



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

September 25, 2009

Mr. Stewart B. Minahan  
Vice President-Nuclear and CNO  
Nebraska Public Power District  
72676 648A Avenue  
Brownville, NE 68321

SUBJECT: COOPER NUCLEAR STATION – DECOMMISSIONING COST ANALYSIS AND PROGRAM FOR MAINTENANCE OF IRRADIATED FUEL (TAC NOS. ME1264 AND ME1269)

Dear Mr. Minahan:

By letter dated December 15, 2008, Nebraska Public Power District (NPPD, the licensee) submitted its Decommissioning Cost Analysis for Cooper Nuclear Station (CNS) pursuant to the requirements of Title 10 of the *Code of Federal Regulations* (10 CFR) Section 50.75(f)(3), "Reporting and recordkeeping for decommissioning planning." Also, by letter dated December 23, 2008, NPPD submitted its Program for Maintenance of Irradiated Fuel for CNS pursuant to the requirements of 10 CFR 50.54(bb), "Conditions of licenses." NPPD provided supplemental information to its submittals by letter dated July 20, 2009.

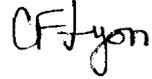
Based on its review of the licensee's submittals, the Nuclear Regulatory Commission staff concludes that the licensee's spent fuel management program for CNS complies with 10 CFR 50.54(bb) and, therefore, approves the program on a preliminary basis. In addition, the staff finds that the preliminary cost estimate for CNS is reasonable and complies with the requirements of 10 CFR 50.75(f)(3). However, if there are changes in the decommissioning trust fund balance that materially impact the licensee's cost analysis, the licensee would be obligated under 10 CFR 50.9 to update its projected costs and available funds. Similarly, the 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. Details of the staff's review are included in the enclosed evaluation.

S. Minahan

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If you have any questions regarding this matter, please contact me at (301) 415-2296 or Fred.Lyon@nrc.gov.

Sincerely,

A handwritten signature in black ink that reads "CF Lyon". The letters are cursive and somewhat stylized.

Carl F. Lyon, Project Manager  
Plant Licensing Branch IV  
Division of Operating Reactor Licensing  
Office of Nuclear Reactor Regulation

Docket No. 50-298

Enclosure:  
As stated

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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 THE PROGRAM FOR MAINTENANCE OF IRRADIATED FUEL

AND THE DECOMMISSIONING COST ANALYSIS

FACILITY OPERATING LICENSE NO. DPR-46

NEBRASKA PUBLIC POWER DISTRICT

COOPER NUCLEAR STATION

DOCKET NO. 50-298

1.0 INTRODUCTION

Pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR), Section 50.54(bb), "Conditions of licenses," a licensee that is within 5 years of the expiration of its operating license for a nuclear power plant must submit a spent fuel management and funding program to the 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), "Reporting and recordkeeping for decommissioning planning," to submit a preliminary decommissioning 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 December 15, 2008 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML083580119), Nebraska Public Power District (NPPD, the licensee) submitted its Decommissioning Cost Analysis for Cooper Nuclear Station (CNS) pursuant to the requirements of 10 CFR 50.75(f)(3). Also, by letter dated December 23, 2008 (ADAMS Accession No. ML083650343), NPPD submitted its Program for Maintenance of Irradiated Fuel for CNS pursuant to the requirements of 10 CFR 50.54(bb). NPPD provided supplemental information to its submittals by letter dated July 20, 2009 (ADAMS Accession No. ML092050203). The following sections document the NRC staff's conclusions resulting from the review of these submittals.

