



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

August 23, 2023

Mr. Rod L. Penfield  
Site Vice President  
Energy Harbor Nuclear Corp.  
Perry Nuclear Power Plant  
P.O. Box 97, SB306  
Perry, OH 44081-0097

SUBJECT: PERRY NUCLEAR POWER PLANT, UNIT NO. 1 – SAFETY EVALUATION  
RE: IRRADIATED FUEL MANAGEMENT PLAN AND PRELIMINARY  
DECOMMISSIONING COST ESTIMATE (EPID L-2023-LLL-0007)

Dear Mr. Penfield:

The U.S. Nuclear Regulatory Commission (NRC) staff has completed its review of Energy Harbor Nuclear Corp.'s (EHNC or the licensee) letter dated November 1, 2021 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML21305A781). In accordance with Title 10 of the *Code of Federal Regulations* (10 CFR) Section 50.54(bb), the licensee submitted this letter to provide the irradiated fuel management plan (IFMP) for Perry Nuclear Power Plant, Unit No. 1 (PNPP). By letter dated March 29, 2021 (ML21088A295), EHNC submitted to the NRC the decommissioning trust fund (DTF) financial status report in accordance with 10 CFR 50.75(f)(1). The licensee states that it provided the PNPP site-specific decommissioning cost estimate (DCE) in Enclosure C of the March 29, 2021, letter, to meet the requirement to submit a preliminary DCE 5 years prior to the projected end of operations in accordance with 10 CFR 50.75(f)(3). By letter dated March 31, 2023 (ML23090A233), EHNC provided an updated DTF financial status report. An updated preliminary DCE was provided as Enclosure A of the March 31, 2023, letter. These submittals address how EHNC will meet the requirements for PNPP set forth in 10 CFR 50.54(bb) and 10 CFR 50.75(f)(3).

The NRC staff finds that PNPP's program for the long-term storage of irradiated fuel is adequate and provides sufficient details associated with the funding mechanisms. The staff therefore concludes that the PNPP IFMP complies with 10 CFR 50.54(bb) and approves the program on a preliminary basis. In addition, the staff finds that the preliminary DCE for PNPP pursuant to 10 CFR 50.75(f)(3) is reasonable. The NRC staff's detailed technical review is provided in the enclosed Safety Evaluation.

R. Penfield

- 2 -

If you have any questions, please contact me at 301-415-2855 or [Scott.Wall@nrc.gov](mailto:Scott.Wall@nrc.gov).

Sincerely,

*/RA/*

Scott P. Wall, Senior Project Manager  
Plant Licensing Branch III  
Division of Operating Reactor Licensing  
Office of Nuclear Reactor Regulation

Docket No. 50-440

Enclosure:  
Safety Evaluation

cc: Listserv



UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
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SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO SPENT FUEL MANAGEMENT PROGRAM AND

THE PRELIMINARY DECOMMISSIONING COST ESTIMATE

ENERGY HARBOR NUCLEAR CORP.

ENERGY HARBOR NUCLEAR GENERATION LLC

PERRY NUCLEAR POWER PLANT, UNIT NO. 1

DOCKET NO. 50-440

1.0 INTRODUCTION

Pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) Section 50.54(bb), nuclear power plants that are within 5 years of expiration of their operating license must submit an irradiated 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 U.S. 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 decommissioning cost estimate (DCE), which includes an up-to-date assessment of the major factors that could affect the cost to decommission the reactor.

By letter dated November 1, 2021 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML21305A781), Energy Harbor Nuclear Corp. (EHNC or the licensee) provided the irradiated fuel management plan (IFMP) for Perry Nuclear Power Plant, Unit No. 1 (PNPP), in accordance with 10 CFR 50.54(bb). By letter dated March 29, 2021 (ML21088A295), EHNC submitted to the NRC the decommissioning trust fund (DTF) financial status report in accordance with 10 CFR 50.75(f)(1). The licensee stated that it provided the PNPP site-specific DCE in Enclosure C of the March 29, 2021, letter, to meet the requirement to submit a preliminary DCE 5 years prior to the projected end of operations in accordance with 10 CFR 50.75(f)(3). By letter dated March 31, 2023 (ML23090A233), EHNC provided an updated DTF financial status report. An updated preliminary DCE was provided as Enclosure A of the March 31, 2023, letter. These submittals address how EHNC will meet the requirements for PNPP set forth in 10 CFR 50.54(bb) and 10 CFR 50.75(f)(3).

