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Draft Environmental Assessment and Draft Finding of No Significant Impact for the Duane Arnold Energy Center Reauthorization of Power Operations Project

Draft Report for Comment

Docket Number: 50-331

Issued: July 2026

Cooperating Agency:

U.S. Department of Energy

COMMENTS ON DRAFT REPORT

Proposed Actions: The U.S. Nuclear Regulatory Commission (NRC or Commission) proposed actions comprise granting NextEra Energy Duane Arnold, LLC (NEDA) interdependent, connected licensing and regulatory requests (see Table 1-1 of this environmental assessment) that, if approved, would collectively support reauthorizing refueling and power operations of the Duane Arnold Energy Center (DAEC) through February 21, 2034, which is the end of the current operating license term under Renewed Facility License No. DPR-49. DAEC is located in Linn County, Iowa.

Type of Statement: Draft Environmental Assessment (EA) and Draft Finding of No Significant Impact (FONSI)

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Comments:

Any interested party may submit comments on this draft EA and draft FONSI. The deadline for submitting comments is 30 days after the date that the draft EA and draft FONSI is published in the *Federal Register*. Comments received after the expiration of the comment period will be considered if it is practical to do so, but assurance of consideration of late comments cannot be given. The NRC encourages electronic comment submission through the Federal Rulemaking website (https://www.regulations.gov) or via email to DAECRestartEnvironmental@nrc.gov. Please include Docket ID NRC-2026-1719 in your comment submission. The NRC cautions you not to include identifying or contact information that you do not want to be publicly disclosed in your comment submission. The NRC will post all comment submissions at https://www.regulations.gov, as well as enter the comment submissions into the NRC's Agencywide Documents Access and Management System. The NRC does not routinely edit comment submissions to remove identifying or contact information.

If you are requesting or aggregating comments from other persons for submission to the NRC, then you should inform those persons not to include identifying or contact information that they do not want to be publicly disclosed in their comment submission. Your request should state that the NRC does not routinely edit comment submissions to remove such information before making the comment submissions available to the public or entering the comment into the NRC's Agencywide Documents Access and Management System.

EXECUTIVE SUMMARY

The Duane Arnold Energy Center (DAEC), located in Linn County, Iowa, consists of a single boiling water nuclear reactor. The facility shut down on August 10, 2020. In accordance with Title 10 of the *Code of Federal Regulations* (10 CFR) 50.82(a)(1) (TN249), NextEra Energy Duane Arnold, LLC (NEDA) submitted to the U.S. Nuclear Regulatory Commission (NRC or Commission) its certification of permanent cessation of operations on August 27, 2020 (NextEra 2020-TN13012). This was followed by the submittal of a certification of the permanent removal of fuel from the reactor vessel on October 12, 2020 (NextEra 2020-TN13013). As part of the transition from an operating reactor to a reactor in decommissioning status, the NRC issued a series of amendments to Renewed Facility License (RFL) No. DPR-49 to reflect the permanently defueled status of the facility. The current licensing status of DAEC is that the RFL remains in place and specifically authorizes NEDA to perform decommissioning and associated activities, but does not authorize power operations.

On January 23, 2025, NEDA expressed its intent to resume power operations at DAEC and submitted its proposed regulatory path for doing so (NextEra 2025-TN13014). Throughout 2025 and 2026, NEDA submitted to the NRC a set of licensing and regulatory requests to support reauthorization of power operations at DAEC through February 21, 2034, the end of the current operating license term under the DAEC RFL.

This environmental assessment (EA) summarizes the environmental review conducted by the NRC staff for the set of licensing and regulatory requests submitted by NEDA in support of the reauthorization of power operations at DAEC through February 21, 2034. In addition to the set of licensing and regulatory requests related to the potential reauthorization of power operations at DAEC, NEDA submitted an application for Federal financial assistance (i.e., a loan guarantee) to the U.S. Department of Energy (DOE) Office of Energy Dominance Financing to finance refueling and other restoration activities to support the resumption of power generation activities at the DAEC 610 megawatts electric (MWe) nuclear generating station. As such, DOE Office of Energy Dominance Financing is a cooperating agency on this environmental review to combine expertise and support streamlining regulatory agency reviews and consultations.

