



UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
WASHINGTON, D.C. 20555-0001

July 27, 2010

Mr. Mark A. Schimmel  
Site Vice President  
Prairie Island Nuclear Generating Plant  
Northern States Power Company - Minnesota  
1717 Wakonade Drive East  
Welch, MN 55089-9642

SUBJECT: PRAIRIE ISLAND NUCLEAR GENERATING PLANT, UNIT 2 – SAFETY  
EVALUATION RE: IRRADIATED FUEL MANAGEMENT PLAN AND  
PRELIMINARY DECOMMISSIONING COST ESTIMATE  
(TAC NOS. ME2480 AND ME2481)

Dear Mr. Schimmel:

By letter dated October 28, 2009 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML093020064), Northern States Power Company, a Minnesota corporation (NSPM, the licensee), doing business as Xcel Energy, submitted "Irradiated Fuel Management Plan and Preliminary Decommissioning Cost Estimates for Prairie Island Nuclear Generating Plant (PINGP)" for PINGP Unit 2 for review and approval. By letter dated April 26, 2010 (ADAMS Accession No. ML101170144), NSPM transmitted supplemental information in support of the application.

Following review of the submittals, the U.S. Nuclear Regulatory Commission (NRC) staff finds that the licensee's program for the long-term storage of spent fuel and the preliminary decommissioning cost estimate for PINGP Unit 2 is adequate and provides sufficient details associated with the funding mechanisms. The staff, therefore, concludes that the PINGP Unit 2, spent fuel management program complies with Title 10 of the *Code of Federal Regulations* (10 CFR) 50.54(bb), and approves the program on a preliminary basis. In addition, the NRC staff finds that the preliminary cost estimate for PINGP Unit 2 pursuant to 10 CFR 50.75(f)(3) is reasonable.

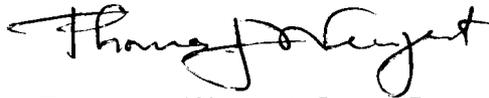
The NRC staff notes that the spent fuel management program analysis is based on a reported decommissioning trust fund (DTF) balance that can fluctuate over time. Should there be a material decline in the DTF balance, the staff's analysis and preliminary findings may no longer be valid, and the licensee would be obligated under 10 CFR 50.9 to update the DTF balance as well as any changes in projected costs. The NRC staff would expect the licensee to update its spent fuel management program to address any adverse material changes, in conjunction with the filing of the licensee's required report on the status of its decommissioning funding.

M. Schimmel

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If you have any questions regarding this letter, please contact me at (301) 415-4037.

Sincerely,

A handwritten signature in black ink, appearing to read "Thomas J. Wengert". The signature is written in a cursive style with a large, sweeping initial "T".

Thomas J. Wengert, Senior Project Manager  
Plant Licensing Branch III-1  
Division of Operating Reactor Licensing  
Office of Nuclear Reactor Regulation

Docket No. 50-306

Enclosure:  
Safety Evaluation

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UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
WASHINGTON, D.C. 20555-0001

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION  
IN SUPPORT OF THE REVIEW OF THE SPENT FUEL MANAGEMENT PROGRAM AND  
PRELIMINARY DECOMMISSIONING COST ESTIMATE  
PRAIRIE ISLAND NUCLEAR GENERATING PLANT, UNIT 2  
NORTHERN STATES POWER COMPANY - MINNESOTA  
DOCKET NO. 50-306

1.0 INTRODUCTION

Pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) Section 50.54(bb), nuclear power reactors that are within 5 years of expiration of their operating reactor license must submit a spent fuel management and funding program to the U.S. Nuclear Regulatory Commission (NRC) for review and preliminary approval. The program should discuss the means by which the licensee intends to manage and provide funding for the management of spent fuel until the fuel is transferred to the Department of Energy (DOE) for permanent disposal. In the same time period, the licensee is also required by 10 CFR 50.75(f)(3) to submit a preliminary cost estimate which includes an up-to-date assessment of the major factors that could affect the cost to decommission.

By letter dated October 28, 2009 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML093020064), Northern States Power Company, a Minnesota corporation (NSPM, the licensee), doing business as Xcel Energy, submitted "Irradiated Fuel Management Plan and Preliminary Decommissioning Cost Estimates for Prairie Island Nuclear Generating Plant (PINGP)." By letter dated April 26, 2010 (ADAMS Accession No. ML101170144), NSPM transmitted supplemental information in support of the application. The following sections document the NRC staff's findings resulting from the review of these submittals.

