



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

October 30, 2023

Justin Both  
Decommissioning Director  
NextEra Energy Duane Arnold, LLC  
3277 DAEC Road  
Palo, IA 52324-9785

SUBJECT: NRC INSPECTION REPORT NO. 05000331/2023001(DRSS)  
DUANE ARNOLD ENERGY CENTER

Dear Justin Both:

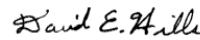
On October 12, 2023, the U.S. Nuclear Regulatory Commission (NRC) completed onsite inspection activities for April through October 2023, at the permanently shut-down Duane Arnold Energy Center (DAEC) in Palo, Iowa. The purpose of the inspection was to determine whether decommissioning activities were conducted safely and in accordance with NRC requirements. The enclosed report presents the results of this inspection, which were discussed with Justin Both and other members of your staff on October 12, 2023.

During the inspection period, the NRC inspectors reviewed the following aspects of onsite activities: safety reviews, design changes and modifications; problem identification and resolution; fire protection; decommissioning performance; occupational radiation exposure; radiological surveys; radioactive waste treatment, effluent, and environmental monitoring; and waste management and transportation. 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, reviewing 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 <http://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,



Signed by Hills, David  
on 10/30/23

David E. Hills, Chief  
Decommissioning, Reactor, and Independent Spent  
Fuel Storage Installation Health Physics Branch,  
Division of Radiological Safety and Security

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

Enclosure:  
IR Nos. 05000331/2023001(DRSS)

cc w/encl: Distribution via LISTSERV®

Letter to Justin Both from David Hill dated October 30, 2023.

SUBJECT: NRC INSPECTION REPORT NO. 05000331/2023001(DRSS)  
DUANE ARNOLD ENERGY CENTER

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U.S. NUCLEAR REGULATORY COMMISSION  
REGION III

Docket No: 50-331

License No: DPR-49

Report No: 05000331/2023001(DRSS);

Enterprise Identifier: I-2023-001-0088

Licensee: NextEra Energy Duane Arnold, LLC

Facility: Duane Arnold Energy Center (DAEC)

Location: Palo, IA

Dates: April 03, 2023, to October 12, 2023

Inspectors: Peter J. Lee, Ph.D., CHP, Reactor Inspector (Decom)

Approved by: David E. Hills, Chief  
Decommissioning, Reactor, and Independent Spent  
Fuel Storage Installation Health Physics Branch,  
Division of Radiological Safety and Security

Enclosure

## EXECUTIVE SUMMARY

### Duane Arnold Energy Center NRC Inspection Report No. 050000331/2023001(DRSS)

The Duane Arnold Energy Center (DAEC) is a permanently shut-down and defueled power reactor maintained in a Safe Storage (SAFSTOR) condition. This periodic safety inspection reviewed licensed activities associated with safety reviews, design changes and modifications; self-assessments, audits, and corrective actions; fire protection; decommissioning performance; occupational radiation exposure; radiological surveys; radioactive waste treatment, effluent, and environmental monitoring; and waste management and transportation.

#### **Safety Reviews, Design Changes, and Modifications**

- The licensee performed adequate safety evaluations or screenings, completed design change evaluations, and properly assessed decommissioning impacts of various work activities as required by Title 10 of the *Code of Federal Regulations* (CFR) 50.59 and its safety review process.

#### **Problem Identification and Resolution**

- 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.

#### **Fire Protection Program**

- An effective decommissioning Fire Protection Program was maintained and implemented that reasonably prevented fires; provided the capability to rapidly extinguish fires that could result in radiological hazards; and ensured the risk of fire-induced hazards to the public, environment, and plant personnel were minimized.

#### **Decommissioning Performance and Status Review**

- The inspectors determined that decommissioning activities were in accordance with the regulations and license requirements. Decommissioning staffing, qualifications, and training were appropriate to the requirements and current decommissioning status. The material condition of structures, systems, and components supported the SAFSTOR condition of the facility.

#### **Occupational Radiation Exposure**

- Adequate protection of worker health and safety from exposure to radiation and radioactive material was provided. Decommissioning activities were executed in general alignment with planning documents and as provided in Radiation Work Permits (RWPs) and As Low As Is Reasonably Achievable (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.