2.0 BACKGROUND

PNPP is located approximately 35 miles northeast of Cleveland, Ohio, on the southern shore of Lake Erie. Although the station is comprised of two nuclear units, only Unit 1 is currently in operation and is the only unit considered within the scope of the IFMP and preliminary DCE. PNPP is authorized to operate at a maximum thermal power level of 3758 megawatts thermal. PNPP received its full-power operating license on November 7, 1986, and currently has a

license expiration date of November 7, 2026. On July 3, 2023 (ML23184A081), EHNC submitted a license renewal application for PNPP to extend the current operating license for an additional 20 years beyond the current expiration date. PNPP also includes a general licensed independent spent fuel storage installation (ISFSI).

EHNC states that it has not made a final determination on the decommissioning approach for PNPP. However, for the purposes of this submittal, the SAFSTOR option has been selected. EHNC further notes that it may select a different decommissioning option in the future, recognizing that the chosen option must meet NRC requirements for decommissioning funding.

### 3.0 REGULATORY REQUIREMENTS AND CRITERIA

#### 3.1 Regulatory Requirements on Management of Spent Fuel (10 CFR 50.54(bb))

The regulation under 10 CFR 50.54(bb) states, in part:

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

Similar to reviews of other IFMPs,<sup>1</sup> the NRC staff reviewed the following information submitted in support of the EHNC IFMPs to evaluate and provide preliminary approval of the spent fuel management (SFM) and funding program:

- Estimated cost to isolate the spent fuel pool and fuel handling systems. For the SAFSTOR option, the cost to manage and to provide funding for the management of irradiated fuel and fuel handling systems may be considered part of the preparation for transfer of the irradiated fuel to the DOE.
- Estimated cost to maintain and, if needed, expand an ISFSI.
- Estimated annual cost for the operation of the SAFSTOR option until the 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.

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<sup>1</sup> Recent reviews include the safety evaluations by the Office of Nuclear Reactor Regulation related to the IFMP for the Duane Arnold Energy Center (ML22089A049); Beaver Valley Power Station, Units 1 and 2 (ML19336A028); Oyster Creek Nuclear Generating Station (ML18226A330); Fort Calhoun Station, Unit 1 (ML18017B005); San Onofre Nuclear Generating Station, Units 2 and 3 (ML15182A256); and Crystal River Unit 3 Nuclear Generating Plant, (ML14344A408).

- Brief discussion of the selected storage method or methods and the estimated time for these activities.
- Information identifying the source of funds for managing spent fuel.

### 3.2 Regulatory Requirements on the Preliminary Decommissioning Cost Estimate (10 CFR 50.75(f)(3) and (f)(5))

Regulation 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 which includes an up-to-date assessment of the major factors that could affect the cost to decommission."

Regulation 10 CFR 50.75(f)(5) requires, if necessary, a licensee to include plans, with the preliminary cost estimate, to adjust decommissioning funding levels to demonstrate a reasonable level of assurance that funds will be available when needed to cover the cost of decommissioning.

Regulation 10 CFR 50.75(c)(1) provides a table of minimum amounts (in 1986 dollars, the "base year") required to demonstrate reasonable assurance of funds for decommissioning by reactor type and power level.

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

The guidance in section C.1.4 of NUREG-1713, "Standard Review Plan for Decommissioning Cost Estimates for Nuclear Power Reactors," dated December 2004 (NUREG-1713) (ML043510113), provides that the NRC staff should compare the preliminary cost estimate to the minimum decommissioning funding amount based on the formulas in 10 CFR 50.75(c), and perform an assessment of the major factors that could affect the preliminary cost estimate.

