From: Wall, Scott

Sent: Wednesday, January 6, 2021 12:37 PM

To: Davis, J.Michael

Cc: Weaver, Tracy

Subject: Final RAI - Duane Arnold - Post-Shutdown Decommissioning Activities Report (EPID No. L-2020-LLL-0005)

Dear Mr. Davis,

By letter dated April 2, 2020 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML20094F603), NextEra Energy Duane Arnold, LLC (NEDA), submitted a Post-Shutdown Decommissioning Activities Report (PSDAR) for Duane Arnold Energy Center (DAEC). NEDA submitted the PSDAR pursuant to Title 10 of the Code of Federal Regulations (10 CFR), Section 50.82(a)(4). NEDA developed the DAEC PSDAR using the Regulatory Guide 1.185, Revision 1, "Standard Format and Content for Post-Shutdown Decommissioning Activities Report" (ADAMS Accession No. ML13140A038).

The NRC staff has reviewed the PSDAR and determined that additional information is needed to complete its review. The specific questions are found in the enclosed request for additional information (RAI). During a telephone calls on January 5, 2021, the NEDA staff indicated that a response to the RAI would be provided by February 5, 2021.

If you have questions, please contact me at 301-415-2855 or via e-mail at Scott.Wall@nrc.gov.

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Docket No. 50-331

Enclosure:
Request for Additional Information

cc: Listserv

RAI-NMSS

REQUEST FOR ADDITIONAL INFORMATION

RELATED TO POST-SHUTDOWN DECOMMISSIONING ACTIVITIES REPORT

NEXTERA ENERGY DUANE ARNOLD, LLC

DUANE ARNOLD ENERGY CENTER

DOCKET NO. 50-331

INTRODUCTION

By letter dated April 2, 2020 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML20094F603), NextEra Energy Duane Arnold, LLC (NEDA), submitted a Post-Shutdown Decommissioning Activities Report (PSDAR) for Duane Arnold Energy Center (DAEC). NEDA submitted the PSDAR pursuant to Title 10 of the Code of Federal Regulations (10 CFR), Section 50.82(a)(4). NEDA developed the DAEC PSDAR using the Regulatory Guide 1.185, Revision 1, "Standard Format and Content for Post-Shutdown Decommissioning Activities Report" (ADAMS Accession No. ML13140A038).

The U.S. Nuclear Regulatory Commission (NRC) staff is reviewing the PSDAR and has determined that the following additional information is required in order to complete the review.

RAI-NMSS

Applicable Regulation and Guidance

The regulation 10 CFR 50.82(a)(4)(i) states that the licensee shall submit a PSDAR to the NRC that includes "a discussion that provides the reasons for concluding that the environmental impacts associated with site-specific decommissioning activities will be bounded by appropriate previously issued environmental impact statements." The regulation 10 CFR 50.82(a)(6) states, in part, that "[l]icensees shall not perform any decommissioning activities … that … [r]esult in significant environmental impacts not previously reviewed …." In NUREG-0586, "Generic Environmental Impact Statement on Decommissioning of Nuclear Facilities: Supplement 1, Regarding the Decommissioning of Nuclear Power Reactors," the NRC evaluated the environmental impacts during the decommissioning of nuclear power reactors. The Decommissioning GEIS (NRC 2002) concludes that:

> For those issues that have been determined to be generic, licensees may proceed with the decommissioning activity without further analysis provided that the impacts resulting from those activities fall within the range of impacts as described in Chapter 4. However, if the impacts of an activity fall outside the range predicted in Chapter 4, or if the activity results in impacts to environmental issues not considered in this Supplement, or if the impact involves an environmental issue determined to be conditionally site-specific as defined above, then the activity cannot be performed until a further site-specific analysis is completed along with a license-amendment request and NRC has approved the license amendment (the license amendment request will provide an opportunity for a public hearing).

Environmental Justice (EJ)

RAI-NMSS-EJ-1

The environmental justice impact analysis, in the DAEC PSDAR, does not adequately explain the reason for concluding the impacts of decommissioning activities would be bounded by the Decommissioning GEIS, NUREG-0586 (NRC 2002). In PSDAR Section 5.1.13 "Environmental Justice," the licensee concludes

"…that the impacts of DAEC decommissioning on environmental justice are small and are bounded by the GEIS." Unfortunately, the Decommissioning GEIS does not provide a generic impact determination for the environmental justice issue. The evaluation of environmental justice impacts in the Decommissioning GEIS, states that "the adverse impacts and associated significance of the impacts must be determined on a site-specific basis." (See Decommissioning GEIS Section 4.3.13.4, Conclusions, page 4-65). The Decommissioning GEIS also states, "Subsequent to the submittal of the PSDAR, the NRC staff will consider the impacts related to environmental justice from decommissioning activities."