## **Radioactive Waste Treatment, and Effluent and Environmental Monitoring**

- The effluent flow paths and environmental monitoring systems reviewed aligned with descriptions in the Offsite Dose Calculation Manual and were functional. The effluent monitors reviewed were functional and calibrated to meet regulatory requirements. Changes to the effluent and environmental monitoring program were consistent with regulatory requirements.

## **Solid Radioactive Waste Management and Transportation of Radioactive Materials**

- The licensee effectively processed, handled, stored, and transported radioactive material.

## **Report Details**

### **Summary of Plant Activities**

During this inspection period, the licensee maintained Duane Arnold Energy Center (DAEC) in SAFSTOR conditions and no major decommissioning activities occurred. Licensee's activities primarily involved routine surveillance and maintenance to support continued SAFSTOR dormancy.

### **1.0 Safety Reviews, Design Changes, and Modifications at Permanently Shutdown Reactors (IP 37801)**

#### **1.1 Inspection Scope**

The inspector performed walkdowns, reviewed documents, and interviewed plant personnel to assess the licensee's performance in the following areas:

- Whether the licensee's safety review process and procedures identified potential changes to Technical Specification resulting from proposed changes, tests, experiments, or modifications;
- Changes to design basis documentation were updated consistent with design changes;
- Design changes or modifications were effectively evaluated to maintain safety; and
- Maintenance and/or work activities appropriately considered whether the activity resulted in a change or modification and were assessed in accordance with 10 CFR 50.59.

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

#### **1.2 Observations and Findings**

The inspector reviewed the design changes associated with SAFSTOR sump water collect and discharge (EC295242). The inspector also interviewed licensee personnel and discussed EC295242. On October 10, 2023, the inspector toured the plant to observe the sump water collect and discharge system.

No findings were identified.

### 1.3 Conclusions

The licensee performed adequate safety evaluations or screenings, completed design change evaluations, and properly assessed decommissioning impacts of various work activities as required by 10 CFR 50.59 and its safety review process.

## **2.0 Problem Identification and Resolution at Permanently Shutdown Reactors (IP 40801)**

### 2.1 Inspection Scope

The inspector performed walkdowns, reviewed documents, and interviewed plant personnel to assess the licensee's performance in the following areas:

- Effectiveness at preventing, detecting, and correcting issues;
- Identifying and evaluating potential 10 CFR Part 21, "Reporting of Defects and Non-Compliance Issues;"
- Audits and assessments evaluating the CAP and Quality Assurance Program; and
- The licensee's safety culture.

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

### 2.2 Observations and Findings

The inspector reviewed all issues entered into the licensee's CAP since the last inspection. The issues reviewed were found to be appropriately addressed by the licensee. There were no issues requiring reporting under 10 CFR Part 21. Audits were performed consistent with a prepared schedule and in accordance with the Quality Assurance Topical Report and NRC requirements. The inspectors interviewed station personnel during walkdowns and did not encounter any concerns with safety culture.

No findings were identified.

### 2.3 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.

## **3.0 Fire Protection Program at Permanently Shutdown Reactors (IP 64704)**

### 3.1 Inspection Scope

The inspector performed walkdowns, reviewed documents, and interviewed plant personnel to assess the licensee's performance in the following areas:

- Fire protection program met Technical Specifications, Post Shutdown Decommissioning Activities Report (PSDAR), and fire hazard analyses requirements;

- Changes to the Fire Protection Program did not reduce the effectiveness of the program;
- Assessments were being performed in accordance with 10 CFR 50.48(f)(2);
- Fire barriers were effectively maintained; and
- Administrative controls were in place to minimize the occurrence of a fire.

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

### 3.2 Observations and Findings

Due to the state of decommissioning, the systems of fire protection program had been no longer credited except the fire extinguishers since 2022. On July 13, 2023, the inspector walked down the plant and verified that any fire hazards present were as described in the licensee's fire protection program. Radiological waste had been disposed of or appropriately stored so that it could not cause a fire to induce a radiological release. The inspector confirmed during walkdowns that the fire extinguishers were available, maintained, and located as indicated in the approved pre-fire plans. The personnel were provided training on the use of fire extinguishers.

No findings were identified.

### 3.3 Conclusions

An effective decommissioning Fire Protection Program was maintained and implemented that reasonably prevented fires; provided the capability to rapidly extinguish fires that could result in radiological hazards; and ensured the risk of fire-induced hazards to the public, environment, and plant personnel were minimized.

