UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION III
2443 WARRENVILLE ROAD, SUITE 210
LISLE, ILLINOIS 60532-4352

January 7, 2021

Mr. Paul Hansen
Decommissioning Director
NextEra Energy Duane Arnold, LLC
3277 DAEC Road
Palo, IA 52324-9785

SUBJECT: NRC INSPECTION REPORT NO. 05000331/2020010(DNMS) – DUANE ARNOLD ENERGY CENTER

Dear Mr. Hansen:

On December 21, 2020, the U.S. Nuclear Regulatory Commission (NRC) completed inspection activities for October through December 2020, at the permanently shut down Duane Arnold Energy Center (DAEC) in Palo, Iowa. The purpose of the inspection was to determine whether decommissioning activities were conducted safely and in accordance with NRC requirements. The enclosed report presents the results of this inspection, which were discussed with Mr. Paul Hansen and other members of your staff on December 21, 2020.

During the inspection period, the NRC inspectors reviewed the following aspects of onsite activities: self-assessments, audits, and corrective actions; spent fuel pool safety; decommissioning performance; occupational radiation safety; radioactive waste treatment, effluent, and environmental monitoring; and waste management. The inspection consisted of an examination of activities at the site as they relate to safety and compliance with the Commission's rules and regulations. Areas examined during the inspection are identified in the enclosed report. Within these areas, the inspection consisted of a selective examination of procedures and representative records, observation of work activities, and interviews with personnel.

Based on the results of this inspection, the NRC did not identify any violations.

This letter, its enclosure, and your response (if any) will be made available for public inspection and copying at https://www.nrc.gov/reading-rm/adams.html and at the NRC Public Document Room in accordance with Title 10 of the Code of Federal Regulations (CFR) 2.390, "Public Inspections, Exemptions, Requests for Withholding."

Sincerely,

David E. Hills Digitally signed by David E. Hills Date: 2021.01.07 09:51:21 -06'00'

David E. Hills, Chief
Materials Control, ISFSI, and
Decommissioning Branch
Division of Nuclear Materials Safety

Docket No: 50-331
License No: DPR-49

Enclosure:
Inspection Report No. 05000331/2020010(DNMS)

cc w/encl: Distribution via LISTSERV®

Letter to Paul Hansen from David Hills, dated January 7, 2021.

SUBJECT: NRC INSPECTION REPORT NO. 05000331/2020010(DNMS) – DUANE ARNOLD ENERGY CENTER

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U.S. NUCLEAR REGULATORY COMMISSION
REGION III

Docket No:	05000331
License No:	DPR-49
Report No:	05000331/2020010(DNMS)
Enterprise Identifier:	I-2020-010-0059
Licensee:	NextEra Energy Duane Arnold, LLC
Facility:	Duane Arnold Energy Center (DAEC)
Location:	Palo, IA
Dates:	October 13, 2020, through December 21, 2020
Inspectors:	Rhex Edwards, Senior Health Physicist Chuck Norton, Senior Resident Inspector
Approved by:	David E. Hills, Chief Materials Control, ISFSI, and Decommissioning Branch Division of Nuclear Materials Safety

Enclosure

EXECUTIVE SUMMARY

Duane Arnold Energy Center
NRC Inspection Report 05000331/2020010(DNMS)

Duane Arnold Energy Center (DAEC) operated at full power until August 10, 2020, when DAEC shutdown and permanently ceased power operation. On October 12, 2020, DAEC certified the permanent removal of fuel from the reactor vessel (ADAMS Accession No. ML20286A317). On October 13, 2020, the U.S. Nuclear Regulatory Commission (NRC) notified DAEC that the Operating Reactor Assessment Program had ceased, and that implementation of the Decommissioning Power Reactor Inspection Program commenced (ML20287A352). As such, in calendar year 2020, the majority of inspections were completed under the Operating Reactor Assessment Program and to a lesser extent the Decommissioning Power Reactor Inspection Program.

Currently, DAEC is a permanently shut-down power reactor facility transitioning to a Safe Storage (SAFSTOR) condition with spent fuel in wet storage and at an Independent Spent Fuel Storage Installation (ISFSI).

