Direct Testimony and Schedule
Glenn D. Mathiasen

Before the Minnesota Public Utilities Commission
State of Minnesota

In the Matter of the Application of Northern States Power Company d/b/a Xcel Energy for a Certificate of Need for Additional Dry Cask Storage at the Monticello Nuclear Generating Plant Independent Spent Fuel Storage Installation in Wright County

Docket No. E002/CN-21-668
Exhibit___(GDM-1)

Radiological Impacts

March 1, 2023

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Schedule

I. INTRODUCTION AND QUALIFICATIONS

Q. PLEASE STATE YOUR NAME AND TITLE.

A. My name is Glenn D. Mathiasen. I am a Principal Health Physicist for the Monticello Nuclear Generating Plant (Monticello Plant or Plant) owned by Northern States Power Company d/b/a Xcel Energy (Xcel Energy or the Company).

Q. PLEASE SUMMARIZE YOUR QUALIFICATIONS AND EXPERIENCE.

A. I have worked for Northern States Power Company or Xcel Energy Services Inc. (XES) since 1969, initially as a Radiation Protection Technician. I then served as Supervisor Radiological Services (1982), Senior Corporate Health Physicist (1985), Plant Health Physicist (1988), Senior Plant Health Physicist (1992), and Principal Plant Health Physicist (1999 to present). My statement of qualifications is provided as Exhibit___(GDM-1), Schedule 1.

Q. WHAT ARE YOUR CURRENT RESPONSIBILITIES?

A. In my current role, I am responsible for oversight of internal and external dosimetry, environmental monitoring related to radiological impacts and radiation protection procedure reviews. I am also responsible for the department's implementation of the corrective action program, which is an ongoing Nuclear Regulatory Commission (NRC) requirement that applies to all nuclear plants.

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

A. The purpose of my Direct Testimony in this proceeding is to discuss the radiological impacts associated with the proposed expansion of the Independent Spent Fuel Storage Installation (ISFSI) at the Monticello Plant.

Q. WHICH SECTIONS OF THE CON APPLICATION ARE YOU SPONSORING?

A. I am sponsoring the following sections of the CON Application:

- 12.1 (Radioactive Wastes)
- 12.2 (Human Exposure to Radiation Due to Operation
- 12.7 (Heat Rejection)
- 13.1 (Management of Radioactive Materials)
- 13.2 (Contingency Plans for Accidental Release)
- 13.6 (Spill and Leak Prevention)
- 13.7 (Heat Rejection Reduction Methods)
- 13.9 (Environmental Monitoring)
- Appendices B-D

Q. HOW IS THE REMAINDER OF YOUR TESTIMONY ORGANIZED?

A. My testimony is organized as follows:

- *Section II*: I discuss radiological wastes from the proposed ISFSI expansion.
- *Section III*: I address the potential for human exposure to radiation from the proposed ISFSI expansion and the methods used to limit such potential exposure.
- *Section IV*: I discuss heat rejection issues associated with the proposed ISFSI expansion.
- *Section V*: Conclusion

II. RADIOACTIVE WASTES AND EMISSIONS

Q. WILL THE ISFSI EXPANSION LEAD TO THE GENERATION OF RADIOACTIVE WASTES?

A. No. As discussed in greater detail in the Application and in the Direct Testimony of Company witness Ms. Pamela Prochaska, the facility will store spent fuel in stainless steel canisters that are sealed closed by multiple weld layers before the canister leaves the reactor building to ensure that no radioactive materials can escape. The canisters are also helium leak-tested to a leak-tight criteria per ANSI N14.5. Further, the outer surface of the canister is decontaminated in compliance with the Plant's NRC license prior to leaving the reactor building to ensure that residual radioactive contamination is not released to the environment.

Q. WHAT IS THE RISK OF A LEAK FROM THE STORAGE CANISTERS THAT WOULD BE STORED IN THE ISFSI?

A. The canisters stored in the ISFSI will be licensed by the NRC. Analyses of normal, off-normal, and accident conditions in spent fuel storage system Safety Analysis Reports have determined that no credible conditions can breach the canister shell or fail the double seal welds at the canister closure.

Q. HAS THE NRC CONDUCTED AN ANALYSIS OF THE LIKELY CONSEQUENCES OF AN ACCIDENTAL RELEASE FROM AN ISFSI?

A. Yes. A generic analysis of potential on-site and off-site consequences of accidental releases associated with the operation of an ISFSI is contained in NUREG-1140, "A Regulatory Analysis on Emergency Preparedness for Fuel Cycle and Other Radioactive Material Licensees."

