



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

June 1, 2009

Mr. Michael D. Wadley
Site Vice President
Prairie Island Nuclear Generating Plant
Northern States Power - Minnesota
1717 Wakonade Drive East
Welch, MN 55089

SUBJECT: PRAIRIE ISLAND NUCLEAR GENERATING PLANT, UNITS 1 AND 2 – SAFETY EVALUATION RE: SPENT FUEL MANAGEMENT PROGRAM AND PRELIMINARY DECOMMISSIONING COST ESTIMATE (TAC NOS. MD9492, MD9493, MD9494, AND MD9495)

Dear Mr. Wadley:

By letter dated August 8, 2008 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML082260425), Nuclear Management Company, LLC, a predecessor license holder to Northern States Power Company, a Minnesota corporation (NSPM, the licensee), submitted "Irradiated Fuel Management Plan and Preliminary Decommissioning Cost Estimates for Prairie Island Nuclear Generating Plant (PINGP)" for review and approval. By letters dated January 19, 2009 (ADAMS Accession No. ML090210156), and March 12, 2009 (ADAMS Accession No. ML090760499), NSPM transmitted supplemental information in support of the application.

Following review of the submittals, the 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 1 is adequate and provides sufficient details associated with the funding mechanisms. The staff, therefore, concludes that the PINGP Unit 1, 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 staff finds that the preliminary cost estimate for PINGP Units 1 and 2 pursuant to 10 CFR 50.75(f)(3) is reasonable.

Although the licensee provided cost information for both Unit 1 and Unit 2, the expiration of the operating license for PINGP Unit 2 is not until October 29, 2014. Therefore, due to possible significant changes in cost and the decommissioning trust fund (DTF) balance by the time Unit 2 reaches 5 years before expiration of its license, the NRC staff's assessment is based on and covers only Unit 1.

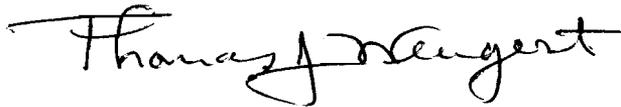
The NRC staff notes that the spent fuel management program analysis is based on a reported DTF balance that can fluctuate over time. Should there be a material decline in the DTF balance, the staff's analysis and preliminary findings may no longer be valid, and the licensee would be under an obligation 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. Wadley

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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 that reads "Thomas J. Wengert". The signature is written in a cursive style with a prominent horizontal line across the middle.

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

Docket Nos. 50-282 and 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

RELATED TO SPENT FUEL MANAGEMENT PROGRAM AND

THE PRELIMINARY DECOMMISSIONING COST ESTIMATE

NORTHERN STATES POWER COMPANY

PRAIRIE ISLAND NUCLEAR GENERATING PLANT, UNIT 1

DOCKET NO. 50-282

1.0 INTRODUCTION

Pursuant to Title 10 of the *Code of Federal Regulations* (CFR) Section 50.54(bb), nuclear power plants that are within 5 years of expiration of their operating 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 the reactor.

By letter dated August 8, 2008 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML082260425), Nuclear Management Company, LLC, a predecessor license holder to Northern States Power Company, a Minnesota corporation (NSPM, the licensee), submitted "Irradiated Fuel Management Plan and Preliminary Decommissioning Cost Estimates for Prairie Island Nuclear Generating Plant (PINGP)." By letters dated January 19, 2009 (ADAMS Accession No. ML090210156), and March 12, 2009 (ADAMS Accession No. ML090760499), 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.

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 522 megawatts of electricity (MWe). PINGP is located on the west bank of the Mississippi River, and within the city limits of Red Wing. The site is in Goodhue County, Minnesota.

The Nuclear Steam Supply System 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 the reactor rated at a net core power output of 1650 megawatts 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 is estimated at \$1,514 million in 2008 dollars. 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 is 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 Prairie Island 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.

Although the licensee provided cost information for both Unit 1 and Unit 2, the expiration of the operating license for PINGP Unit 2 is not until October 29, 2014. Therefore, due to possible significant changes in cost and the decommissioning trust fund (DTF) balance by the time Unit 2 reaches 5 years before expiration of its license, the NRC staff's assessment is based on and covers only Unit 1.

