

Direct Testimony and Schedules
Carl R. Bible

**BEFORE THE OFFICE OF ADMINISTRATIVE HEARINGS
FOR THE
MINNESOTA PUBLIC UTILITIES COMMISSION
STATE OF MINNESOTA**

IN THE MATTER OF XCEL ENERGY'S
PETITION FOR APPROVAL OF ITS 2023
ANNUAL FUEL FORECAST AND
MONTHLY FUEL COST CHARGES

MPUC Docket No. E002/AA-22-179

OAH Docket No. 21-2500-40336

DIRECT TESTIMONY OF

CARL R. BIBLE

On Behalf of

NORTHERN STATES POWER COMPANY

May 1, 2025

Exhibit____(CRB-1)

Cable Failure and Customer Benefits

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1 **I. INTRODUCTION AND QUALIFICATIONS**

2

3 Q. PLEASE STATE YOUR NAME AND BUSINESS ADDRESS.

4 A. My name is Carl R. Bible. My business address is 500 Townpark Lane,
5 Kennesaw, Georgia 30144.

6

7 Q. BY WHOM ARE YOU EMPLOYED AND WHAT IS YOUR POSITION?

8 A. I am employed by Enercon as an Electrical Consultant.

9

10 Q. FOR WHOM ARE YOU TESTIFYING?

11 A. I am testifying on behalf of Northern States Power Company – Minnesota,
12 d/b/a Xcel Energy (Xcel Energy or the Company).

13

14 Q. PLEASE SUMMARIZE YOUR QUALIFICATIONS AND EXPERIENCE.

15 A. Prior to joining Enercon in February 2025, I worked for the Florida Power and
16 Light/NextEra Energy nuclear fleet for 46 years. My positions included
17 engineering director for fleet and at multiple sites, fleet programs director, and
18 fleet design and technical manager. I have significant experience and am
19 considered a subject matter expert in the nuclear industry in the areas of power
20 distribution, switchgear, cables, transformers, generators, instrument and
21 control systems, associated regulatory requirements, and root cause and failure
22 analysis. I have relevant specific experience with control cables failures at the
23 Turkey Point Nuclear Plant. My qualifications and experience are more fully
24 described in Exhibit____(CRB-1), Schedule 1.

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

2 A. Xcel Energy engaged Enercon to review information related to an incident
3 (Event) in October 2023 that caused inadvertent damage to direct current (DC)
4 control cables at the Prairie Island Nuclear Generating Plant (PINGP).
5 Specifically, the Company asked Enercon to opine on: (1) the appropriateness
6 of the Company replacing the damaged cables following the Event, rather than
7 attempting to repair them; (2) the likelihood that these cables would have been
8 identified for replacement during the subsequent license renewal (SLR) for
9 PINGP had the Event not occurred; (3) the likelihood that, if not replaced
10 following the Event or during SLR, the cables would have failed, resulting in a
11 forced outage at PINGP; (4) the Company's use of the outage time at PINGP
12 following the Event to perform additional work that avoids future outage time;
13 and (5) whether customers have benefitted from the past performance of
14 PINGP. As part of this engagement, my work principally focused on issues (1),
15 (3), (4), and (5). I prepared an Expert Report (Report), attached as
16 Exhibit___(CRB-1), Schedule 2, summarizing my conclusions.

17

18 Q. PLEASE SUMMARIZE THE PRINCIPAL CONCLUSIONS OF YOUR REPORT.

19 A. As detailed in the Report, my principal conclusions are: (1) there was a high
20 probability that the DC control cables in the direct buried section would have
21 failed during future plant operation if not discovered during the boring activity;
22 (2) that upon discovering the condition of the cables, replacement, rather than
23 repair, was best industry practice; (3) the outage times experienced to replace
24 the cables were appropriate based on the scope of work and the testing required
25 to ensure correct equipment operation; (4) Xcel Energy took advantage of the
26 required outage time for the cable replacements to perform additional work that
27 maximized the benefit to the plant, the Company, and its customers; (5) the

1 Company's estimated outage times had the control cables not been replaced and
2 then failed during operation are reasonable; and (6) PINGP's strong
3 performance history has provided substantial benefits to Xcel Energy's
4 customers.