Self-Assessment, Auditing, and Corrective Action

- Issues were identified by the licensee at appropriate thresholds and entered into the Corrective Action Program (CAP). Issues were screened and prioritized commensurate with safety significance. Licensee evaluations determined the significance of issues and included appropriate remedial corrective actions. (Section 1.0)

Spent Fuel Pool Safety

- The inspectors determined the licensee was safely storing spent fuel in wet storage. Specifically, the Spent Fuel Pool (SFP) was adequately protected from a siphon or drain down event. Licensee SFP operational strategies were consistent with those used during reactor power operations. (Section 2.0)

Decommissioning Performance and Status Review

- The inspectors determined that the licensee conducted decommissioning activities in accordance with the regulations and license requirements. The licensee's progress towards establishing a SAFSTOR condition was in accordance with Technical Specifications (TSs), the Updated Final Safety Analysis Report (UFSAR) and the Post Shutdown Decommissioning Activities Report (PSDAR). (Section 3.0)

Occupational Radiation Exposure

- Radiation Work Permit (RWP) and As Low As Is Reasonably Achievable (ALARA) reviews provided contamination controls and dose reduction measures appropriate for the work activities. Workers adhered to the radiological controls provided in the RWPs and ALARA plans and followed the Radiation Protection (RP) staff instruction.

- Decommissioning activities were executed in general alignment with planning documents and as provided in RWPs and ALARA reviews. Radiation surveys were performed adequately to identify the hazards present. Command and control of radiologically significant activities was executed in a manner that was safe and achieved the desired result. (Section 4.0)

Radioactive Waste Treatment, and Effluent and Environmental Monitoring

- The effluent flow paths and monitoring systems reviewed aligned with descriptions in the Offsite Dose Assessment Manual (ODAM) and were functional. The effluent monitors reviewed were functional, calibrated, and alarm set points conservatively set to meet regulatory requirements. (Section 5.0)

Solid Radioactive Waste Management and Transportation of Radioactive Materials

- Radioactive materials were properly stored and secured. During this inspection period, the licensee was implementing its strategy to achieve a SAFSTOR condition. (Section 6.0)

Report Details

Summary of Plant Activities

During the inspection period, the licensee took actions to place the unit in SAFSTOR conditions. Major onsite activities included implementation of the following: site organizational changes; preparation and submission of license amendments and regulatory exemptions; changes to the UFSAR following the docketing of the permanent cessation of operations and permanent removal of fuel from the reactor vessel in accordance with Title 10 of the Code of Federal Regulations (CFR) 50.82(a); reclassification of remaining onsite systems; implementation of system abandonment plans, which included isolation, draining, and abandonment of systems no longer in use; and the development and implementation of modifications to support placing the unit in a SAFSTOR condition.

1.0 Self-Assessments, Auditing, and Corrective Action at Permanently Shutdown Reactors (Inspection Procedure (IP) 40801)

1.1 Inspection Scope

The inspectors reviewed documents and interviewed plant personnel to assess the licensee's performance in the following areas:

- Licensee management reviewed self-assessments, audits, and corrective actions to remain knowledgeable of plant performance;
- Issues or problems were identified and corrected in accordance with the licensee's CAP;
- Quality assurance personnel audited changes in the status of decommissioning and licensee organization; and
- Licensee management observed maintenance and surveillance activities, operations evolutions, and training.

The inspectors reviewed CAP documents to determine if a sufficiently low threshold for problem identification existed; the quality of follow-up evaluations, including extent-of-condition; and if the licensee assigned timely and appropriate prioritization for issue resolution commensurate with the significance of the issue. Issues that were repetitive and those with the potential for safety or regulatory consequence were evaluated further by the inspectors to assess apparent and/or common cause and significance.

1.2 Observations and Findings

The inspectors determined that issues were identified by the licensee at an appropriate threshold within various functional areas of the site and entered into the CAP. Issues were effectively screened, prioritized, and evaluated commensurate with safety significance. The scope and depth of evaluations were adequate in that the evaluations

reviewed addressed the significance of issues and assigned an appropriate course of remedial action.

