine. Xcel's proposal to keep maintenance cost benefits from the Sherco 3 restoration is inconsistent with the way maintenance costs are treated in the regulatory process.

Q. Are the calculations of the customer benefits contained in Mr. Shottler's testimony verifiable, proven, or actual?

A. No, Mr. Schottler's calculations of the customer benefits contain many assumptions which cannot be proved or verified. His calculations are for future benefits that may or may not occur and, accordingly, are speculative. Further, some of Xcel's claimed customer benefits may have happened through other normal or planned maintenance activities and not as a result of the Sherco 3 restoration work.

Q. What customer benefits does Mr. Schottler claim are the result of the Sherco 3 restoration avoiding future plant work?

A. Mr. Schottler's list of potentially avoided future work[29] resulting from the restoration represents potential Xcel future work and costs, all of which are speculative. For example, the first item on Mr. Schottler's list is the Sherco 3 major overhaul of the LP turbine. While this outage will not be necessary in 2014, an LP turbine major overhaul will be needed 5-7 years after completion of the restoration work. Thus, this outage is not eliminated, just delayed. Another example is Sherco 3 LP turbine L-0 blade replacement work scheduled for 2020. The replacement of the L-0 blades is a life extension project and there is no certainty it would have occurred without the restoration work. Xcel plans on retiring Sherco 3 by 2030 and could choose to operate the plant without blade replacements. Other items like, "*Cross over pipe bellows replacement"* is listed as a future replacement that reduces likelihood of a *"failure"* induced future outage. There is no certainty of the cross over pipe bellows failure and this may only be a postponement of this future outage. Review of Mr. Schottler's Schedule 4 finds that none of these items provide real benefits with real certainty. Thus, Xcel's $7.4 million claim for these benefits should be rejected.

Q. Do you agree with Mr. Schottler's claims that the restoration work reduced future planned outage schedules?

A. No. Mr. Schottler estimates that the restoration work allowed Xcel to avoid 10 to 11 weeks of future planned overhauls and extensions to planned overhauls. Mr. Schottler

[29] Xcel Ex. __ (DWS-1) (Schottler Direct), Schedule 4.

does not, however, provide any calculation that supports this estimate.[30] In addition, planned outage schedules are complicated because of all the various activities, and determining an actual reduction in an outage schedule is a very difficult task. Xcel has not provided any definitive comparison that shows how it calculated the outage time reduction. To perform this analysis, each future planned outage would need to have all the outage tasks defined, schedule the tasks within the outage period, see how it overlaps with other outage activities, and then do the same without the outage tasks Mr. Schottler says were avoided by the restoration work. In addition, Sherco 3 is a complicated machine with hundreds of systems and thousands of parts. A component or system failure could easily cause an increase in outage time that would negate any reduction in outage time or damage one of the components repaired during the restoration. Again, Mr. Schottler's premise is unfounded and cannot be proven to actually result in customer benefits.

Q. Should Xcel be able to claim the Sherco 3 performance and efficiency benefits from the restoration work as a reason for reducing its responsibility for fuel replacement costs resulting from its failure to operate and maintain Sherco 3 in a prudent manner?

A. No. With respect to the improved performance of Sherco 3 following its restoration, Mr. Schottler "estimates" that new components installed in connection with restoring Sherco 3 to operation reduced fuel consumption and saved customers $4,500,000

[30] See Exhibit __ (DWS-1) (Schottler Direct), Schedule 4.

(approximately $3.3 million in the Minnesota jurisdiction.)[31]. First, Mr. Schottler describes the calculation as an estimate, but he fails to explain how he arrived at this estimate. His testimony on fuel consumption reduction has a very large range, does not explain which components contribute to fuel reduction, and Mr. Schottler also does not provide any calculations for this estimate. Second, Xcel does not provide any evidence of actual performance or efficiency improvement. Claiming a fuel consumption reduction by 0.25% to 1.0% does not result in that magnitude of actual fuel cost savings. Other factors like plant dispatch levels, the time Sherco 3 is actually in operation, and other plant operating conditions can affect the project fuel cost saving estimates. Other future maintenance on the steam turbine may have resulted in similar fuel cost benefits. Sherco 3 had new HP and IP turbines installed during the 2011 outage that should have resulted in similar fuel cost benefits. Xcel has not provided any calculations that compare actual plant performance after the restoration, adjusting for the new HP and IP turbine benefits, to historical plant performance to back up their *"*estimate*."* Last, utilities perform periodic maintenance and component upgrades which result in improved plant performance and the costs of the upgrades is covered through the utility rate structure. Awarding Xcel the benefit of allegedly improved performance by reducing the replacement power cost refunds would be awarding Xcel funds it is not entitled to under normal principles of utility cost recovery.

[31] Xcel Ex. __ (DWS-1) (Schottler Direct) at 16.

Q. Do you agree with Mr. Schottler's claim that the restoration work reduced future forced outage risk?

A. There is the potential that the restoration work reduced future risk of a forced outage but that cannot be quantified without performing an analysis of past outage causes and a probabilistic risk assessment for future outage causes. Xcel would need to define the potential forced outage frequency for each component that was restored, review all historic outages to determine if the restored components caused actual forced outages, and perform a long term probabilistic projection for each restored component contribution to forced outage factor. Mr. Schotter has not provided any of this necessary analysis. But this is a moot point because, as I have said previously, awarding Xcel the benefit of the reduced forced outages by reducing the replacement power cost refunds would be awarding Xcel funds it is not entitled to under normal principles of utility cost recovery.

Q. Do utilities routinely perform maintenance work during outages which affect future fuel costs?

A. Yes. Anytime a power plant outage task improves the operational efficiency, repairs a component, engages in preventive maintenance, etc., it can and usually does affect future fuel costs of the plant and the utility. The utility recovers the cost of maintenance or repairs through its base rates that are set in the previous general rate case. Forced outage costs are part of maintenance costs and also recovered through base rates. If the utility incurs capital costs during the outage, those costs generally become part of rate

base and will be rolled into rates in the next rate case. A good example of plant maintenance improving plant performance and the capital costs being rolled into general rates was the replacement of the high pressure turbine during the 2011 Sherco 3 maintenance outage. If Sherco 3 had been able to operate after the 2011 outage, the unit should have operated more efficiently and been able to either produce the same MWs with less fuel or more MWs with the same fuel. The capital costs associated with the high pressure turbine replacement would then be included in Xcel's capital cost portion of Sherco 3 rate base.

Utilities do not claim additional compensation simply because a maintenance outage task may result in future fuel cost reduction. The customer is paying for that benefit through rates by paying for the return of, and on, the capital investment and by paying for the associated plant maintenance costs. Claiming additional customer benefits would result in double recovery of utility costs and excess return on investment.

The restoration work performed at Sherco 3 aligns with utility cost recovery in the same fashion. If the capital costs Xcel incurred in excess of the costs refunded by its insurance company or as part of the GE settlement, then Xcel is entitled to incorporate those costs into rate base in its next general rate case. Xcel's claims that it should benefit by a reduction in the replacement power costs would penalize customers by charging them for costs that were not prudently incurred by Xcel and rewarding Xcel by allowing them to retain funds they are not entitled to under the automatic fuel cost adjustment mechanism.

Mr. King's testimony discusses the problems with Xcel's fuel cost savings estimates.

Q. Does this conclude your rebuttal testimony?

A. Yes.