NUREG-1713, section C.1, provides additional guidance on the information that is to be addressed in the preliminary cost estimate. The major 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, or similar, major decommissioning phases:

- 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.

NUREG-1307, Revision 19, “Report on Waste Burial Charges: Changes in Decommissioning Waste Disposal Costs at Low-Level Waste Burial Facilities – Final Report” (ML23044A207) provides guidance on how licensees are to calculate the NRC minimum decommissioning formula fund amount and is the appropriate source for obtaining the adjustment factor for waste burial/disposition costs. Consistent with NUREG-1713, the NRC staff assesses the preliminary DCE against the NRC minimum decommissioning formula fund amount to determine whether the preliminary DCE is greater than or equal to the NRC minimum decommissioning formula fund amount.

#### 4.0 TECHNICAL EVALUATION

##### 4.1 Evaluation of the SFM Plan Estimated Costs

The NRC staff's review of the licensee's submittal included that of spent fuel management activities and associated cost elements. The IFMP and spent fuel management costs estimated by the licensee (per the March 31, 2023, letter) total \$447,155,471 million (2022 dollars) for all spent fuel management activities. The NRC staff reviewed estimates for major spent fuel management activities and funding requirements, including capital for spent fuel management infrastructure; spent fuel pool operation, maintenance, and isolation costs; ISFSI operating and maintenance costs; emergency planning costs; security and utility staffing costs; and spent fuel transfer costs.

With regard to spent fuel removal from the reactor site, the licensee indicates that its plan for spent fuel removal remains dependent upon DOE's ability to remove spent fuel from the site in a timely manner. EHNC maintains its position that DOE has a contractual obligation to accept fuel from PNPP in a timely manner, and staff accepts these assumptions with regard to the final disposition of PNPP spent fuel. Consistent with the IFMP, the PNPP ISFSI serves to address interim storage requirements of spent fuel at the site.

With regard to the cost estimate for the spent fuel management plan and related activities at PNPP, the NRC staff evaluated the \$447,155,471 million (2022 dollars) estimated cost for reasonableness. The NRC staff reviews cost information from independent sources and compares and evaluates that data against information provided by licensees. One such study, “Blue Ribbon Commission on America's Nuclear Future,” (Blue Ribbon Commission report) published in January 2012 for the DOE, provides cost and cost considerations for the operation and maintenance of spent fuel storage at shutdown sites. Costs cited in that report range from \$4.5 million to \$8 million per year (2012 dollars) for SFM at shutdown sites.<sup>2</sup> These costs adjusted for inflation (2022 dollars) are \$5.6 million and \$9.9 million, respectively. Accounting for inflation, and considering the IFMP operational period, the NRC staff determined that the cost estimates provided by EHNC, on average (approximately \$11.1 million for PNPP), is slightly above the range of costs cited in the study. In addition, the NRC staff determined that the EHNC cost estimates were comparable to a range of other licensees' IFMP cost estimates previously

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<sup>2</sup> See page 35 of the Blue Ribbon Commission report.

reviewed by the NRC staff. The NRC staff acknowledges that potential site-specific variances may exist among individual IFMPs. Based on the foregoing, the NRC staff finds the \$447,155,471 million (2022 dollars) cost estimate for SFM at PNPP to be reasonable.

As a result of its evaluation of the IFMP estimated costs, NRC staff concludes that the EHNC IFMP is comprehensive, contains sufficient detail regarding activities and identified costs for managing spent fuel, and whose timeline for SFM activities is reasonable. In addition, the NRC staff finds the SFM program cost estimates to be reasonable. This conclusion is based upon the staff's analysis of estimated costs presented in the PNPP IFMP, and upon a comparison with data from recent studies reflected in the Blue Ribbon Commission report, and from a range of other licensee IFMP cost estimates previously reviewed by staff.