No findings were identified.

1.3 Conclusions

Issues were identified by the licensee at appropriate thresholds and entered into the CAP. Issues were screened and prioritized commensurate with safety significance. Licensee evaluations determined the significance of issues and included appropriate remedial corrective actions.

2.0 Spent Fuel Pool Safety at Permanently Shutdown Reactors (IP 60801)

2.1 Inspection Scope

The inspectors reviewed documents and interviewed plant personnel to assess the licensee's performance in the following areas:

- Administrative measures are in place to prevent a substantial reduction in SFP coolant inventory and TS surveillance criteria are being met;
- Procedures ensure that systems are properly maintained, and temporary hoses are appropriately controlled;
- SFP water level, alarm response procedures, and operator rounds are adequate to satisfy TS requirements and consistent with the facility's licensing basis;
- Foreign material exclusion and combustible material control adequately protect the integrity and cooling of the spent fuel and SFP; and
- Equipment, procedures, and trained personnel are adequate to implement the required strategies to maintain or restore spent fuel cooling.

The inspectors verified that when issues were identified, licensee personnel appropriately documented the issue in the CAP.

2.2 Observations and Findings

On October 28, 2020, the inspectors visually confirmed that all spent fuel had been removed from the reactor vessel and was placed in the SFP.

The inspectors verified the safe wet storage of spent fuel in the Reactor Building. The review included walkdowns of equipment related to the safe storage of spent fuel such as spent fuel cooling pumps, portions of the Reactor Building Closed Cooling Water (RBCCW) System, normal power supplies, and Emergency Diesel Generators. The inspectors reviewed the SFP cooling, RBCCW, Well Water System, and SFP design drawings in addition to performing frequent walk downs of the SFP and accessible SFP cooling system piping.

No findings were identified.

2.3 Conclusions

The inspectors determined that the licensee was safely storing spent fuel in wet storage. Specifically, the SFP was adequately protected from a siphon or drain down event. Licensee SFP operational strategies were consistent with those used during reactor power operations.

3.0 Decommissioning Performance and Status Review at Permanently Shutdown Reactors (IP 71801)

3.1 Inspection Scope

The inspectors reviewed documents, interviewed plant personnel and toured the plant to assess the licensee's performance in the following areas:

- Status of ongoing decommissioning activities and planning for future activities;
- Licensee activities were in accordance with license conditions and docketed commitments, as well as, within the bounds of the docketed PSDAR;
- Operability and functionality of systems necessary for safe decommissioning were assessed through control room and plant walkdowns, including the following systems: radioactive effluent monitoring, SFP cooling, level and temperature control, RP monitors and alarms, and equipment that provided normal and standby electrical power;
- Operator logs and data taking for normal facility operations, surveillances, maintenance;
- Assessed ongoing in-plant work activities to ensure work activities were evaluated for risk in accordance with 10 CFR 50.65(a)(4), operational work risk assessments were performed, and operations shift turnovers appropriately communicated pertinent plant status;
- Pre-job briefs were conducted for facility operations, including maintenance, surveillance, operations, and decommissioning activities;
- In-plant field conditions and decommissioning abandonment activities were adequate; and
- Plant material condition of structures, systems, and components was maintained at a high level to ensure safe storage of spent fuel;

The inspectors verified that when issues were identified, licensee personnel appropriately documented the issue in the CAP.

3.2 Observations and Findings

The inspectors determined through the plant tours and activities observed that the licensee conducted activities in accordance with the regulatory requirements and plant procedures. Specifically, on October 26 and October 27, 2020, the inspectors performed a walkdown of the liquid radwaste discharge pathway and performed a general tour of the facility including the dilution structure, the groundwater mitigation wells, the SFP, and the radwaste building.

No findings were identified.

3.3 Conclusions

The inspectors determined that the licensee conducted decommissioning activities in accordance with the regulations and license requirements. The licensee's progress towards establishing a SAFSTOR condition was in accordance with TSs, the UFSAR and the PSDAR.