This EA follows 10 CFR 51.30 (TN10253), “Environmental assessment,” and 10 CFR 51.31, “Determinations based on environmental assessment,” which are the NRC’s regulations for preparing EAs in accordance with the National Environmental Policy Act of 1969 (TN661), as amended. As discussed in this EA, the NRC staff determined that the reasonably foreseeable environmental effects of the proposed restoration activities and resumption of power operations at DAEC would not be significant for each potentially affected resource area and that, therefore, a Finding of No Significant Impact for the proposed actions is warranted.

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ABBREVIATIONS AND ACRONYMS

°F	degree(s) Fahrenheit
ac	acre(s)
ACHP	Advisory Council on Historic Preservation
ADAMS	Agencywide Documents Access and Management System
APE	area of potential effects
AREOR	annual radiological environmental operating report
ARMRR	annual radioactive material release report
BCE	Before Common Era
bgs	below ground surface
BMBI	benthic macroinvertebrate index of biotic integrity
BMP	best management practice
BTA	best technology available
BWR	boiling water reactor
CDF	core damage frequency
CE	Common Era
CFR	*Code of Federal Regulations*
cfs	cubic foot/feet per second
CH_4	methane
CO	carbon monoxide
CO_2	carbon dioxide
CRPP	cultural resources protection plan
CWA	Clean Water Act
DAEC	Duane Arnold Energy Center
dB	decibel(s)
dBA	A-weighted decibel(s)
DBA	design-basis accident
DNR	Department of Natural Resources
DOE	U.S. Department of Energy
DKey	Determination Key
EA	environmental assessment
EDF	DOE Office of Energy Dominance Financing
EIS	environmental impact statement
EPA	U.S. Environmental Protection Agency
ER	environmental report
ESA	Endangered Species Act of 1973, as amended

FES	final environmental statement
FLEX	Diverse and Flexible Coping Strategies
FONSI	Finding of No Significant Impact
fps	foot/feet per second
FR	*Federal Register*
ft	foot/feet
ft^3	cubic foot/feet
FWS	U.S. Fish and Wildlife Service
gal	gallon(s)
gal/min	gallon(s) per minute
GHG	greenhouse gas
gpd	gallon(s) per day
gpm	gallon(s) per minute
GW/d	gigawatt day(s)
GWPP	groundwater protection program
GWL	global warming level
in.	inch(es)
IPaC	Information for Planning and Consultation
kV	kilovolt(s)
LAR	license amendment request
LR GEIS	*Generic Environmental Impact Statement for License Renewal of Nuclear Plants*
mg/L	milligram(s) per liter
Mgal	million gallon(s)
Mgd	million gallon(s) per day
Mgy	million gallon(s) per year
mi	mile(s)
mi^2	square mile(s)
mrem	millirem(s)
mph	mile(s) per hour
MSA	Magnuson-Stevens Fishery Conservation and Management Act of 1976, as amended
MTU	metric ton(s) uranium
MWe	megawatt(s) electric
MWt	megawatt(s) thermal
N/A	not applicable
NEDA	NextEra Energy Duane Arnold, LLC
NEPA	National Environmental Policy Act of 1969, as amended

NHPA	National Historic Preservation Act of 1966, as amended
NMFS	National Marine Fisheries Service
N_2O	nitrous oxide
NOAA	National Oceanic and Atmospheric Administration
NO_x	nitrogen oxides
NPDES	National Pollutant Discharge Elimination System
NRC or Commission	U.S. Nuclear Regulatory Commission
NR GEIS	*Generic Environmental Impact Statement for Licensing of New Nuclear Reactors*
NRHP	National Register of Historic Places
OSHA	Occupational Safety and Health Administration
pCi/L	picocurie(s) per liter
PM	particulate matter
ppm	parts per million
PSDAR	post-shutdown decommissioning activities report
RAI	request for additional information
RCI	request for confirmation of information
REMP	radiological environmental monitoring program
RFL	renewed facility license
ROW	right-of-way
SAMA	severe accident mitigation alternative
SEIS	supplemental environmental impact statement
SF_6	sulfur hexafluoride
SHPO	State Historic Preservation Office
SO_2	sulfur dioxide
SPCC	spill prevention, control, and countermeasures
SSP	shared socioeconomic pathway
SWPPP	stormwater pollution prevention plan
TSP	total suspended particulate
U-235	uranium-235
U.S.C.	*United States Code*
USGS	United States Geological Survey
VOCs	volatile organic compounds
wt%	weight percent