#### 4.2 Evaluation of the Program to Manage and Provide Funding of All Spent Fuel

Per the licensee, the total obligation for the initial period of spent fuel management, which includes ISFSI activities and the transfer of spent fuel from the spent fuel pools to the ISFSI, for PNPP is approximately \$120 million dollars. In the event that PNPP shuts down based on the current license expiring, EHNC intends to fund this obligation through a cash deposit of \$120 million paid into a provisional trust by no later than the final shutdown date. In addition, EHNC expects to recover its costs by making claims for damages resulting from the DOE's breach of the Standard Contract for Disposal of Spent Nuclear Fuel and/or High-Level Radioactive Waste (Standard Contract) for PNPP. It also expects that by no later than January 1, 2031, it will be able to obtain a settlement agreement to recover costs annually. Therefore, EHNC has focused on planning to fund the expected costs through 2030.

The provisional trust will enable use of the funds for spent fuel management activities through 2030. Upon the completion of the spent fuel activities that concludes when all the spent fuel is moved to the ISFSI, the terms of the provisional trust will provide that it can be terminated, and its balance released back to EHNC.

As described in the PNPP DCE, it is anticipated that the spent fuel will be entirely located on the ISFSI pad by 2030. The spent fuel is assumed to remain on the ISFSI pad between 2030 and 2066, when the last of the spent fuel is transferred to the DOE. There are annual costs associated with maintaining the spent fuel on the ISFSI pad during this period. EHNC generally expects to recover those costs for spent fuel management during this time through reimbursements from the DOE due to its partial breach of the DOE Standard Contract.

Per the IFMP, as EHNC recovers its damages from the DOE, adequate funds will be retained in a segregated account to fund future annual expenses. Depending upon when litigation is resolved or a settlement is reached, this may include funding for expenses prior to 2030. Once adequate funds are set aside to fund the remaining annual spent fuel management expenses pending recovery from the DOE under a settlement, the purpose of the provisional trust will have been satisfied, and the provisional trust can be terminated. Instead, EHNC will rely upon funds set aside in the segregated account. EHNC's plan for funding the time from when all fuel is in dry storage until DOE has taken possession of all the spent fuel is to retain approximately \$26.4 million in the segregated account for the site. The intent is to pay for the annual ISFSI activities, then apply for recovery of the expenses from the DOE, as needed. If EHNC is unable to obtain a settlement with DOE by the end of 2030, EHNC will obtain a performance bond for approximately \$26.4 million (approximately 1.3 times the highest one-year value of ISFSI maintenance expenses). If needed, the bond will be in place by the end of 2030. The bond will

be renewed annually and remain in-place until such time that a settlement with the DOE is obtained.

Based on its review of the information discussed above, the NRC staff finds that the assumptions, activities, and associated costs of EHNC's IFMP for the PNPP appear to be reasonable. On that basis, the NRC staff concludes that there is reasonable assurance of the EHNG having the necessary funds, through the use of the proposed provisional trust of \$120 million, the recovery of funds from DOE, and the use of a performance bond in a segregated account to cover the cost in the event of a delay in recovering funds from DOE, to cover estimated costs for spent fuel management in accordance with 10 CFR 50.54(bb).

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

##### 4.3.1 Comparison to NRC Minimum Decommissioning Formula Fund Amount

Consistent with the guidance in NUREG-1713, the NRC staff compared the preliminary cost estimate to the minimum decommissioning funding amount based on the formulas in 10 CFR 50.75(c). In its March 31, 2023, decommissioning funding status report, EHNC reported the 10 CFR 50.75(c) minimum formula amount of \$706,320,000 (2022 dollars). Using the algorithm in 10 CFR 50.75(c) and the methodology provided in NUREG-1713 and NUREG-1307, the NRC staff independently calculated the 2022 minimum decommissioning funding amount and agrees with EHNC's reported amount.

As noted above, PNPP submitted a site-specific DCE to meet the requirement to submit a preliminary DCE in accordance with 10 CFR 50.75(f)(3). Thus, the preliminary DCE amount, as reported in PNPP's 2022 radiological site-specific DCE in Enclosure A, "Perry Nuclear Power Plant Updated Decommissioning Cost Analysis," of the March 31, 2023, letter is \$1,001,940,000 (2022 dollars).