4.0 Occupational Radiation Exposure (IP 83750)

4.1 Inspection Scope

The inspectors reviewed documents and interviewed plant personnel to assess the licensee's performance in the following areas:

- Planning and preparation for radiation work were adequate and if licensee management supported RP planning;
- Personal dosimetry for external exposure met requirements;
- Management and administrative controls of external radiation exposure met requirements and was designed to make exposures ALARA;
- Processes or engineering controls were used to the extent practicable to limit concentrations of airborne radioactive materials; and
- Control of radioactive materials and contamination met requirements.

The inspectors verified that when issues were identified, licensee personnel appropriately documented the issue in the CAP.

4.2 Observations and Findings

On October 28, 2020, the inspectors attended a pre job brief for removing Source Range Monitors (SRMs) from under the Reactor Vessel and followed the conduct of the work throughout the day. In reviewing plans to remove the SRMs, the inspectors determined that the RWP and ALARA plans generally provided contamination control and dose reduction measures appropriate for the work activities. Engineering controls were used to the extent practicable including the use of: teledosimetry; personnel protective devices such as respiratory protection equipment; and tooling engineered for the safe retrieval of SRMs.

The inspectors found that radiologically risk significant activities were evaluated by the licensee and ALARA controls were prescribed to satisfy the requirements of 10 CFR 20.1101. Work in the Reactor Building was observed to be controlled adequately to prevent the creation of airborne hazards, control the spread of contamination, and to reduce external dose.

No findings were identified.

4.3 Conclusions

RWP and ALARA reviews provided contamination controls and dose reduction measures appropriate for the work activities. Workers adhered to the radiological controls provided in the RWPs and ALARA plans and followed the RP staff instruction.

Decommissioning activities were executed in general alignment with planning documents and as provided in RWPs and ALARA reviews. Radiation surveys were performed adequately to identify the hazards present. Command and control of radiologically significant activities was executed in a manner that was safe and achieved the desired result.

5.0 Radioactive Waste Treatment, and Effluent and Environmental Monitoring (IP 84750)

5.1 Inspection Scope

The inspectors reviewed documents and interviewed plant personnel to assess the licensee's performance in the following areas:

- Radioactive waste treatment systems were maintained and operated to keep offsite doses ALARA;
- The licensee effectively controlled, monitored, and quantified releases of radioactive materials in liquid forms to the environment; and
- The radiological environmental monitoring programs were effectively implemented to ensure effluent releases were being adequately performed as required to minimize public dose.

The inspectors verified that when issues were identified, licensee personnel appropriately documented the issue in the CAP.

5.2 Observations and Findings

The inspectors noted during walkdowns on October 19 and October 26, 2020, of the above radioactive effluent equipment and pathways that they were configured as described in the ODAM and were in good material condition. The inspectors focused their inspections and observations on the liquid radwaste discharge system as several discharges were planned during this inspection period. The first liquid discharge commenced on November 6, 2020 and was completed on November 7, 2020. The inspectors independently assessed the isotopic analysis of the contents discharged and

performed their own calculations in accordance with the ODAM to verify the licensee's results. Additionally, the inspectors independently calculated and verified the licensee had established conservative alarm setpoints in the effluent discharge monitored pathway to ensure no quantities of radioactive material in excess of regulatory limits were discharged. Finally, the inspectors reviewed the calibration records of the liquid discharge effluent monitor (RM-3972) and interviewed the rad waste operator on the discharge process including sampling, recirculation, and dilution.

No findings were identified.

5.3 Conclusions

The effluent flow paths and monitoring systems reviewed aligned with descriptions in the ODAM and were functional. The effluent monitors reviewed were functional, calibrated, and alarm set points conservatively set to meet regulatory requirements.

6.0 Solid Radioactive Waste Management and Transportation of Radioactive Materials (IP 86750)

6.1 Inspection Scope

The inspectors reviewed documents and interviewed plant personnel to assess the licensee's performance in the following areas:

- The material was properly described, packaged, marked, and stored.

The inspectors verified that when issues were identified, licensee personnel appropriately documented the issue in the CAP.