CONVERSION TABLE

To Convert English to Metric Equivalents

Multiply	By	To Obtain
acres (ac)	0.4047	hectares (ha)
cubic feet (ft^3)	0.02832	cubic meters (m^3)
cubic yards (yd^3)	0.7646	cubic meters (m^3)
curies (Ci)	3.7×10^{10}	becquerels (Bq)
degrees Fahrenheit (°F) −32	0.5555	degrees Celsius (°C)
feet (ft)	0.3048	meters (m)
gallons (gal)	3.785	liters (L)
gallons (gal)	0.003785	cubic meters (m^3)
inches (in.)	2.540	centimeters (cm)
miles (mi)	1.609	kilometers (km)
pounds (lb)	0.4536	kilograms (kg)
rads	0.01	grays (Gy)
rems	0.01	sieverts (Sv)
short tons (tons)	907.2	kilograms (kg)
short tons (tons)	0.9072	metric tons (t)
square feet (ft^2)	0.09290	square meters (m^2)
square yards (yd^2)	0.8361	square meters (m^2)
square miles (mi^2)	2.590	square kilometers (km^2)
yards (yd)	0.9144	meters (m)

Note: Not all units may appear in this document.

To Convert Metric to English Equivalents

Multiply	By	To Obtain
becquerels (Bq)	2.7×10^{-11}	curies (Ci)
centimeters (cm)	0.3937	inches (in.)
cubic meters (m^3)	35.31	cubic feet (ft^3)
cubic meters (m^3)	1.308	cubic yards (yd^3)
cubic meters (m^3)	264.2	gallons (gal)
degrees Celsius (°C) +17.78	1.8	degrees Fahrenheit (°F)
grays (Gy)	100	rads
hectares (ha)	2.471	acres
kilograms (kg)	2.205	pounds (lb)
kilograms (kg)	0.001102	short tons (tons)
kilometers (km)	0.6214	miles (mi)
liters (L)	0.2642	gallons (gal)
meters (m)	3.281	feet (ft)
meters (m)	1.094	yards (yd)
metric tons (t)	1.102	short tons (tons)
sieverts (Sv)	100	rems
square kilometers (km^2)	0.3861	square miles (mi^2)
square meters (m^2)	10.76	square feet (ft^2)
square meters (m^2)	1.196	square yards (yd^2)

Note: Not all units may appear in this document.

1 INTRODUCTION

The Duane Arnold Energy Center (DAEC), located in Linn County, Iowa, approximately 2.5 miles (mi) northeast of the village of Palo, Iowa, consists of a single boiling water reactor (BWR) with a Mark I containment system. The U.S. Atomic Energy Commission originally granted the owner an initial operating license on February 22, 1974. The U.S. Nuclear Regulatory Commission (NRC or Commission) subsequently issued Renewed Facility License (RFL) No. DPR-49 on December 10, 2010, with the operating license term expiring on February 21, 2034 (NRC 2010-TN13011).

On August 27, 2020, NextEra Energy Duane Arnold, LLC (NEDA) submitted the first of two certifications required under Title 10 of the *Code of Federal Regulations* (10 CFR) 50.82(a)(1) (TN249) that NEDA had permanently ceased operations at DAEC on August 10, 2020 (NextEra 2020-TN13012), followed by a certification that fuel had been permanently removed from the reactor vessel on October 12, 2020 (NextEra 2020-TN13013). In accordance with 10 CFR 50.82(a)(2), upon the docketing of these certifications, the DAEC license no longer authorized operation of the reactor or emplacement or retention of fuel in the reactor vessel.