In its October 28, 2009, application, the licensee stated that NSPM fulfillment of the requirements of 10 CFR 50.54(bb) and 10 CFR 50.75(f)(3) for PINGP Unit 2 is also provided by Attachment 1 to its submittal dated August 8, 2008, entitled, "Decommissioning Cost Analysis for Prairie Island Nuclear Generating Plant, August 2008, by TLG Services, Inc" (ADAMS Accession No. ML082260425), as supplemented by its letters dated January 19, 2009 (ADAMS Accession No. ML090210156) and March 12, 2009 (ADAMS Accession No. ML090760499).

Enclosure

## 2.0 BACKGROUND

The PINGP site currently consists of two operating pressurized-water reactors, Units 1 and 2, which are each nominally rated to produce approximately 545 megawatts of electricity (MWe). PINGP is located on the west bank of the Mississippi River, and within the city limits of Red Wing, Minnesota. The site is located in Goodhue County, Minnesota.

The Nuclear Steam Supply System for each unit consists of a pressurized-water reactor and a two-loop reactor coolant system. The system comprises the reactor vessel and two closed reactor coolant loops connected in parallel to the reactor vessel, each containing a reactor coolant pump and a steam generator. An electrically heated pressurizer is connected to one of the loops. The components were supplied by the Westinghouse Electric Corporation, with each reactor rated at a net core power output of 1650 MW thermal. The steam and power conversion equipment, including the turbine-generator, have the capability to generate a gross unit output of 592 MWe. The reactor containment vessel is surrounded by a cylindrical shield building constructed of reinforced concrete, which serves as a radiation shielding for normal operations and for the loss-of-coolant condition. Heat produced in the reactor is converted to electrical energy by the plant's power conversion system. A turbine-generator converts the thermal energy of steam produced in the steam generators into mechanical shaft power and then into electrical energy. Based on seasonal limitations, heat is transferred to the environment either by the mechanical draft cooling towers, discharge to the river, or a combination of both.

The licensee's projected cost to decommission PINGP Unit 2 is estimated to be \$816.8 million in 2009 dollars, with radiological costs estimated to be \$553.5 million. The licensee stated that the estimate incorporates a minimum cooling period for the spent fuel that resides in the storage pool when operations cease. Any residual fuel remaining in the pool after the cooling period will be relocated to the independent spent fuel storage installation (ISFSI) to await transfer to a DOE facility. The estimate also includes the dismantling of site structures and non-essential facilities, and the limited restoration of the site.

An ISFSI is currently operating on the PINGP site. The facility will contain 29 Transnuclear dry storage casks after 40 years of operation. An additional 39 Transnuclear casks will be purchased to accommodate all residual fuel remaining in the pool after final shutdown. Transfer of all spent fuel post-shutdown will require 15 years, to allow for radioactive decay to decrease heat loading. Spent fuel is expected to be completely removed from the site by 2053. The NRC staff's assessment below addressed PINGP Unit 2 only. An evaluation of PINGP Unit 1 was performed previously, and documented in the NRC staff's safety evaluation dated June 1, 2009 (ADAMS Accession No. ML091200541).

## 3.0 REGULATORY REQUIREMENTS AND CRITERIA

### 3.1 Regulatory Requirement (10 CFR 50.54(bb))

Pursuant to 10 CFR 50.54(bb), "For nuclear power reactors licensed by the NRC, the licensee shall, within 2 years following permanent cessation of operation of the reactor or 5 years before expiration of the reactor operating license, whichever comes first, submit written notification to the Commission for its review and preliminary approval of the program by which the licensee intends to manage and provide funding for the management of all irradiated fuel at the reactor

following permanent cessation of the reactor until title to the irradiated fuel and possession of the fuel is transferred to the Secretary of Energy for its ultimate disposal in a repository...”

### 3.1.1 Criteria to Support the 10 CFR 50.54(bb) Review

For the NRC to evaluate and provide preliminary approval of the spent fuel management and funding program, the submittal should include:

- Estimated cost to isolate the spent fuel pool and fuel handling systems. For the DECON option, the cost to isolate the spent fuel pool and fuel handling systems may be considered part of the preparation for DECON
- Estimated cost to construct an ISFSI or a combination of wet/dry storage
- Estimated annual cost for the operation of the selected option (wet or dry storage or a combination of the two) until DOE takes possession of the fuel
- Estimated cost for the preparation, packaging, and shipping of the fuel to DOE
- Estimated cost to decommission the spent fuel storage facility
- Brief discussion of the selected storage method or methods and the estimated time periods for these activities.

### 3.2 Regulatory Requirement (10 CFR 50.75(f)(3) and (f)(5))

Section 10 CFR 50.75(f)(3) requires that a licensee “...shall at or about 5 years prior to the projected end of operations submit a preliminary decommissioning cost estimate [herein referred to as the preliminary cost estimate] which includes an up-to-date assessment of the major factors that could affect the cost to decommission.”