## 4.0 **Decommissioning Performance and Status Review (IP 71801)**

### 4.1 Inspection Scope

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

- Whether maintenance was conducted at an appropriate frequency;
- Updates to the DSAR were made consistent with 10 CFR 50.71
- Records important to decommissioning were kept consistent with 10 CFR 50.75(g)
- Appropriate administrative and/or engineering controls were identified and implemented in work plans;
- Organization and staffing were appropriately adjusted for changes in the status of decommissioning; and
- Changes to the decommissioning schedule or costs were made consistent with the requirements in 10 CFR 50.82(a)(7).

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



#### 4.2 Observations and Findings

The inspector performed walkdowns of the plant on July 12, 2023. The general condition of the facility was found to be well maintained and consistent with good housekeeping practices. The postings and boundaries for the contamination control were well maintained. The inspector observed that the effluent filtration and monitoring systems were in working condition. The inspectors also interviewed licensee personnel and discussed the effluent filtration and monitoring systems of gaseous and liquid discharges. The licensee performed the effluent filtration and monitoring in accordance with the approved procedures.

No findings were identified.

#### 4.3 Conclusions

The inspector determined that decommissioning activities were in accordance with the regulations and license requirements. Decommissioning staffing, qualifications, and training were appropriate to the requirements and current decommissioning status. The material condition of structures, systems and components supported the SAFSTOR condition of the facility.

### **5.0 Occupational Radiation Exposure at Permanently Shutdown Reactors (IP 83750)**

#### 5.1 Inspection Scope

The inspector performed walkdowns, reviewed documents, and interviewed plant personnel to assess the licensee's performance in the following areas:

- Changes made to organization, personnel, facilities, instrumentation, equipment, and programs that impact occupational radiation protection;
- Radiological controls, postings, and material conditions inside the radiological control area; and
- Accuracy and functionality of radiation monitoring instruments.

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

#### 5.2 Observations and Findings

On July 12, 2023, a tour was specifically performed for the purposes of assessing radiological conditions, postings, and controls. The inspectors found postings and controls were appropriate to notify personnel of potential radiological hazards. Barriers used to preclude unintentional access were checked and found to be intact and capable of serving their intended purpose.

On October 11, 2023, the inspector reviewed the calibration records of all radiation survey instruments and observed the source check of calibration. The inspector also interviewed the licensee personnel to discuss the calibration procedures. The licensee performed the source check of calibration in accordance with the approved procedures.

The inspector reviewed the ALARA Plan of removing the resin residing in the collection tanks. The goal was to clean the tanks sufficiently to allow the sump water collection to be processed to the river without the additional contamination from the resin. The inspector also reviewed the worker doses received during the cleaning and determined that the decontamination of the collection tanks met the ALARA Plan.

No findings were identified.

### 5.3 Conclusions

Adequate protection of worker health and safety from exposure to radiation and radioactive material was provided. 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.

## 6.0 **Radioactive Waste Treatment, and Effluent and Environmental Monitoring (IP 84750)**

### 6.1 Inspection Scope

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

- Changes made to the Offsite Dose Calculations Manual or liquid, gaseous, and solid radwaste system design and operation were within the licensing basis and regulations;
- The annual effluent release report was submitted as required, and any anomalous results, unexpected trends, or abnormal releases were identified and entered into the CAP;
- Whether potential leakage or spills were appropriately added to records as required by 10 CFR 50.75(g);
- The licensee's annual radiological environmental monitoring report was submitted as required, and any anomalous results, unexpected trends, or abnormal environmental impacts were identified; and
- Changes made to the environmental program.

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

### 6.2 Observations and Findings

There were no changes with respect to liquid or gaseous effluent pathways or monitoring during this inspection period. The inspector noted during a review of past annual radiological effluent release and environmental monitoring reports that no anomalous results, unexpected trends, or abnormal releases were identified in association with plant activities. Since the last inspection, there were no spills or leakage associated with plant activities requiring records to be maintained in accordance with 10 CFR 50.75(g).

On October 10, 2023, the inspector performed the calibration check of germanium detectors by analyzing the gamma spectrum from counting the standards of air filter and water-equivalent solid as unknown samples and comparing the results with the certificates of the standards. The sampling results were in consistent with the certificates. The inspector determined that the germanium detectors were well calibrated for analyzing gaseous particulate filters and water samples.