As part of the transition from an operating reactor to a reactor in decommissioning status, the NRC issued several amendments (i.e., amendment nos. 309–318) changing the operating license, and its included technical specifications, to reflect the authorities and requirements for a reactor in decommissioning status (NRC 2020-TN13015, NRC 2020-TN13016, NRC 2020-TN13190, NRC 2020-TN13191, NRC 2021-TN13192, NRC 2021-TN13193, NRC 2022-TN13194, NRC 2022-TN13195, NRC 2022-TN13196, NRC 2022-TN13197). Among other things, the amendments removed language from the license regarding the authority to operate the reactor and removed the technical specifications for an operating reactor that were not relevant to decommissioning. However, even after these amendments became effective, the license remained a 10 CFR Part 50 operating license in accordance with 10 CFR 50.51(b), albeit one that had been modified by regulation and licensing actions to no longer authorize power operations.

Subsequent to the cessation of power operations and the entering into decommissioning status, as well as the licensing actions to reflect the decommissioning status, NEDA began to pursue a path to resume power operations at DAEC. This environmental assessment (EA) summarizes the environmental review conducted by the NRC staff for the set of licensing and regulatory requests submitted by NEDA in support of the reauthorization of power operations at DAEC through February 21, 2034, as further described in Section 1.1.

On January 23, 2025, NEDA submitted to the NRC a letter outlining a proposed regulatory path encompassing the necessary NRC licensing and regulatory actions, including the submission of license amendment requests (LARs), for the reauthorization of power operations at DAEC (NextEra 2025-TN13014). Throughout 2025 and 2026, NEDA engaged with the NRC and submitted a set of licensing and regulatory requests for NRC approval to support the reauthorization of power operations at DAEC through February 21, 2034, the end of the current operating license term under the DAEC RFL. This set of requests consists of:

- A January 23, 2025, request for an exemption from the 10 CFR 50.82(a)(2) (TN249) restriction that prohibits power operations and emplacement or retention of fuel in the reactor vessel to allow for a one-time rescission of the docketed 10 CFR 50.82(a)(1) certifications (NextEra 2025-TN13198).
- LARs under 10 CFR 50.90, as listed in Table 1-1.

The exemption from 10 CFR 50.82(a)(2) would allow rescission of the 10 CFR 50.82(a)(1) certifications on the same date that the LARs would be implemented, if approved. It is on this date that DAEC would transition from a facility in decommissioning status to a facility once again authorized for power operations.

Collectively, the requested NRC approvals identified above and listed in Table 1-1, including any revisions or supplements thereto or other regulatory or licensing requests submitted to the NRC that are necessary to reauthorize power operations at DAEC, define the scope of the proposed NRC Federal actions to support the potential reauthorization of power operations under the DAEC RFL.

By letter dated November 10, 2025, NEDA also submitted an environmental report (ER) to support the NRC staff's environmental review related to the resumption of power operations under the DAEC RFL (NextEra 2025-TN13199).

For the NRC staff, evaluation of the exemption request and the LARs occurs simultaneously for both safety and environmental reviews through the NRC's Office of Nuclear Reactor Regulation. Therefore, in parallel with this environmental review, the NRC staff is conducting a detailed safety evaluation related to the exemption request and the LARs.

Ultimately, through the exemption request and the LARs, NEDA is seeking to (1) gain NRC approval to restore the licensing basis for DAEC to an operational status; (2) return plant components to a status that supports safe operation; and (3) complete any upgrades necessary to meet the proposed operational licensing basis.

1.1 Proposed Federal Actions

The NRC's proposed Federal actions that collectively support preparation for and resumption of power operations at DAEC require an environmental review under the National Environmental Policy Act of 1969, as amended (NEPA) (42 *United States Code* [U.S.C.] 4321 et seq. [TN661]), among other requirements. In addition to the set of licensing and regulatory requests that NEDA submitted to the NRC related to the potential reauthorization of power operations at DAEC, NEDA submitted an application for Federal financial assistance to the U.S. Department of Energy (DOE) Office of Energy Dominance Financing (EDF) (formerly the Loan Programs Office). Given that the two agencies' Federal actions that collectively support preparation for and resumption of power operations at DAEC are related, DOE EDF requested to become a cooperating agency to combine agency expertise and streamline agency reviews to support agency consultations and in furtherance of Executive Order 14302, "Reinvigorating the Nuclear Industrial Base" (90 *Federal Register* [FR] 22595-TN13463).