The licensee's PSDAR Section 5.1.13, "Environmental Justice," provides a few brief statements regarding potential impacts to minority and low-income populations, including land use, human health, environmental, and socioeconomic effects. The analysis relies on radiological environmental monitoring program data and environmental justice impact conclusions for the continued operation of DAEC from the October 2010 license renewal SEIS (NUREG-1437, Supplement 42, Duane Arnold Energy Center, October 2010). However, the normal reactor operations activities at DAEC addressed in the October 2010 license renewal SEIS do not consider the effects of major decommissioning activities (i.e., dismantlement and decontamination of the containment structure).

In addition, Section 4.3.13.2, "Potential Impacts of Decommissioning Activities on Environmental Justice," (page 4-64) of the Decommissioning GEIS states:

> [D]ecommissioning activities that may affect environmental justice are related to organizational or staffing changes and offsite transportation issues…. Any decommissioning activity that results in a disproportionate share of the negative environmental consequences to minority or low-income groups has the potential to be an adverse environmental justice impact.

The Decommissioning GEIS goes on to state:

> Detectability and destabilization, as they relate to environmental justice, must be defined in proportion to the minority and low-income populations that reside in the area of the power plant. Proportionment must be determined at each site at the time of decommissioning.

The licensee's analysis in the PSDAR does not address proportionment at the time of decommissioning and is silent on the potential impacts of dismantlement and decontamination activities on minority and low-income populations living near DAEC.

a. In accordance with 10 CFR 50.82(a)(4)(i) and 10 CFR 50.82(a)(6)(ii), explain the reasons for concluding that the environmental justice impacts associated with site-specific decommissioning activities will (or will not) be bounded by appropriate previously issued environmental impact statements.

b. In addition, provide a more up-to-date environmental justice demographic analysis (i.e., using data from the 2010 census) on site-specific human health and environmental

> effects from dismantlement and decontamination activities, including offsite transportation issues associated with the delivery of dismantlement equipment and the removal of waste material, on minority and low-income populations living near DAEC.

Historic and Cultural Resources (HC)

RAI-NMSS-HC-1

Section 5.1.14 of the PSDAR provides an analysis of potential impacts to cultural, historic, and archeological resources. In the PSDAR, NEDA indicates that decommissioning activities at DAEC would be confined to the operational area, and because this area was degraded during site construction, no impact to cultural, historical, or archeological resources would be anticipated. NEDA further acknowledges that the SEIS for DAEC license renewal (NUREG-1437, Supplement 42) determined that potential impacts to historic and archaeological resources were possible due to the potential richness of archaeological resources on the DAEC property. The PSDAR states that NEDA has, accordingly, coordinated with the Iowa State Historic Preservation Officer (SHPO) to develop and maintain excavation and trenching procedures for the DAEC which address potential impacts to both known and undiscovered resources.

However, NEDA did not indicate in the PSDAR whether they considered the DAEC nuclear facility itself eligible for inclusion on the National Register of Historic Places or Historic American Engineering Record. There is also no indication that NEDA had contacted the SHPO regarding this matter.

Section 4.3.14.2 of the decommissioning GEIS (page 4-67) states:

> In a few situations, the nuclear facility itself could be potentially eligible for inclusion in the National Register of Historic Places, especially if it is older than 50 years and represents a significant historic or engineering achievement. In this case, appropriate mitigation would be developed in consultation with the SHPO [State Historic Preservation Officer]. Even for buildings that are less than 50 years old, the processes and engineering that were employed may be of interest and may be eligible for the Historic American Engineering Record.

In order to remain in compliance with the National Historic Preservation Act, the NRC is required to take into account the effects of its undertakings on historic properties (see “Protection of Historic Properties” regulations, 36 CFR 800). Under these regulations, the NRC staff’s review of the PSDAR may be considered an undertaking “activity” (see 36 CFR 800.16(y)).