The licensee's calculations for assessing doses to a member of the public were consistent with approved DODAM methodologies. The inspector assessed the isotopic analysis of the contents discharged, and independently performed calculations in accordance with the DODAM to verify the licensee's results.

The review of sampling results of gaseous effluent release of 2023 did not indicate any licensed materials. There was no liquid effluent release during the period of inspection. The liquid waste was generated from the ground water leaking into the contaminated floor drains in the plant and collected in the collection tanks. The licensee had improved the procedures to reduce the concentrations in the collection tank by including the absorbent to the filtration system since September 6, 2023. The zeolite absorbent was included to reduce the concentrations more effectively in the collection tank. The licensee was recirculating the liquid waste in the collection tank, attempting to reduce the concentrations to meet the DODAM dose criteria prior to release through dilution flow path to the river. On October 11, 2023, the inspector reviewed the analytical results of water samples from collection tanks and determined that the concentrations met the DODAM dose criteria for the effluent release. Licensee planned to release the liquid wastes to the river.

The inspector reviewed the groundwater monitoring results of tritium. Since all the results were less than 2000 pCi/L for the past two years, the licensee had stopped the operation of tritium extraction to continuously reduce the concentrations in the ground water.

The review of TLD data at the independent spent fuel storage installation (ISFSI) fence line indicated that the workers at the Solar Farm construction site near the ISFSI received less than 10 mrem per year.

No findings were identified.

### 6.3 Conclusions

The effluent flow paths and environmental monitoring systems reviewed aligned with descriptions in the Offsite Dose Calculation Manual and were functional. The effluent monitors reviewed were functional and calibrated to meet regulatory requirements. Changes to the effluent and environmental monitoring program were consistent with regulatory requirements.

## 7.0 **Solid Radioactive Waste Management and Transportation of Radioactive Materials (IP 86750)**

### 7.1 Inspection Scope

The inspector performed walkdowns, reviewed documents, and interviewed plant personnel to assess the licensee's performance in the following areas:

- Radioactive waste storage areas were appropriately controlled, labelled, posted and secured against unauthorized removal;
- Containers of radioactive material were inventoried, and their material condition was monitored;
- Implementation of the 10 CFR Part 37 security plan; and
- Sealed sources are accounted for and are appropriately leak tested.

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

## 7.2 Observations and Findings

During the period of inspection, the inspectors toured the Radwaste Processing and Storage Facility and found the radiological postings to be accurate and the material in storage was labeled appropriately.

On October 11, 2023, the inspector reviewed the sealed source inventory and verified the sources were secured and located in the plant as indicated by records. The licensee performed the inventories and leak tests in accordance with the approved procedures, and no leakage was detected.

No findings were identified.

## 7.3 Conclusions

The licensee effectively processed, handled, stored, and transported radioactive material.

## 8.0 **Exit Meeting**

The inspector presented the results of the inspection to Mr. B. Justin and other members of the DAEC staff at an exit meeting on October 12, 2023. 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

J. Both, Decommissioning Director  
T. Weaver, Licensing Manager  
H. Christopher, Security manager  
M. Casey, Radiation and Chemistry Manager  
M. Jeffery, Facilities Manager

### INSPECTION PROCEDURES (IPs) USED

IP 37801 Safety Reviews, Design Changes, and Modifications at Permanently Shutdown Reactors  
IP 40801 Problem Identification and Resolution at Permanently Shutdown Reactors  
IP 64704 Fire Protection Program 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

<u>Opened</u>	<u>Type</u>	<u>Summary</u>
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None

<u>Closed</u>	<u>Type</u>	<u>Summary</u>
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None

### PARTIAL LIST OF DOCUMENTS REVIEWED

Licensee documents reviewed and utilized during the course of this inspection are specifically identified in the "Report Details"

### LIST OF ACRONYMS USED

ALARA	As Low As Is Reasonably Achievable
CAP	Corrective Action Program
CFR	Code of Federal Regulations
DRSS	Division of Radiological Safety and Security
DODAM	Defueled Offsite Dose Assessment Manual
NRC	U.S. Nuclear Regulatory Commission
PCM	Personnel Contamination Monitor

PSDAR      Post Shutdown Activities Report  
RWP        Radiation Work Permit  
SAFSTOR    Safe Storage