The NRC is the lead agency. DOE EDF is a cooperating agency with the NRC for the environmental review of NEDA's exemption request and LARs that must be approved to support the reauthorization of power operations at DAEC (DOE 2026-TN13328).

1.1.1 Proposed Actions of the NRC

The NRC's proposed actions are decisions on whether to grant or deny NEDA's interdependent, connected licensing and regulatory requests (see Table 1-1), including any revisions or supplements thereto or other regulatory or licensing requests submitted to the NRC that are necessary to support the reauthorization of power operations and refueling of the DAEC reactor.

Table 1-1 Licensing and Regulatory Requests for the Duane Arnold Energy Center Resumption of Power Operations Project

Document Description	ADAMS Accession No.
Request for Exemption from Certain Termination of License Requirements of 10 CFR 50.82, dated January 23, 2025.	ML25023A270
Application to Revise the Renewed Facility License and Technical Specifications to Support Resumption of Power Operation, dated November 20, 2025.	ML25324A300
Application to Revise the Physical Security Plan to Support Resumption of Power Operation, dated December 17, 2025.	ML25363A083
Application to Revise the Emergency Plan to Support Resumption of Power Operation, dated January 30, 2026.	ML26033A048

ADAMS = Agencywide Documents Access and Management System; CFR = *Code of Federal Regulations*.
All documents are electronically available via the U.S. Nuclear Regulatory Commission's ADAMS at https://www.nrc.gov/reading-rm/adams.

1.2 Purpose and Need for the Proposed Federal Actions

1.2.1 Purpose and Need for the NRC Actions

The purpose and need for the NRC proposed actions (approval of the licensing and regulatory requests identified in Table 1-1), which would collectively support the reauthorization of power operations and refueling of the DAEC reactor under the existing RFL, is to provide 610 MWe of baseload power generation capability through February 21, 2034 (NextEra 2025-TN13199). DAEC was prematurely shut down in August 2020 due to windstorm damage to mechanical draft cooling towers and market conditions; however, the economic environment has changed (NextEra 2025-TN13199). On October 27, 2025, NEDA signed a 25-year power purchase agreement with Google to supply carbon-free energy from DAEC to Google's cloud and artificial intelligence infrastructure in Iowa (NextEra 2025-TN13200).

1.3 NEPA Process and Environmental Review

1.3.1 Level of NEPA Review

The NRC staff has determined that NEDA's licensing and regulatory requests in support of the reauthorization of power operations at DAEC, as listed in Table 1-1, are connected (i.e., interdependent) actions that should be considered together as part of the staff's environmental review. After reviewing the criteria in 10 CFR 51.20, 10 CFR 51.21, and 10 CFR 51.22 and internal guidance, the NRC staff has determined that the preparation of an EA, with a draft comment period to ensure public participation, is appropriate for this environmental review. The proposed actions are not specifically covered by the criteria requiring the preparation of an environmental impact statement (EIS) as described in 10 CFR 51.20 without knowing the significance of the potential impacts from the proposed actions.

1.3.2 Significance Determination

An EA is a decisional document for an action that either does not have a reasonably foreseeable significant effect on the quality of the human environment, or if the significance of such effect is unknown. An EA is used to support a Federal agency's determination of whether to issue a Finding of No Significant Impact (FONSI) or to prepare an EIS.