5

6 Q. DOES THIS CONCLUDE YOUR DIRECT TESTIMONY?

7 A. Yes, it does.



Carl R. Bible, Jr.

Senior Electrical Consultant

Professional Years of Experience - 46

EDUCATION: Bachelor of Science, Electrical Engineering, University of Tennessee

PROFESSIONAL ASSOCIATIONS: Senior Reactor Operator (SRO) Certification Training at Turkey Point

SUMMARY:

Mr. Bible is a Senior Electrical Consultant who supported the Florida Power and Light/NextEra nuclear fleet for 46 years. The experience described below is for FPL/NEE supporting Seabrook, Point Beach, Duane Arnold, Turkey Point, and St. Lucie. Experience includes power distribution, switchgear, cables, transformers, generators, Instrument and Control systems and associated NRC requirements.

ENERCON PROFESSIONAL EXPERIENCE

Senior Electrical Consultant / Nuclear Service Group (NSG)

Supports electrical engineering work as needed for ENERCON's NSG. 02/05 – present.

PREVIOUS PROFESSIONAL EXPERIENCE

Florida Power & Light (FPL)/NextEra Energy (NEE) 1978-2024

Fleet Technical Engineering Manager (2022-2024)

Responsibilities included subsequent license renewal scoping and implementation activities for Turkey Point, St. Lucie, and Point Beach.

Director of Nuclear Accounting (2021-2022)

Supported converting O&M expenses to Capital.

Fleet Design and Technical Engineering Manager (2014-2021)

Responsible for all design activities in fleet

Engineering Director – St. Lucie Nuclear Plant (2013-2014)

Director of Nuclear Programs (2007-2013)

Managed and standardized engineering programs and functions.

Engineering Director – Turkey Point and St. Lucie (2004-2006)

Engineering Director (2000-2004)

Managed fleet spent fuel storage activities and mentored fleet engineers.

Engineering Director – St. Lucie (1997-2000)

Engineering Director – Turkey Point (1996-1997)

Site Design Engineering Manager – Turkey Point (1993-1996)

Electrical and Instrument and Controls Engineering Supervisor – Turkey Point (1987-1993)

Electrical Engineer – Turkey Point and St. Lucie (1981-1987)

Expert Report
of
Carl R. Bible, Jr.
ENERCON

May 1, 2025

Qualifications and Experience

Mr. Carl R. Bible has been employed by Enercon as an Electrical Consultant since February 2025.

Previously, Mr. Bible worked for the Florida Power and Light/NextEra Energy nuclear fleet for 46 years. His positions included engineering director for fleet and at multiple sites, fleet programs director, and fleet design and technical manager.

Mr. Bible has significant experience and is considered a subject matter expert in the nuclear industry in the areas of power distribution, switchgear, cables, transformers, generators, instrument and control systems, associated regulatory requirements, and root cause and failure analysis. Mr. Bible has relevant specific experience with control cables failures at the Turkey Point Nuclear Plant.

Cable Failure and Customer Benefits

On October 19, 2023, DC direct buried control cables from the switchyard to the Prairie Island Nuclear Generating Plant (PINGP) were damaged. At the time the cables were cut, Unit 2 was in a refueling outage and Unit 1 was online at 100% power. As a result of the cut cables, the Unit 1 generator and switchyard breakers opened and Unit 1 tripped. PINGP personnel performed an inspection of the damaged cables and other control cables in the cable bundle and determined that these cables should be replaced rather than repaired.

Based on my review of Xcel Energy documents and discussion with plant personnel, the decision to replace the cable bundle in the direct buried section with the damaged cables and install new cables from the switchyard was in the best interest of the plant and Xcel Energy's customers as discussed below.

An Operational Decision-Making Issue Evaluation (ODMI # 501000077958, dated 11/07/24) was prepared that evaluated options for cable repair and replacement. It was not feasible to utilize any cables in the direct buried section as several of the cables that were not inadvertently cut had visible evidence of degradation. The installation of new cables above ground as a temporary solution was reviewed and not pursued due to difficulty in protecting cables from damage and because subsequent unit outages would be required to remove the temporary cables and install permanent cables. This would result in overall

more outage time than the selected option to replace all cables in this area with new cables installed in underground conduits.