Q. WHAT DID THAT ANALYSIS SHOW?

A. The NUREG-1140 analysis concluded that the postulated accident involving an ISFSI has insignificant consequences to the public health and safety. The maximum dose to a member of the public off site due to an accidental release of radioactive materials under this scenario was calculated to be .003 roentgen equivalent man (rem) at 100 meters. The calculated dose is within the 1 rem effective dose equivalent EPA Protective Action Guideline and the 10 CFR 72.106 limit of 5 rem to the whole body or 50 rem to the maximally exposed organ from any design basis accident.

Q. ARE THERE ANY CONTINGENCY PLANS IN PLACE AT THE MONTICELLO PLANT IN THE CASE OF A RELEASE?

A. Yes. Under NRC requirements, an emergency plan is required for the Monticello spent fuel storage facility. The NRC-required emergency plan already in effect for the Monticello Plant is applied to the ISFSI. This plan describes the organization, assessment actions, activation of the emergency organization, notification procedures, emergency facilities, training, provisions for maintaining emergency preparedness, and recovery criteria for off-normal and accident conditions.

Q. WHAT DO YOU CONCLUDE ABOUT THE RISK OF EXPOSURE FROM A RELEASE OF RADIOACTIVE MATERIAL FROM THE ISFSI?

A. For the reasons discussed above, the risk associated with a release is very low. First, the cask system that will be used is unlikely to fail. Second, the risks to public health and safety posed by a release have been shown to be insignificant. Third, in the highly unlikely event of a release from the ISFSI, there is an emergency plan in place for the Monticello Plant that includes measures designed to address this situation.

III. EXPOSURE TO RADIATION

Q. WILL FACILITY PERSONNEL WORKING AT THE ISFSI RECEIVE INCREASED RADIATION EXPOSURE AS A RESULT OF THE EXPANSION?

A. Because there will be more spent fuel stored at the ISFSI, there would be an increase in dose rates and collective doses to MNGP personnel working near the ISFSI. The Company will adhere to NRC requirements regarding personnel exposure to radiation, ensuring that each worker's annual exposure is below the regulatory limit of 0.05 Sv [5 rem]. As with the initial ISFSI, there will be some exposure during spent fuel handling, canister loading, closure welding, spent fuel drying, onsite transport operations, and placement and storage of the canisters.

Q. WHAT DOES THE COMPANY DO TO MINIMIZE DOSES TO ITS WORKERS?

A. Workers are provided with dosimetry devices to measure and record radiation dose exposure. The NRC requires a radiation protection program for the ISFSI. The Company meets this requirement by applying the extensive NRC-required program in place for the Monticello Plant to the ISFSI.

Q. CAN YOU PROVIDE SOME MORE INFORMATION ON THE RADIATION PROTECTION PROGRAM?

A. The primary goal of the radiation protection program is to minimize exposure to radiation such that the total individual and collective exposure to personnel in all phases of operation and maintenance is kept As Low As Reasonably Achievable (ALARA). The ALARA program has three basic objectives:

1. Protection of personnel, including surveillance and control over internal and external radiation exposure, and ensuring that such exposure remains within permissible limits and ALARA;
2. Protection of the public, meaning that all activities related to shipment and storage of spent fuel are controlled by a monitoring plan, which I describe below, to ensure off-site doses are ALARA; and
3. Protection of the facility, including monitoring for physical changes that could lead to exposure hazards, and determining what changes or improvements are needed to maintain exposure ALARA.

The radiation protection staff at the Monticello Plant is responsible for, and has the necessary authority to, maintain occupational exposures as far below the specified limits as is reasonably achievable. The staff conducts periodic formal reviews of the radiation protection program to determine whether there are any additional reasonably achievable means to lower exposure, and modifications are made as appropriate. The program ensures that ISFSI personnel receive appropriate training, that safe operational procedures are enforced, and that adequate equipment and supplies for radiation protection work are provided.

Q. WHAT SORT OF RADIATION MONITORING IS IN PLACE AT THE ISFSI?

A. Federal Regulations require radiological alarm systems in accessible work areas, but the NRC has determined that storage confinement systems of acceptable design and construction that are sealed by welding do not require closure monitoring.

That said, there will be adequate radiological monitoring during canister handling activities through the use of portable survey instruments.