In considering whether an adverse effect of the proposed actions is significant, the NRC staff evaluated the reasonably foreseeable environmental effects of the proposed actions in accordance with Sections 102 and 106 of NEPA, as amended (TN661), the NRC's regulations for implementing NEPA (10 CFR Part 51-TN10253), and applicable guidance. Accordingly, each resource area potentially impacted by the proposed actions is evaluated with a rationale provided to explain the determination of whether the impact(s) would be "SIGNIFICANT" or would be "NOT SIGNIFICANT." If impacts from the proposed actions are determined to be NOT SIGNIFICANT, then a FONSI is prepared; if impacts from the proposed actions are determined to be SIGNIFICANT, then an EIS is prepared.

In addition to these impact thresholds under NEPA and the NRC's regulations for implementing NEPA, there are other effects determination definitions that are applicable specifically for the Endangered Species Act of 1973, as amended (ESA) (TN1010), and the National Historic Preservation Act of 1966, as amended (NHPA) (TN4157), and their implementing regulations.

1.3.3 Analysis of the Environmental Effects of the Proposed Agency Actions

The reasonably foreseeable environmental effects (effects or impacts) of the proposed actions and their significance are determined by comparing the environmental conditions at the point in time prior to the commencement of the proposed actions, known as the environmental baseline or affected environment, with the degree of the effects on those environmental conditions following the commencement of the proposed actions. The affected environment for the potential reauthorization of power operations at DAEC is the current decommissioning state of the site prior to implementing any of the activities related to the preparation for the resumption of power operations. The corresponding impact determination analysis for each potentially impacted resource area comprises the impacts in relation to the affected environment from both the activities related to the preparations for the resumption of power operations and those related to the resumption of power operations itself. The impact significance determination in Chapter 3 includes the following evaluations for each analyzed resource area:

- *Affected Environment*—provides a brief description of the affected environment.
- *Impacts from Preparations for the Resumption of Power Operations*—provides a description of the reasonably foreseeable environmental effects related to the preparations for the resumption of power operations.
- *Impacts from the Resumption of Power Operations*—provides a description of the reasonably foreseeable incremental environmental effects from the resumption of power operations for the remainder of the operating term of the DAEC RFL.

Additionally, the environmental effects of greenhouse gas (GHG) emissions and climate change, as well as decommissioning activities, are discussed for each analyzed resource area in Appendix D and Section 3.16, respectively.

1.3.4 Related Environmental Documents

Incorporation by reference is a tool that Federal agencies can use to improve the efficiency of their environmental review process to aid in the preparation of analytical, concise, and informative environmental documents. Incorporation by reference integrates material that is essential to the NEPA analysis, such as including planning studies, analyses, or other relevant information, into environmental documents by reference. The effect will be to cut down on bulk without impeding agency and public review of the action (10 CFR Part 51-TN10253: Appendix A).

The NRC and other Federal agencies have prepared other NEPA and technical documents that contain information relevant to this environmental review of the licensing and regulatory requests in support of the reauthorization of power operations at DAEC. Most notably, the NRC staff prepared NUREG-1437, Supplement 42, *Generic Environmental Impact Statement for License Renewal of Nuclear Plants, Supplement 42, Regarding Duane Arnold Energy Center, Final Report* (the 2010 supplemental environmental impact statement [SEIS]) (NRC 2010-TN13201). This document was prepared as a plant-specific supplement to NUREG-1437, *Generic Environmental Impact Statement for License Renewal of Nuclear Plants* (the 1996 and 1999 LR GEIS) (NRC 1996-TN288, NRC 1999-TN289). The 2010 SEIS was prepared in response to an application to renew the operating license for DAEC for an additional 20 years (i.e., from February 21, 2014 to February 21, 2034). Thus, the 2010 SEIS previously considered the environmental effects of facility operations through the end of the current DAEC RFL term. Accordingly, in this EA, the NRC staff focuses its analysis on the reasonably foreseeable environmental effects of restoration activities, including any new construction, and the reasonably foreseeable incremental environmental effects of any proposed operational changes associated with the resumption of power operations at DAEC (collectively, restart activities).

In August 2024, the NRC issued Revision 2 of NUREG-1437, *Generic Environmental Impact Statement for License Renewal of Nuclear Plants* (the 2024 LR GEIS) (NRC 2024-TN10161). The 2024 LR GEIS was prepared to identify and evaluate environmental issues for license renewal and determine which could result in the same or similar impact (i.e., generic issues) at all nuclear power plants and which could result in different levels of impact. Many of the analyses presented in the 2024 LR GEIS may be relevant to the proposed actions related to the reauthorization of power operations at DAEC, and they also serve to update many of the findings in the 2010 SEIS.