Based on the NRC staff assessment, the PNPP preliminary DCE amount is greater than the NRC minimum decommissioning formula fund amount. Therefore, the NRC staff finds that the preliminary DCE amount conforms to the guidance in NUREG-1713.

##### 4.3.2 Assessment of Major Factors that Could Affect the Preliminary DCE

As discussed below, the licensee indicated that it assessed each of the major factors referenced in NUREG-1713 that could affect the cost to decommission. These factors include the licensee's choice of decommissioning method, potential contamination issues and their extent, LLW disposal considerations, decommissioning schedules, and other potentially significant factors.

###### 4.3.2.1 Decommissioning Method Utilized

EHNC has not made a final determination on the method to decommission PNPP but has selected the SAFSTOR<sup>3</sup> method of decommissioning for the purpose of meeting the NRC's regulatory requirements. Should the licensee change its method of decommissioning, another

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<sup>3</sup> This method places the reactor site in a safe and stable long-term storage state followed by subsequent decontamination and dismantlement, or performs some incremental decontamination and dismantlement activities before, or during, the storage period. NUREG-0586, "Final Generic Environmental Impact Statement on Decommissioning of Nuclear Facilities," Supplement 1, Volumes 1 and 2, dated November 2002 (ML023470327 and ML023500228, respectfully)

NRC review will need to be conducted to ensure the chosen method complies with NRC regulations.

#### 4.3.2.2 Potential Contamination Factors Affecting the Cost of Decommissioning

The NRC staff considered EHNC's evaluation of the anticipated extent of contamination to reactor site based on information presented in the preliminary DCE. No known areas of contaminated soil were identified in the preliminary DCE, and therefore, no specific soil or groundwater remediation was included since none was needed. However, the licensee indicated that inherent in any cost estimate for a significant future project is the inability to specify the precise source of costs since that may be changed due to various factors. In Section 3.4, "Updated Perry DCE Financial Assumptions," of Enclosure A of the March 31, 2023, letter, the licensee stated that for the preliminary DCE, a contingency of 18 percent was applied to each cost item. Inclusion of contingency considerations provides assurance that sufficient funding will be available to accomplish the intended tasks.

#### 4.3.2.3 Low-Level Waste Disposition Plan

NRC regulations define a LLW classification system that is based on potential hazards and specified disposal and waste requirements for each of the general classes of waste: "A," "B," and "C." The classifications are based on the key radionuclide material that is present in the waste and their half-lives. Tables defining the classes of waste can be found in 10 CFR 61.55, "Waste classification." In general, requirements for waste form, stability, and disposal methods become more stringent from Class A to Class C. Another waste category, Greater-Than-Class C waste (GTCC), exceeds the concentration limits in 10 CFR 61.55 and is generally unsuitable for near-surface disposal as LLW, even though it is legally defined as LLW. The NRC's regulations in 10 CFR 61.55(a)(2)(iv) require this type of waste to be disposed of in a geologic repository, unless the NRC grants approval for an alternative disposal method. The regulations in 10 CFR Part 72, "Licensing Requirements for the Independent Storage of Spent Nuclear Fuel, High-Level Radioactive Waste, and Reactor-Related Greater Than Class C Waste," allow for storage of GTCC that is generated at a reactor site.

The preliminary DCE provides a description of EHNC's LLW disposal plans. Attachment 4 to Enclosure A of the March 31, 2023, letter, provides a summary of the PNPP waste volumes by regulatory disposal classification. And in Section 3.3, "Waste Management Considerations for the DCE," of Enclosure A of the March 31, 2023, letter, the licensee provides details on its waste management plan. In its submittal, the licensee assumes that it will have access to the Waste Control Specialists facility (located in Andrews, Texas) to dispose of radiological waste. This facility is licensed for Class "B" & "C" disposal and is the assumed disposal site for these wastes generated at PNPP. The majority of the material generated from the decontamination and dismantling activities is considered to be Class "A" waste. EHNC states it will perform LLW volume reduction for material that requires disposal at an LLW disposal facility resulting in reduction of LLW for disposal by approximately 15,000,000 lbs of material. GTCC material will be packaged in the same spent-fuel canisters used for spent-fuel storage and assumed to be disposed of in a manner similar to that envisioned for spent fuel. LLW waste disposal costs have been estimated based upon 2022 markets conditions.