6.2 Observations and Findings

During tours on October 27 and October 28, 2020, the inspectors verified radioactive material, including Special Nuclear Material, was properly stored and secured. In preparation for long-term SAFSTOR, the licensee was implementing a strategy to reduce the quantity of radioactive material, to the extent practicable, and plans future shipments for disposal of this material.

No findings were identified.

6.3 Conclusions

Radioactive materials were properly stored and secured. During this inspection period, the licensee was implementing its strategy to achieve a SAFSTOR condition.

7.0 Exit Meeting

The inspectors presented the results of the inspection to Mr. P. Hansen and other members of the DAEC staff at an exit meeting on December 21, 2020. The licensee acknowledged the results presented and did not identify any of the information discussed as proprietary.

ATTACHMENT: SUPPLEMENTAL INFORMATION

SUPPLEMENTAL INFORMATION

PARTIAL LIST OF PERSONS CONTACTED

P. Hansen, Decommissioning Director
M. Davis, Licensing Manager
R. Spading, Operations Director
M. Casey, Radiation and Chemistry Manager

INSPECTION PROCEDURES (IPs) USED

IP 40801	Self-Assessment, Auditing, and Corrective Action at Permanently Shutdown Reactors
IP 60801	Spent Fuel Pool Safety at Permanently Shutdown Reactors
IP 71801	Decommissioning Performance and Status Reviews at Permanently Shutdown Plants
IP 83750	Occupational Radiation Exposure
IP 84750	Radioactive Waste Treatment, and Effluent and Environmental Monitoring
IP 86750	Solid Radioactive Waste Management and Transportation of Radioactive Materials

ITEMS OPENED, CLOSED, AND DISCUSSED

Opened	Type	Summary
None		

Closed	Type	Summary
None		

PARTIAL LIST OF DOCUMENTS REVIEWED

The following is a partial list of documents reviewed during the inspection. Inclusion on this list does not imply that the NRC inspectors reviewed the documents in their entirety, but rather that selected sections of portions of the documents were evaluated as part of the overall inspection effort. Inclusion of a document on this list does not imply NRC acceptance of the document or any part of it, unless this is stated in the body of the inspection report.

- AR 02374842; Diesel Fire Pump Failed to Start; 11/8/2020
- DAEC DFO Shutdown Safety Management Plan; Revision 0
- NS790704, Radwaste Effluent Radiation Monitor Calibration, Revision 5
- NS790704, Radwaste Effluent Radiation Monitor Calibration, Revision 6
- Offsite Dose Assessment Model; Revision 40
- PCP 8.7A; Alarm Setpoint for Liquid Effluent Monitor; Revision 2
- PCP 10.5; Liquid Release Dose Calculations; Revision 0
- STP NS790709; GWPP Mitigation System; Revision 6

- STP NS79071A; 1T71A Liquid Release Through Radwaste (RM-3972); Revision 0
- WO 40723196; STP NS790710 Radioactive Liquid release From "Clean"; 12/16/2020
- WO 407061380; RM3972: Replace Electrolytic Capacitors; 06/01/2020
- WO 407493960; Radwaste Effluent Radiation Monitor Calibration

LIST OF ACRONYMS USED

ADAMS	Agencywide Document Access and Management System
ALARA	As Low As Is Reasonably Achievable
CAP	Corrective Action Program
CFR	Code of Federal Regulations
DAEC	Duane Arnold Energy Center
DNMS	Division of Nuclear Materials Safety
IP	Inspection Procedure
IR	Inspection Report
ISFSI	Independent Spent Fuel Storage Installation
NRC	U.S. Nuclear Regulatory Commission
ODAM	Offsite Dose Assessment Manual
PSDAR	Post Shutdown Activities Report
RBCCW	Reactor Building Closed Cooling Water
RP	Radiation Protection
RWP	Radiation Work Permit
SAFSTOR	Safe Storage
SFP	Spent Fuel Pool
SRM	Source Range Monitor
TS	Technical Specification
UFSAR	Updated Final Safety Analysis Report