To support the preparation of this EA, the NRC staff also conducted an environmental audit (NRC 2026-TN13330) to evaluate new information available since the development and issuance of the 2010 SEIS and the 2024 LR GEIS.

Other technical or professional studies, analyses, and input have been prepared by other agencies or interests that provide information that is relied upon, in whole or in part, or otherwise considered to support this EA. These include the 2025 DAEC ER (NextEra 2025-TN13199) prepared by NEDA to support the NRC staff's environmental review, as well as NEDA's responses to the NRC staff's requests for confirmation of information (RCIs) and request for additional information (RAI) (NextEra 2026-TN13298), which were issued following the completion of the NRC staff's environmental audit. Relevant documents, or portions thereof, relied upon by the NRC staff are incorporated by reference as appropriate in Chapters 2 and 3.

1.4 Regulatory Provisions, Permits, and Required Consultations

Appendix A lists environmental regulatory requirements, permits, and consultations necessary for the resumption of power operations at DAEC. The NRC staff has also performed consultations required under the ESA (TN1010) and the NHPA (TN4157), as applicable.

2 DESCRIPTION OF PLANT FACILITY AND ALTERNATIVES

2.1 Description of the Duane Arnold Energy Center

Section 2.1 of the NRC's 2010 SEIS (NRC 2010-TN13201) provides a detailed description of the DAEC site vicinity. The NRC staff considered this information as well as the updated information in Section 2.1 of the 2025 DAEC ER (NextEra 2025-TN13199). The information from these sources is incorporated here by reference and summarized to describe the facility site characteristics and features that are relevant to the DAEC site.

DAEC is located on an approximately 500-acre (ac) site in a rural, sparsely populated area in Linn County, Iowa, on the western bank of a north-south reach of the Cedar River. The site is approximately 2 mi north-northeast of the town of Palo and approximately 3 mi east of the Benton County line (Figure 2-1). The general topographical features in this portion of the Cedar River consist of broad valleys and narrow flood plains. Across the Cedar River from the site, the land rises to an elevation of about 900 ft above mean sea level. The slopes are heavily wooded, but away from the immediate vicinity of the river, the land is gently rolling farmland (NRC 2010-TN13201).

DAEC is a single General Electric BWR with a standard BWR-4 reactor design and a Mark I primary containment design. Under its RFL, DAEC was licensed to operate at 1,912 megawatts-thermal (MWt), with a generating capacity of 610 MWe. During operations, DAEC relied on the Cedar River as its source of makeup water for its cooling system, which included two cross-flow mechanical draft cooling towers designed to dissipate heat from the plant's steam cycle to the atmosphere. Makeup water is withdrawn from the Cedar River via a reinforced concrete intake structure located on the west bank of the river. Water used in the reactor and most other plant systems is piped in from the site's well water supply (NextEra 2025-TN13199; NRC 2010-TN13201).

DAEC was prematurely shut down in August 2020 due to windstorm damage to the mechanical draft cooling towers and market conditions. Following the permanent cessation of operations, NEDA completed activities to transition the facility into SAFSTOR, a long-term storage condition for a reactor in decommissioning status. These activities included defueling the reactor; draining fluids and de-energizing systems; reconfiguring the electrical distribution, ventilation, heating, and fire protection systems; and minor deconstruction activities (NextEra 2025-TN13199).

Many major structures at DAEC remain intact from its prior operations, including the reactor building, control building, turbine building, pumphouse, river intake structure, and radioactive waste building (Figure 2-2). A switchyard, substation, and a large parking lot are located to the west of the main complex. A discharge canal runs from the cooling tower area to the river, where intake and pump house facilities are located (NextEra 2025-TN13199). Some deconstruction activities were completed since the shutdown of DAEC, including removal or demolition of the cooling towers, large transformers, and support structures (e.g., external office buildings, maintenance facilities).