2.0 BACKGROUND

CNS is a single unit facility located on the west bank of the Missouri River between the villages of Brownville and Nemaha, Nebraska. CNS is owned and operated by NPPD, a public corporation and political subdivision of the State of Nebraska engaging in generation,

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transmission, distribution, and sale of electric energy. The station is comprised of a single cycle, forced circulation, boiling-water reactor designed by the General Electric Company, producing steam for direct use in the steam turbine. The original supporting facilities were engineered and constructed by Burns and Roe, Inc. The reactor vessel and the recirculation piping system are contained within the drywell of a pressure suppression system housed within the Reactor Building. The pressure suppression system consists of a drywell, a pressure suppression chamber which stores a large volume of water and a connecting submerged vent system between the drywell and water pool, isolation valves, containment cooling systems, and other service equipment. The Reactor Building encloses the primary containment system thereby providing a secondary containment. Heat produced in the reactor is converted to electrical energy by the power conversion system. A turbine-generator system converts the thermal energy of the steam produced in the reactor into mechanical shaft power and then into electrical energy. The turbine consists of one high-pressure, double-flow turbine element, and two low-pressure, double-flow turbine elements all aligned in tandem. The turbine is operated in a closed feedwater cycle, which condenses the steam; the heated feedwater is returned to the reactor. Based upon the licensed power of 2419 Megawatts thermal, CNS's generating capacity is approximately 830 Megawatts electric (MWe). The circulating water system provides the heat sink required for removal of waste heat in the power plant's thermal cycle. Circulating water is drawn from the Missouri River, with heated cooling water returned to the river.

### 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 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 licensee's submittal should include:

- Estimated cost to isolate the spent fuel pool and fuel handling systems;
- 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 Requirements (10 CFR 50.75(f)(3) and (f)(5))

Pursuant to 10 CFR 50.75(f)(3), "Each power reactor 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, "Standard Review Plan for Decommissioning Cost Estimates for Nuclear Power Reactors" (ADAMS Accession No. ML043510113), Section C.1, provides additional guidance on the information 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 (SAFSTOR) - 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

As required by 10 CFR 50.54(bb), NPPD estimated the costs associated with the long-term management of spent fuel for CNS at \$195.39 million (note: all dollar values identified in this evaluation are indicated in 2008 dollars). The long-term management of the spent fuel for CNS is divided between an initial storage of the fresh core, as well as the spent fuel for the most recent fuel cycles following permanent shutdown, to provide the cooling for the final core and transfer to an independent spent fuel storage installation (ISFSI). The licensee estimates that the spent fuel pool will remain operational for an estimated 5-6 years, with the projected end of wet storage operations to end in 2019. Following this period, the fuel will be stored in the ISFSI, which is currently under construction, until the fuel is transferred to the DOE. NPPD projected that DOE would begin receiving spent fuel in 2020, with the first assembly removed from CNS's ISFSI in 2027. NPPD estimated that the last assembly will be leaving CNS in 2046, with an estimated annual cost of \$3.3 million associated with dry storage for the period from 2020 to 2046. Following transfer of the fuel to the DOE, the ISFSI will be decontaminated and dismantled at a cost of \$2.29 million in the period from 2070-2073. CNS is projected to generate 4,098 assemblies through the end of its current licensed operation in 2014, which includes 1,054 assemblies in storage at General Electric Company's wet-pool Independent Fuel Storage Installation in Morris, Illinois.

The licensee submitted an application on September 24, 2008 (ADAMS Accession No. ML083030227), for renewal of the operating license for CNS, which is currently under review by the NRC staff. The licensee stated in its December 23, 2008, submittal that it will continue 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, if CNS ceases operation in 2014. NPPD stated that the ISFSI currently under construction will have sufficient storage capacity to store all of its spent fuel. The licensee projected that 16 multi-purpose canisters (MPCs) would be placed in storage on the ISFSI prior to shutdown, and an additional 34 MPCs would be placed in storage on the ISFSI after shutdown.

In the licensee's December 23, 2008, submittal, NPPD acknowledged the necessity for an exemption, in accordance with 10 CFR 50.12, from the requirements of 10 CFR 50.82(a)(8)(i)(A) in order to use the decommissioning trust funds for spent fuel management expenses, since the rule allows withdrawals of decommissioning funds only as defined in 10 CFR 50.2. As of December 31, 2008, NPPD has a trust fund balance of \$425.9 million. NPPD has an approved real rate of return of 2.5 percent and based its analysis on a trust fund balance of \$403.4 million, making NPPD's analysis conservative. The licensee demonstrated in its December 23, 2008, submittal, Table 5, "Cooper Nuclear Station Decommissioning Funding Plan, Scenario 3: 2014 Shutdown, SAFSTOR Alternative," that, in applying the 2.5 percent real rate of return and deducting the expenses associated with license termination (Column A) and

spent fuel management (Column B), sufficient funds are available to address both the spent fuel management and decommissioning costs.