According to Protection of Historic Properties regulations in 36 CFR 800.4(a)(2), Identification of historic properties, in consultation with the SHPO, the NRC is required to “Review existing information on historic properties within the area of potential effects, including any data concerning possible historic properties not yet identified.” In addition, according to 36 CFR 800.4(a)(3), the NRC must “Seek information, as appropriate, from consulting parties, and other individuals and organizations likely to have knowledge of, or concerns with, historic properties in the area, and identify issues relating to the undertaking's potential effects on historic properties….”

Regulations in 36 CFR 800.4(c)(1) state:

> In consultation with the SHPO…the agency official shall apply the National Register criteria (36 CFR part 63) to properties identified within the area of potential effects that have not been previously evaluated for National Register eligibility.

If requested by the Iowa SHPO, an eligibility determination for NRHP listing status would need to be conducted by a professional that meets the Secretary of the Interior's standards in 36 CFR 61. A professional, experienced in conducting Historic American Building Surveys, would also be needed to determine the eligibility of listing DAEC in the Historic American Engineering Record.

- In light of these considerations, does NEDA plan to determine, in consultation with the Iowa SHPO, the current eligibility status of the DAEC facility itself for inclusion in the National Register of Historic Places or Historic American Engineering Record, and, if required, identify appropriate mitigation measures (e.g., preservation of historic information and data) potentially resulting from this consultation?

Special Status Species and Habitats (SSSH)

RAI-NMSS-SSSH-1

Table 5.1, "State and Federally Listed Species Potentially Occurring in the Vicinity of DAEC," of the PSDAR identifies several federally listed species that occur within the vicinity of DAEC, including the Higgin's-eye pearly mussel (*Lampsilis higginsii*) and northern long-eared bat (*Myotis septentrionalis*). However, Section 5.1.7, "Threatened and Endangered Species," does not sufficiently analyze how or whether these species would be affected by decommissioning activities.

a. Explain more fully how decommissioning activities may affect northern long-eared bats in the area by assessing all possible effects and forms of take that may occur during the decommissioning period. For instance, impacts to bats may result from:

    - mortality or injury from collisions with plant structures, equipment, or vehicles;
    - habitat loss, degradation, disturbance, or fragmentation, and associated effects; and
    - behavioral changes resulting from noise, lighting, and other factors associated with decommissioning activities.

    The above list is not comprehensive, and other effects may be relevant for the assessment.

b. Explain more fully how decommissioning activities may affect Higgin's-eye pearly mussels in the area by assessing all possible effects and forms of take that may occur during the decommissioning period. For instance, impacts to mussels may result from:

    - mortality or injury during cooling water intake and discharge structure dismantlement;
    - habitat loss, degradation, or disturbance, or fragmentation associated with in-water work; and
    - mortality, injury, or habitat effects resulting from dredging.

    The above list is not comprehensive, and other effects may be relevant for the assessment.

c. Has NEDA identified any known occurrences of the three federally listed plants—prairie bush clover (*Lespedeza leptostachya*), eastern prairie fringed orchid

(*Platanthera leucophaea*), and western prairie fringed orchid (*Platanthera praeclara*)—on the DAEC site? If so, provide a species-specific assessment of the potential effects of decommissioning.

d. If adverse effects or incidental take of any federally listed species is possible, explain how NEDA would obtain the necessary permits under either the Endangered Species Act (ESA) Section 7 or ESA Section 10 to exempt such take during the decommissioning period.

Water Resources (WR)

RAI-NMSS-WR-1

Neither the PSDAR's discussion of decommissioning costs summarized in Table 2.2 (and discussed in Section 4) nor the Decommissioning Cost Estimate (DCE) included as Attachment 1 to the PSDAR appear to account for costs associated with groundwater remediation during the decommissioning period. Section 5.0 of the DCE states that "No known areas of radiologically contaminated soil have been identified…documented tritium levels in groundwater are below drinking water standards. Therefore, no soil or groundwater remediation costs will be assumed." However, NEDA states in Section 2.3.6 (pages 17-18) of the PSDAR that "[i]n 2012, measurable amounts of tritium began to be detected in some of the groundwater monitoring wells in an area immediately adjacent to the south side of the Turbine and Reactor buildings, continuing for a short distance to the southeast on the plant property. This area has been and continues to be mitigated through mitigation wells." The PSDAR further states that tritium mitigation is not expected to be required at the end of the SAFSTOR period. Still, the PSDAR provides no timeframe when groundwater remediation would be completed.