Section 50.75(f)(5) requires a licensee to include plans to adjust decommissioning funding levels to demonstrate a reasonable level of financial assurance, if necessary, in the preliminary cost estimate.

#### 3.2.1 Criteria to Support the 10 CFR 50.75(f)(3) Review

Regulatory Guide 1.202, entitled “Standard Format and Content of Decommissioning Cost Estimates for Nuclear Power Reactors,” and NUREG-1713, entitled “Standard Review Plan for Decommissioning Cost Estimates for Nuclear Power Reactors,” Section C1, provide additional guidance on the information that is to be addressed in the preliminary cost estimate. The principal factors to be addressed are:

- Decommissioning option/method anticipated
- Potential for known or suspected contamination of the facility or site
- Low-level radioactive waste (LLW) disposition plan
- Preliminary schedule of decommissioning activities
- Any other factors that could significantly affect the cost to decommission

The cost estimate should provide costs for each of the following:

- Pre-decommissioning engineering and planning - decommissioning engineering and planning prior to completion of reactor defueling
- Reactor deactivation - deactivation and radiological decontamination of plant systems to place the reactor into a safe, permanent shutdown condition
- Safe storage - safe storage monitoring of the facility until dismantlement begins (if storage or monitoring of spent fuel is included in the cost estimate, it should be shown separately)
- Dismantlement - radiological decontamination and dismantlement of systems and structures required for license termination (if demolition of uncontaminated structures and site restoration activities are included in the cost estimate, they should be shown separately)
- LLW disposition - LLW packaging, transportation, vendor processing, and disposal.

#### 4.0 EVALUATION

##### 4.1 Evaluation of the Program to Manage and Provide Funding of all Irradiated Fuel

The licensee estimated the costs associated with the long-term management of the Unit 2 spent fuel to be \$209.86 million (2009 dollars). The long-term management of the spent fuel for PINGP Unit 2 is divided between an initial storage of the fresh core, as well as the most recent fuel cycles following shutdown to provide the cooling for the final core and transfer to an ISFSI. The licensee estimates that the spent fuel pool will remain operational for a minimum of 15 years. After shutdown, the first period of an estimated 20 months will be used for isolation of the spent fuel pool and supporting fuel handling systems at a total estimated cost for the period of \$17.0-\$18.0 million. The next period has an estimated duration of 16 years and a total estimated cost of approximately \$100.0 million, which includes transferring the fuel to the ISFSI. Following this period, the fuel will be stored in the ISFSI until the fuel is transferred to DOE. The licensee estimated that fuel transfer would begin in 2028, with completion of the fuel transfer to DOE in 2053, and estimated the annual cost associated with dry storage for the period from 2031 to 2053 to be approximately \$3.4 million. The licensee stated that, following transfer of the fuel to DOE, the ISFSI will be decontaminated and dismantled in 2054 at an estimated cost of \$7.4 million.

The licensee is currently seeking license renewal for PINGP. However, if a renewed license for PINGP Unit 2 is not issued and if PINGP ceases operation in 2014, the licensee has committed to comply with existing licensing requirements, including the operation and maintenance of the systems and structures needed to support continued operation of the spent fuel pool. PINGP's costs include the cost of expanding the ISFSI to have storage capacity to store all spent fuel.

The NRC staff finds the spent fuel management program estimates to be reasonable, based on a cost comparison with similar decommissioning reactors, while acknowledging that there are large uncertainties and potential site-specific variances.

As of December 31, 2009, the licensee had \$29.86 million in a separate subaccount in the decommissioning trust fund (DTF) with projected annual contributions of \$0.394 million (2009 dollars) for the period from 2010 - 2014, and projected annual contributions of \$16.8 million (2009 dollars) for the period from 2015 - 2024. The licensee applied a real rate of return of 3.41 percent based on the approval by the Minnesota Public Utilities Commission, as documented in its April 26, 2010 supplemental letter.

In summary, the licensee estimated that the total costs associated with the long-term management of the Unit 2 spent fuel will be \$209.8 million. This estimate is based on transfer of fuel to DOE to start in 2028 and to be completed in 2053, with decommissioning of the ISFSI to be completed in 2054. The spent fuel management and funding program estimated the cost for the storage, security, and insurance to store the fuel, the cost to purchase, load, and transfer the fuel storage canisters, as well as the decommissioning cost of the ISFSI. The licensee asserts that the total funds contributed will cover the \$209.8 million estimated cost for spent fuel management.

The NRC staff has reviewed the licensee's submittals and finds that the licensee's spent fuel program addresses the principal areas related to the management and funding of the spent fuel program and preliminarily approves the PINGP's spent fuel management program.