The NRC staff concludes that the licensee's spent fuel program addresses the principal areas related to the management and funding of the spent fuel and preliminarily approves NPPD's spent fuel management program, assuming NRC approval of an exemption from the requirements of 10 CFR 50.82(a)(8)(i)(A).

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

NPPD estimated in its July 20, 2009, supplemental letter that the radiological decommissioning cost for CNS would be approximately \$674.9 million in 2008 dollars. NPPD has elected to use the SAFSTOR option. The licensee summarized its annual expenses associated with license termination and spent fuel management in its December 23, 2008, submittal, Table 5, "Cooper Nuclear Station Decommissioning Funding Plan, Scenario 3: 2014 Shutdown, SAFSTOR Alternative."

Prior to starting the detailed review of the cost estimate, the NRC staff reviewed the estimate to confirm the supporting systems/structures necessary to support the safe operation 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 has divided the estimated total radiological cost of \$674.9 million into the following principal categories: radioactive component removal, decontamination and dismantlement, packaging, management and engineering (staffing) support, low-level waste disposal, and administrative costs. In addition, the licensee has included a timeline and annual cost projection that identifies when these activities will take place, and the cost associated with each of these items. The cost estimate developed for CNS applied an average weighted contingency factor for the major activities of 16.8 percent. The contingency factors were as high as 75 percent for reactor segmentation, and 50 percent for decontamination.

In addition, the NRC staff reviewed the work difficulty factors used for the licensee's contractor's cost estimate, which was provided in the licensee's December 15, 2008, submittal, and found they were reasonable. The staff reviewed Appendices A, B, and E of the contractor's cost estimate, which listed the unit cost factors that were used to develop the decommissioning cost. Appendix E listed the work difficulty adjustment factors. The staff concluded that the unit cost factors and work difficulty adjustment factors were consistent with other cost estimates and in a reasonable range. The staff also recognizes that a significant uncertainty exists regarding the low-level waste disposal cost, since the Barnwell LLW disposal facility is no longer accepting waste from Non-Atlantic compact members. The NRC staff concluded that the waste volume estimates were reasonable.

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 Barnwell disposal site reopens to members outside its compact, disposal rates will likely be significantly higher. In addition, the decommissioning trust fund (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 \$425.9 million as of March 24, 2009. The staff allowed an earnings credit of 2.5 percent, as stated by the licensee thru the SAFSTOR period, and deducted the annual expenses. 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 and available funds.

Based on the above, the NRC staff concludes that the licensee's preliminary cost estimate to decommission CNS is reasonable.

## 5.0 CONCLUSION

Based on its review of the licensee's submittals, the NRC staff concludes that the licensee's spent fuel management program for CNS complies with 10 CFR 50.54(bb) and, therefore, approves the program on a preliminary basis. In addition, the staff finds that the preliminary cost estimate for CNS is reasonable and complies with the requirements of 10 CFR 50.75(f)(3). However, if there are changes in the decommissioning trust fund balance that materially impact the licensee's cost analysis, the licensee would be obligated under 10 CFR 50.9 to update its projected costs and available funds. Similarly, the 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.

Principal Contributor: Clayton L. Pittiglio

Date: September 25, 2009

S. Minahan

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If you have any questions regarding this matter, please contact me at (301) 415-2296 or Fred.Lyon@nrc.gov.

Sincerely,

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Carl F. Lyon, Project Manager  
Plant Licensing Branch IV  
Division of Operating Reactor Licensing  
Office of Nuclear Reactor Regulation

Docket No. 50-298

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