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 occurs 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 operation 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 staff 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 (as described on page viii of xv of Attachment 1 of the August 8, 2008, submittal), 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 the DOE takes possession of the fuel;
- Estimated cost for the preparation, packaging, and shipping of the fuel to the DOE;
- Estimated cost to decommission the spent fuel storage facility; and
- Brief discussion of the selected storage method or methods, and the estimated time 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

NUREG-1713, entitled "Standard Review Plan for Decommissioning Cost Estimates for Nuclear Power Reactors," Section C1 provides 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; and
- 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); and
- 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

In its submittal, the licensee provided the estimated cost information identified in Section 3.1.1 above. As required by 10 CFR 50.54(bb), the licensee estimated the Unit 1 costs associated with the long-term management of spent fuel at \$200.1 million (note: all dollar values identified in this evaluation are indicated in 2008 dollars). The long-term management of the spent fuel for PINGP Unit 1 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 shut down, the first 20 months will be used for isolation of the spent fuel pool and supporting fuel handling systems at a total estimated cost of \$17.0 - \$18.0 million for the period. 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 the DOE. The licensee estimated that fuel transfer would begin in 2028, with completion of the fuel transfer to the DOE in 2053, and estimated the annual cost associated with dry storage for the period from 2031 to 2053 at \$3.3 million. The licensee stated that, following transfer of the fuel to the DOE, the ISFSI will be decontaminated and dismantled.

In April 2008, the licensee filed an application for license renewal for PINGP Units 1 and 2. That application is currently the subject of adjudication before the Atomic Safety and Licensing Board. If renewed licenses for PINGP Units 1 and 2 are not issued and PINGP ceases operation in 2013, 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 costs also include the cost of expanding the ISFSI to have sufficient 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, 2007, the licensee had \$26.4 million in a separate subaccount in the DTF with projected annual contributions of \$2.262 million for the period from 2009 - 2013, and projected annual contributions of \$13.5 million for the period from 2014 - 2028, and a \$10.0 million contribution in 2029. The licensee applied a real rate of return of less than 2.0 percent.

In summary, the licensee estimated that the total costs associated with the long-term management of spent fuel will be \$200.1 million for the DECON option. This estimate is based on the 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 total funds contributed will cover the \$200.1 million estimated cost for spent fuel management.

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

4.2 Evaluation of the Preliminary Decommissioning Cost Estimate

The licensee estimated the total decommissioning cost of PINGP to be approximately \$487.9 million in 2008 dollars. The licensee has elected to immediately dismantle PINGP Unit 1, although the licensee has stated that, before transferring the all 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 combined with 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 SAFSTOR (as described on page viii of xv of Attachment 1 of the August 8, 2008, submittal) 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 of the major equipment necessary to support operation was included. The licensee's submittal included the estimated cost information identified in Section 3.2.1 above.

The licensee has divided the estimated total cost of \$487.9 million into the following principal categories: decontamination costs; support systems/component removal; packaging; transportation; waste disposal; program management; insurance and regulatory fees; miscellaneous equipment costs; property taxes; energy costs; characterization and licensing surveys; and site and operating and maintenance costs. In addition, the licensee included a time line and an annual cost projection that identifies when these activities will take place, and the costs associated with each of these items.

The TLG Engineering, Inc., cost estimate developed for PINGP 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 17.0 percent for Unit 1. 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 in a reasonable range.

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

For disposal cost estimating purposes, the disposal rate is reasonable based on the mix of waste and the 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 the DTF balance for radiological decommissioning of \$370.2 million as of December 31, 2007. The 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, given these considerations, the licensee would be under an obligation under 10 CFR 50.9 to update any changes in the projected cost or available funds.

The NRC staff finds the preliminary cost estimate to decommission PINGP Unit 1 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 for PINGP 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 complies with 10 CFR 50.54(bb) and approves the program on a preliminary basis. In addition, the staff finds that the preliminary cost estimate for PINGP complies with the requirements of 10 CFR 50.75(f)(3) and the staff finds that the preliminary cost estimate for PINGP Unit 1 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, given these considerations, the licensee would be under an obligation under 10 CFR 50.9 to update any changes in projected cost, or available funds.

Although the licensee's submittals provided cost information for both Unit 1 and Unit 2, the expiration of the operating license for PINGP Unit 2 is not until October 29, 2014. Therefore, due to possible significant changes in cost and the DTF balance by the time Unit 2 reaches 5 years before expiration of its license, the NRC staff's assessment is based on and covers only Unit 1.

Principal Contributor: C. Pittiglio, NRR

Date: June 1, 2009

M. Wadley

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If you have any questions regarding this letter, please contact me at (301) 4154037.

Sincerely,

/RA/

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

Docket Nos. 50-282 and 50-306

Enclosure:
Safety Evaluation

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