#### 4.3.2.4 Preliminary Schedule of Decommissioning Activities

EHNC provided a preliminary schedule that describes decommissioning activities related to the SAFSTOR method of decommissioning. The licensee's decommissioning timeline includes six

periods of license termination site restoration activities: (1) Pre-Decommissioning Planning and Preparation, (2) Plant Deactivation, (3) SAFSTOR Operations, (4) Dismantlement, (5) Ongoing ISFSI Operations, and (6) Program Management. Although the detailed decommissioning activities listed within the preliminary DCE are titled differently than the major decommissioning phases cited in NUREG-1713, they achieve the same result of decommissioning PNPP. These phases are further considered in Section 4.3.3 of this review, "Evaluation of the Decommissioning Work Scope."

#### 4.3.2.5 Additional Factors that Could Significantly Affect the Cost to Decommission

In preparation of the preliminary DCE, EHNC considered other potential factors that could significantly affect the cost of decommissioning. For example, the licensee assumes that the ISFSI will operate from the time of final shutdown until the scheduled end date of fuel removal by the Department of Energy (DOE). The licensee notes that the completion of the decommissioning process is entirely dependent on DOE's ability to remove spent fuel from the site in a timely manner. Any delay in removing the fuel from the reactor site may affect the cost of decommissioning.

EHNC states that the cost estimate for PNPP reflects a savings that is achieved from its efforts to reduce waste volume required to be disposed of at a licensed LLW disposal facility. EHNC also notes that the reduction in the volume of LLW requiring disposal at an LLW disposal facility is speculative and may alter the cost to decommission the reactor site. Finally, EHNC notes that the GTCC waste generated from operations is assumed to be packaged and disposed of as high-level waste, and at a cost equivalent to that envisioned for spent fuel. Any change in policy to this assumption may affect the cost to decommission PNPP.

In Section 3.4, "Updated Perry DCE Financial Assumptions," of Enclosure A of the March 31, 2023, letter, the licensee provides additional information regarding assumptions that could affect the cost to decommissioning.

#### 4.3.2.6 Staff Conclusion – Major Factors that Could Affect the Preliminary DCE

In its submission, the licensee addressed all of the factors that could affect the preliminary DCE as identified in NRC guidance. Based on its independent review of this information, the NRC staff concludes that the licensee has adequately assessed the major factors that could affect the preliminary DCE.

#### 4.3.3 Evaluation of the Decommissioning Work Scope

In addition to the major factors that could affect the cost to decommission, the NRC staff reviewed the preliminary DCE to confirm that costs were represented in current year (estimate year) dollars, that it accounted for the entire decommissioning work scope, and that it included costs for all activities in each of its six major decommissioning periods identified in Section 3.2, "Perry DCE Methodology," of Enclosure A of the March 31, 2023, letter. Section 3.2 provides six decommissioning periods that are similar to the major decommissioning phases described in NUREG-1713.

Attachment 1, "Perry Decommissioning SAFSTOR Cost Summary," to Enclosure A of the March 31, 2023, letter, provides a general overview of the cost summary. The summary of the costs estimated are broken down into License Termination, Spent Fuel and Site Restoration cost categories. Attachment 5, "Estimated Decommissioning Cost by Major Category," to

Enclosure A of the March 31, 2023, letter, provides the decommissioning cost by cost element assigned to each major cost category. Attachment 6, "Decommissioning Activities and Cost by Period," to Enclosure A of the March 31, 2023, letter, provides the decommissioning activities and cost by period. As stated in the preliminary DCE, the licensee estimates PNPP total decommissioning costs to be of \$1,486,312 (thousands of 2022 dollars), with the following allocations (thousands of 2022 dollars): \$1,001,940 for License Termination (i.e. radiological decommissioning, license termination, and completion of related reports); \$447,155 for Spent Fuel (i.e. spent fuel management and ISFSI decommissioning costs); and \$37,217 for Site Restoration. As provided in the preliminary DCE, a brief summary of each major decommissioning phase follows.