The original DC control cables were buried in direct contact with the soil, as was typical practice in the early 1970s for switchyard cables, and not in an underground cable bus duct or conduit. All of the replaced cables were installed in polyvinyl chloride (PVC) conduit to limit environmental interactions.

Subsequent testing by Electric Power Research Institute (EPRI) (Draft EPRI Examination Prairie Island Station Failed Control Cables, April 2025) on these cables determined that cable jackets were hardened and cracked, and several conductors were discolored, which is indicative of exposure of the copper conductor to moisture that most likely occurred because of breaches in the cable jacket.¹ It is my understanding that EPRI concurred that replacement of this cable when excavation damage occurred represented best industry practice.

There was a high probability that cables in the direct buried section would have failed during future plant operation if not discovered during the boring activity. This would result in plant alarms, spurious operation of equipment (e.g., opening of closed breakers), and potentially tripping one or both units. The basis for these statements comes from:

- PINGP personnel observed several cables with cracked jackets and discolored conductors.
- EPRI testing of these cables determined that cable jackets had evidence of overheating and were hardened and cracked. Conductors were discolored and had observed corrosion. EPRI determined the soil backfill was comprised of fine sand of similar particle size with low moisture content. If representative, this backfill composition can cause cables to overheat over time. Current backfill guidance indicates that backfill should consist of a range of particle sizes to provide air gaps that reduce the susceptibility of the cables to overheating.
- The degraded condition of these cables and soil backfill composition most likely would not have been discovered prior to cable failure as discussed below:
 - There are no industry requirements to inspect or test these cables.

¹ It is my understanding that EPRI is in the final stages of its engagement and will issue a final report regarding its findings and conclusions in the near-term.

- The only inspections or tests that would reasonably have been done on these cables would have been as a part of required sample testing for subsequent license renewal (SLR). However, there is an approximately 20 percent probability that the degraded cables would have been included in an initial sample and inspected for SLR as discussed in Mr. Allen Hiser's testimony and corresponding expert report.
- Industry operational experience is that control cables fail either due to damage caused during installation or long-term exposure to water. From discussions with the PINGP cable program owner, there have been no observations of water accumulation in manholes or ponding of water in the vicinity of these cables. As such, the plant would have had no indications of a condition that would require action to determine and correct the accelerated aging degradation experienced by the control cables in question.
- Corrosion observed on cable conductors was most likely caused by water from normal ambient conditions entering through the cracked cable jackets.

Outage times that were experienced to replace the cables were appropriate based on the scope of work to install new cables and the extensive testing that was required to ensure correct equipment operation. To take advantage of the required outage time for the cable replacements and maximize the benefit to the plant, Xcel Energy, and its customers, additional work was added to the outage scope on both units. Work added to Unit 1 improved unit reliability and unit performance. Unit 1 condensers were cleaned which improved thermal performance (unit generation improved approximately 4 megawatts) and eliminated a future spring down power to clean condensers. Design changes were completed on the Unit 1 condenser hotwell and feedwater systems improving reliability by eliminating single point vulnerabilities, a single instrument or signal failure could have caused a unit trip prior to these changes. From the actual work hours, PINGP determined that the additional work scope for Unit 1 and Unit 2 resulted in approximately 8 avoided future outage days.

Assuming that the cables were not damaged and were instead replaced in a future outage, PINGP provided for review three scenarios and their respective number of future outage days that would be avoided - 1) Planned replacement during a scheduled refueling outage, 2) Unplanned replacement after an emergent cable failure with one unit in a refueling outage, 3) Unplanned replacement after an emergent cable failure resulting in both units

tripping and creating a dual unit outage (22-0179 DOC-035 Supplement 1 PUBLIC, provided as Exhibit___(NJD-1), Schedule 2).