Additionally, there are thermo-luminescent dosimeters (TLDs) mounted on the ISFSI security fence as well as on the nearest Owner Controlled Area boundary fence to monitor cumulative direct radiation levels over a set time period as part of the environmental monitoring program. Additional TLDs will be added in the event the ISFSI is expanded.

Q. DOES THE STATE OF MINNESOTA CONDUCT ANY RADIATION MONITORING OF THE PLANT AND THE ISFSI?

A. Yes. The Minnesota Department of Health (MDH) monitors the MNGP ISFSI with two Geiger-Mueller tube-based dose rate monitors (DRM). The DRMs continuously measure and report levels of gamma radiation within the ISFSI. The MDH also monitors air and surface water, and conducts milk sampling. Ambient radiation dose levels are monitored using optically stimulated luminescence dosimeters.

Q. WHAT EFFECT WOULD THE EXPANSION HAVE ON RADIATION EXPOSURE EXPERIENCED BY PEOPLE WHO DO NOT WORK ON SITE, BUT LIVE NEAR THE ISFSI?

A. A calculation was performed to estimate the radiation levels assuming 14 additional casks of the same model type as the current casks are loaded into an expanded ISFSI, using fuel representative of the actual fuel in the Monticello Plant. The nearest residence to the ISFSI is 550 meters from the site. The calculation showed that the dose rate to that nearest resident would be 0.4 millirem (mrem)/year at the time the casks were loaded, which is indistinguishable from normal background levels. For comparison purposes, the NRC has determined that the annual average dose per person from all natural and man-made sources is about 620 mrem. It should also be remembered that once the spent fuel is loaded at the site, the dose rate will

decrease from that point forward due to the radioactive decay of the spent fuel.

IV. HEAT REJECTION

Q. WHAT IS THE ANTICIPATED HEAT LOAD ASSOCIATED WITH THE CANISTERS THAT WILL BE USED AT THE EXPANDED ISFSI?

A. Dry cask storage systems are passive with no active heat rejection required. By the time they are placed in the casks, the used fuel assemblies have decayed sufficiently such that natural conduction and convection is sufficient to remove the heat generated by the assemblies. Any cask design selected by the Company will be licensed by the NRC, and current NRC-licensed cask designs are designed and licensed for heat loading of 20-47 kW per cask.

Q. WILL ANY HEAT REJECTION REDUCTION METHODS BE PUT IN PLACE IN THE EXPANDED ISFSI?

A. No, because the heat load associated with the canisters will have no adverse impact on the local environment. Depending on the specific system design, some monitoring of air inlets and outlets or temperatures may be required.

V. CONCLUSION

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

A. Yes, it does.

Glenn Mathiasen, CHP, NRRPT

EDUCATION & CERTIFICATIONS

1978 — Passed credentialing exam for National Registry of Radiation Protection Technologists (NRRPT). The Radiation Protection Technologist is engaged in providing radiation protection to the radiation worker, the general public, and the environment from the harmful effects of ionizing radiation.

1983 — Saint Cloud State University, Saint Cloud MN
Bachelor Elective Studies, Business and Management

1985 — Granted the title of Certified Health Physicist (CHP) by the American Board of Health Physics, the certification board for health physicists in the United States. The CHP has a responsibility to act in the public interest, having due regard for the safety and health of the public and of individuals who may be affected by his/her work.

WORK EXPERIENCE

1999 - Present — Xcel Energy, Monticello, MN
Principal Health Physicist

- Personnel internal and external dosimetry oversight
- Onsite environmental monitoring oversight
- Department corrective action program
- Radiation protection procedure reviews

1988 - 1999 — Northern States Power, Monticello, MN
Senior Plant Health Physicist

- Implementation of revised 10 CFR 20
- Technical support in health physics related areas
- Incident investigations
- Dose calculations
- Station radiation protection plan maintenance

1985 - 1988 — Northern States Power, Minneapolis, MN
Senior Corporate Health Physicist

- Nuclear plant environmental monitoring program administration
- Nuclear plant radiation protection programs oversight

1982 - 1985 Northern States Power, Monticello, MN
Supervisor Radiological Services

- Radioactive material shipping coordination
- Plant emergency plan and implementing procedure development
- Coordination of ALARA program (As Low as Reasonably Achievable application to personnel radiation dose)

1969 - 1982 Northern States Power, Monticello, MN
Radiation Protection Technician

- Radiation surveys and radiological work oversight
- Procedure development
- Chemistry and radiochemistry analysis