In addition, NEDA's 2018 Annual Radiological Environmental Operating Report (NEDA 2019) includes sampling results from the groundwater protection program where seven (7) on-site wells completed in the shallow aquifer exceeded the drinking water standard for tritium (20,000 pCi/L). Samples that exceeded the standard for tritium, ranged in concentration from 20,346 to 290,512 pCi/L. NEDA's 2019 annual report (NEDA 2020a) indicates that tritium concentrations continued to exceed the standard in several monitoring wells in 2019, up to a maximum of 95,396 pCi/L. As discussed in the 2019 Annual Radioactive Material Release Report (Section 2.8, p. 15), since early February 2017, NEDA has operated groundwater extraction wells to continuously remove tritiated groundwater from the shallow aquifer. The extracted groundwater is diluted and then discharged to the Cedar River as a permitted release (NEDA 2020b).

During decommissioning, the NRC will need to evaluate on-site and any off-site groundwater contamination against drinking water standards (Maximum Contaminant Levels – MCLs), as prescribed in the Memorandum of Understanding between the EPA and NRC (EPA and NRC 2002). The NRC's regulations at 10 CFR 20.1406(c), "Minimization of Contamination," and 10 CFR 20.1501(a), "General," prescribe additional requirements with respect to the disposition of radiological releases at decommissioning sites.

- Consider providing an update to the DCE and associated summary that accounts for the costs for ongoing remediation of the shallow aquifer to MCLs, or below. Otherwise, provide an explanation beyond the current statements in the PSDAR for why such costs should not be considered.

RAI-NMSS-WR-2

As referenced in RAI-NMSS-WR-1, NEDA's PSDAR states that tritium was detected in shallow groundwater in the 2012 timeframe. The most recent available groundwater protection program monitoring data indicate the presence of a contaminant plume (tritium) in the shallow aquifer (less than 25 feet deep) and moving toward the Cedar River. This plume was reportedly first identified in February 2016, as indicated in the 2019 annual report (NEDA 2020a) (see Section 4.3 and Appendix D). Since February 2017, NEDA has operated a groundwater extraction, treatment (dilution), and disposal system to address tritiated groundwater in the shallow aquifer.

Two near surface aquifers underlie most of the site area, an upper water table aquifer and a lower artesian aquifer in weathered rock. These aquifers are separated by a relatively impervious clay aquiclude (FPL Energy 2008). As has been seen with other reactor sites with groundwater contamination, the potential exists for the engineered backfill beneath the DAEC nuclear island and other engineered structures to provide a preferential flow path for groundwater contamination from the shallow (water table) aquifer to the underlying artesian aquifer.

The environmental impact of the inadvertent release of radionuclides at the DAEC site and ongoing groundwater remediation activities during decommissioning on water quality (surface and groundwater) and water use have not previously been considered.

The Decommissioning GEIS (NRC 2002) does not generically consider the environmental impacts of inadvertent releases of radionuclides to groundwater and the associated operational impacts of groundwater remediation systems during the decommissioning of a nuclear reactor site. Additionally, the inadvertent release from DAEC was discovered after the NRC prepared its license renewal SEIS in 2010 (NRC 2010). NEDA initiated groundwater remediation in 2017. The staff does not know of any environmental impacts statements that have evaluated these activities and impacts. Therefore, the environmental impacts of the inadvertent release of radionuclides have not been previously been considered and further that the PSDAR does not show that site-specific decommissioning activities with respect to ongoing groundwater remediation will be bounded, as specified in 10 CFR 50.82(a)(4)(i).

Address or provide the following, and include or reference supporting analyses in the response:

a. Identify the source(s) of the inadvertent releases of radionuclides to site groundwater;
b. Address whether the releases have been stopped and, if so, describe the corrective actions taken (include dates);
c. If the source(s) of the inadvertent releases have not been stopped, describe whether and for how long such releases may be likely to continue into the decommissioning period;
d. Provide an analysis of the impacts of the inadvertent release of radionuclides from DAEC on the shallow aquifer and underlying artesian aquifer. This analysis should characterize the extent and magnitude of current contamination in the water table aquifer and in the underlying artesian aquifer, if any.
e. Provide an evaluation of the impacts of ongoing groundwater plume remediation on groundwater and surface water quality and use (i.e., extraction system withdrawals); and
f. Provide an estimate or projection of when groundwater remediation will be completed and describe the cleanup standards to be achieved.

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