These scenarios assumed a dual unit outage was required to complete cable replacement activities. This approach is valid to ensure no adverse challenges to plant operation and to nuclear safety. The cables being replaced provide control to both unit's generator's breakers, various switchyard breakers and motor operated disconnects, and spurious operation of this equipment will cause a unit trip. There is an increased potential for unit trips during cable replacement with one or both units online. Cable conductors could short circuit causing spurious equipment operation during trenching activities as these cables are direct buried in close proximity to each other and were in a physically degraded condition with hardened and cracked cable jackets. Spurious operation could also occur during the termination of new cables in various control panels. Additionally, after cable replacement, extensive testing is performed, which requires equipment operation (breakers opening/closing and relay operations). While testing this equipment, the equipment is no longer available to provide redundancy for its function within the plant. In summary, there is an increased potential for a unit trip during cable replacement due to physical damage to existing cables, during new cable terminations, and during testing equipment after new cables are installed.

PINGP determined the following (22-0179 DOC-035 Supplement 1 PUBLIC, provided as Exhibit___(NJD-1), Schedule 2):

Planned cable replacement during a scheduled refueling outage would extend the refueling unit outage by 45 days and the non-refueling outage unit would have an outage time of 48 days, a total of 93 outage days. The outage unit time extension was determined by utilizing the actual time incurred replacing cables and subtracting time for overlapping activities that would occur in performance of a normal refueling outage. The non-refueling outage period is significantly reduced from the actual time which occurred as a portion of the new cables could be installed while the unit is online. Based on my decades of experience in the industry, these time periods are reasonable.

An unplanned replacement after an emergent cable failure with one unit in a refueling outage would extend the outage for the refueling unit by 95 days and the tripped unit outage would be 101 days, a total of 196 outage days. These time frames were derived from the actual outage times replacing the cables and subtracting time for overlapping activities

that would occur in performance of a normal refueling outage. Based on my decades of experience in the industry, these time periods are reasonable.

An unplanned replacement after an emergent cable failure resulting in both units tripping and creating a dual unit outage with one unit experiencing an outage of 101 days and the other unit 107 days, total of 208 outage days. These time periods were derived from using the actual 101-day outage time replacing the cables on the non-refueling unit for both units and adding an additional 6 days for startup of the second unit. Based on my decades of experience in the industry, these time periods are reasonable.

PINGP and industry performance from 2018 to 2022 was also reviewed. The indicators reviewed demonstrated that PINGP over this time period had high standards in operation and maintenance, quality and thoroughness of the site's procedures and workforce, and was committed to safety and reliability.

Both units are in Column 1 of the NRC Reactor Oversight Process (ROP). The NRC uses the Reactor Oversight Process (ROP) to monitor, assess, and regulate the performance and safety of commercial nuclear power plants in the United States. Column 1 (also known as the "Licensee Response" Column) is reserved for nuclear plants with robust safety performance and no significant regulatory findings.

The operating performance of PINGP was noteworthy during this five-year period as there was only one unit trip (Unit 1 on 8/26/2020), whereas the industry over the same five years experienced an average of 2.25 trips/unit. Additionally, the average station capacity factor exceeded the industry average for each year during this period. Both performance measures have provided substantial benefit to customers. Minimizing these events is important, not only to enhance safety but also to ensure plant reliability and economic efficiency.

Conclusions

Based on my review of Xcel Energy documents and discussion with plant personnel, the decision to replace the cable bundle in the direct buried section with the damaged cables and install new cables from the switchyard was in the best interest of the plant and Xcel Energy's customers.

There was a high probability that cables in the direct buried section would have failed during future plant operation if not discovered during the boring activity. Outage times that were experienced to replace the cables were appropriate based on the scope of work to install new cables and the extensive testing that was required to ensure correct equipment operation. To maximize the benefit to the plant, Xcel Energy, and its customers, additional work was added to the outage scope on both units. Work added to Unit 1 improved unit reliability and unit performance.

Assuming that the cables were not damaged and were instead replaced in a future outage, PINGP provided for review three scenarios and their respective number of future outage days that would be avoided. These scenarios assumed a dual unit outage was required to complete cable replacement activities. This approach is valid to ensure no adverse challenges to plant operation and to nuclear safety. I review the Company's scenarios and, based on my decades of experience in the industry, the time periods Xcel Energy developed for them are reasonable.

PINGP performance from 2018 to 2022 was noteworthy, exceeded industry performance and provided substantial benefit to customers.