#### 4.2 Evaluation of the Preliminary Decommissioning Cost Estimate

The licensee has estimated the total radiological decommissioning cost of PINGP Unit 2 to be approximately \$553.5 million in 2009 dollars. The licensee has elected to immediately dismantle PINGP Unit 2, although the licensee has stated that, before transferring all of the spent fuel post-shutdown, the fuel will be required to remain in the spent fuel pool for 15 years to decrease the heat loading before transferring the fuel to the ISFSI. Because of the time required for fuel cooling in wet storage and the time required to transfer the fuel to the ISFSI, other than the spent fuel pool and supporting systems, the remaining part of the facility will have been decommissioned and will essentially be in safe storage (SAFSTOR) until the transfer of the fuel to the ISFSI is completed.

Prior to starting the detailed review of the cost estimate, the NRC staff reviewed the estimate to confirm that the supporting systems/structures necessary to support fuel pool operations had been identified in the estimate. The validity of the cost estimate is based on a reasonable estimate of the cost to decommission the supporting systems and structures, as well as confirming that all the major equipment necessary to support operation was included.

The licensee has divided the estimated total cost of \$553.5 million into the following principal categories: 1) decontamination costs; 2) support systems/component removal; 3) packaging; 4) transportation; 5) waste disposal; 6) program management; 7) insurance and regulatory fees; 8) miscellaneous equipment costs; 9) property taxes; 10) energy costs; 11) characterization and licensing surveys; and 12) site and operation and maintenance costs. In addition, the licensee included a timeline and an annual cost projection that identify when these activities will take place, and the costs associated with each of these items.

The TLG Engineering, Inc. cost estimate developed for PINGP has identified contingency factors for the major activities that range from 15 percent to as high as 75 percent for an activity, and an overall contingency factor of 17.2 percent for Unit 2. In addition, the NRC staff reviewed the

work difficulty factors used for the TLG cost estimate and found them to be reasonable. The NRC staff reviewed Appendix A and Appendix B of TLG's cost estimate, which listed the unit cost factors that were used to develop the decommissioning cost, and concluded that the unit cost factors were consistent with other cost estimates and within a reasonable range.

The NRC staff also recognizes that a significant uncertainty exists regarding the low-level waste disposal cost, since Barnwell no longer accepts waste from Non-Atlantic Compact members; the NRC staff concluded that the waste volume estimates were in a reasonable range.

For disposal cost estimating purposes, the disposal rate is not unreasonable, based on the mix of waste and available disposal options. However, when new disposal facilities become available, or if the South Carolina disposal site reopens to members outside its Compact, disposal rates will likely be significantly higher. In addition, the DTF balance could be subject to decline, at least in the short run. The licensee's decommissioning cost analysis was based on a DTF balance for radiological decommissioning of \$385.0 million as of December 31, 2009. The NRC staff allowed an earnings credit, as stated by the licensee, to reflect a period of safe storage while the fuel remained in the pool for cooling. If there is change in the DTF balance that materially impacts the licensee's cost analysis, or if new disposal rates are significantly higher, the licensee would be obligated under 10 CFR 50.9 to update any changes in the projected cost or available funds.

The NRC staff finds that the preliminary cost estimate to decommission PINGP Unit 2 is reasonable.

## 5.0 CONCLUSION

The NRC staff finds that PINGP's program for the long-term storage of spent fuel and the preliminary cost estimate are adequate and provide sufficient details associated with the funding mechanisms. The staff therefore concludes that the licensee's spent fuel management program for PINGP Unit 2 complies with 10 CFR 50.54(bb) and approves the program on a preliminary basis. In addition, the NRC staff finds that the preliminary cost estimate for PINGP Unit 2 complies with the requirements of 10 CFR 50.75(f)(3) and the staff finds that the preliminary cost estimate for PINGP Unit 2 is reasonable.

However, if there are changes in the DTF balance that materially impact the licensee's cost analysis, or if new disposal rates are significantly higher, the licensee would be obligated under 10 CFR 50.9 to update any changes in the projected cost or available funds.

The licensee's previous submittal dated August 8, 2008, provided cost information for both Unit 1 and Unit 2. However, since the expiration dates of their respective operating licenses are different, Unit 1 and Unit 2 were evaluated separately by the NRC staff, due to possible significant changes in the decommissioning cost and the DTF balance. The foregoing evaluation applies to Unit 2 only.

Principal Contributor: C. Pittiglio, NRR

Date: July 27, 2010

M. Schimmel

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If you have any questions regarding this letter, please contact me at (301) 415-4037.

Sincerely,

**/RA/**

Thomas J. Wengert, Senior Project Manager  
Plant Licensing Branch III-1  
Division of Operating Reactor Licensing  
Office of Nuclear Reactor Regulation

Docket No. 50-306

Enclosure:  
Safety Evaluation

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