#### 4.3.3.1 Pre-Decommissioning Planning and Preparation

The "pre-decommissioning planning and preparation" period includes preparations for long-term storage including the planning for permanent defueling of the reactor, revision of technical specifications appropriate to the operating conditions and requirements, and characterization of the facility. Pre-planning tasks initiated prior to plant deactivation are limited to the following activities: (a) development of licensing submittals to support shutdown and plant post shutdown configuration; (b) general characterization of the site and surrounding environs, including radiation surveys of work areas, major components (including the reactor vessel and its internals), internal piping, and primary shield cores; and (c) engineering tasks related to the procurement of casks for dry storage.

#### 4.3.3.2 Plant Deactivation

The "plant deactivation" period allows for completing the work to prepare for the site's dormancy period. The process of placing the plant in SAFSTOR includes, but is not limited to, isolating the spent fuel storage services and fuel handling systems so that SAFSTOR operations may commence; transferring the spent fuel from the storage pool to the ISFSI for interim storage; draining and deenergizing of the noncontaminated systems not required to support continued site operations or maintenance; draining of the reactor vessel, with the internals and the reactor vessel remaining in place; draining and deenergizing nonessential systems; decontaminating as required for future maintenance and inspection; preparing lighting and alarm systems whose continued use is required; deenergizing portions of fire protection, electric power, and HVAC systems whose continued use is not required; cleaning of the loose surface contamination from building access pathways; performing an interim radiation survey of plant and posting warning signs where appropriate; erecting physical barriers and/or securing all access to radioactive or contaminated areas, except as required for inspection and maintenance; installing security and surveillance monitoring equipment and relocating security fence around secured structures, as required; developing of procedures for occupational exposure control, control and release of liquid and gaseous effluent; processing of radwaste, site security and emergency programs; and industrial safety.

#### 4.3.3.3 SAFSTOR Operations

The "SAFSTOR operations" period is expected to be the longest portion of the decommissioning process. SAFSTOR dormancy activities include, but are not limited to, security, routine maintenance and radiological inspections of contaminated structures, maintenance of structural integrity, interim site and environmental characterization surveys, and transfer of spent fuel to the DOE.

#### 4.3.3.4 Dismantlement

The “dismantlement” period is where preparations are undertaken to reactivate site services and prepare for the upcoming decommissioning phase. Preparation activities include, but are not limited to, engineering and planning; a detailed site characterization; the assembly of a decommissioning management organization and infrastructure; and the development of a license termination plan (LTP), which is the licensee’s site-specific plan to terminate its license. The LTP should include a site characterization; identification of the remaining dismantling activities; plans for site remediation; detailed plans for the final radiation survey; a description of the end use of the site, if restricted; an updated site-specific cost estimate of the remaining decommissioning costs; and a supplement to the environmental report.

#### 4.3.3.5 Ongoing ISFSI Operations

The “ongoing ISFSI operations” period includes the loading of the remainder of the spent fuel and GTCC waste into casks and moving to the ISFSI. The ISFSI will remain operational until the spent fuel is transferred to an appropriate disposal facility.

#### 4.3.3.6 Program Management

The “program management” period includes site restoration activities. The removal of the contaminated materials at the site may result in damage to many of the site structures. Decontamination activities can impact the power block structures, potentially weakening the footings and structural supports. Therefore, repair and preservations of these structures after the radiological contamination is removed is expected.

#### 4.3.3.7 Staff Conclusion – Decommissioning Work Scope

Based on its above, the NRC staff finds that the licensee has addressed in sufficient detail the entire scope of work required to complete decommissioning of PNPP as identified in NRC guidance and has evaluated costs associated with all phases of decommissioning PNPP. Based on its independent review of this information, the NRC staff concludes that the licensee has adequately addressed and evaluated the scope of work and costs associated with all major phases of decommissioning PNPP.

#### 4.3.4 Evaluation of the Funds Available to Decommission PNPP

In addition to the elements discussed in Sections 3 and 4 of this review, the NRC staff considered the adequacy of available funding to safely decommission PNPP. The NRC staff used the annual costs for license termination activities found in the Schedule 2 table in Attachment 4 of the March 31, 2023, letter, to calculate a positive ending balance of its trust fund at the end of the projected decommissioning schedule (year 2087) to determine that there is sufficient funding to decommission PNPP. In order to attain the most conservative estimate possible, the NRC staff only considered the lowest estimated funding levels, and the highest estimated costs, throughout its analysis.

As the NRC staff noted above in Section 4.3.1, the updated preliminary DCE relies on estimated PNPP site-specific radiological decommissioning costs of \$1,001,940,000 (2022 dollars), which is higher than the 10 CFR 50.75(c) minimum formula amount of \$706,320,000 (2022 dollars) as reported by EHCN in its March 31, 2023, decommissioning funding status report.

Currently, the PNPP license expires on November 7, 2026. In order to determine that adequate funds would be available, the NRC staff needed to forecast a November 2026 starting balance. Accordingly, the NRC staff used the December 31, 2022, biennial funding amount of \$514,936,901 (2022 dollars) reported by the licensee as the initial balance. Using 2 percent real rate of return on the December 31, 2022, balance compounded for 3 years, between December 2022 and December 2025, the NRC staff's balance of funds forecast is \$546,455,159 (2022 dollars) starting in 2026. This is consistent with the licensee's forecasted value.

Using the starting balance of \$546,455,159 (2022 dollars), the staff first subtracted the license termination cost from the opening fund balance. The NRC staff then applied a 2-percent annual real rate of return to this value, as prescribed by 10 CFR 50.75(e)(1)(ii), to calculate a yearly ending balance. This methodology was applied for each year over the span of the 60-year decommissioning period. The NRC staff concluded that a positive ending balance is achieved in the last year of decommissioning (2087), indicating that sufficient funding is available to decommission PNPP using the SAFSTOR method.

#### 4.3.5 Staff Conclusion – Preliminary Decommissioning Cost Estimate

The NRC staff assessed the PNPP preliminary DCE, as submitted in the March 31, 2023, letter, and has concluded that it meets all NRC regulatory requirements and is consistent with NRC guidance. As noted above, the PNPP preliminary DCE amount is greater than the NRC minimum decommissioning formula fund amount. The licensee addressed all the factors that could affect the preliminary DCE as identified in NRC guidance and adequately and comprehensively assessed the major factors that could affect the preliminary DCE. The licensee also has comprehensively addressed the entire scope of work required to complete decommissioning PNPP as identified in NRC guidance and has evaluated costs associated with all periods of decommissioning PNPP. Finally, the NRC staff concluded that the decommissioning trust fund balances reported by the licensee are sufficient to meet the anticipated costs of radiological decommissioning as presented in the preliminary DCE during the 60-year SAFSTOR period. Therefore, the staff finds that the preliminary DCE for PNPP pursuant to 10 CFR 50.75(f)(3) is reasonable.

## 5.0 CONCLUSION

The NRC staff finds that EHNC's program for the long-term storage of spent fuel and the preliminary cost estimate for radiological decommissioning of PNPP are adequate and provide sufficient details associated with the funding mechanisms. The NRC staff, therefore, concludes that the licensee's IFMP for PNPP 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 estimates for radiological decommissioning of PNPP comply with the requirements of 10 CFR 50.75(f)(3) and the NRC staff finds that the preliminary cost estimates are reasonable.

Principal Contributors: T. Wertz, NMSS  
S. Wall, NRR

Date: August 23, 2023

SUBJECT: PERRY NUCLEAR POWER PLANT, UNIT NO. 1 – SAFETY EVALUATION  
RE: IRRADIATED FUEL MANAGEMENT PLAN AND PRELIMINARY  
DECOMMISSIONING COST ESTIMATE (EPID L-2023-LLL-0007)  
DATED AUGUST 23, 2023

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