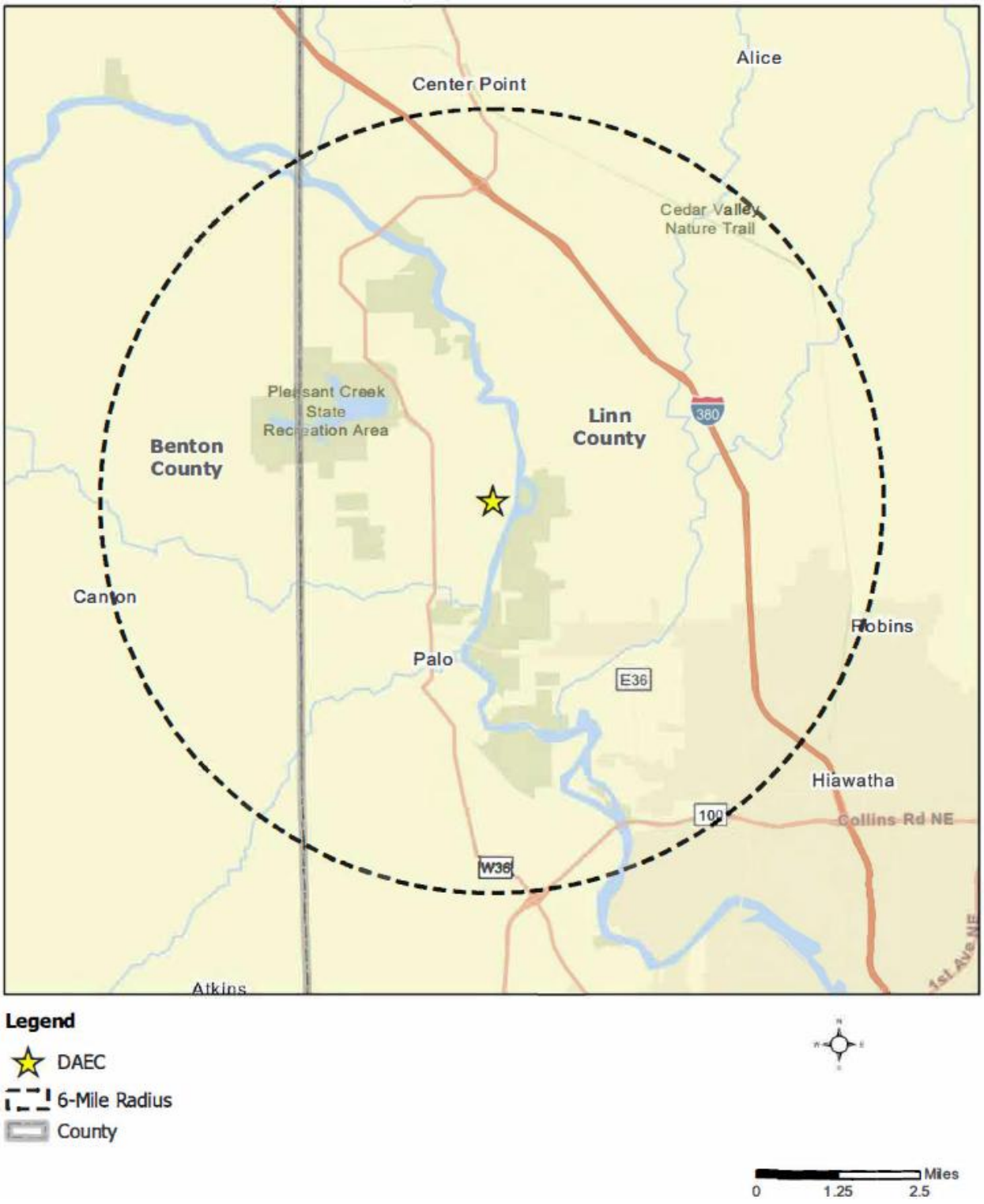


Figure 2-1 Duane Arnold Energy Center 6 mi Radius Map. Source: NextEra 2025-TN13199.

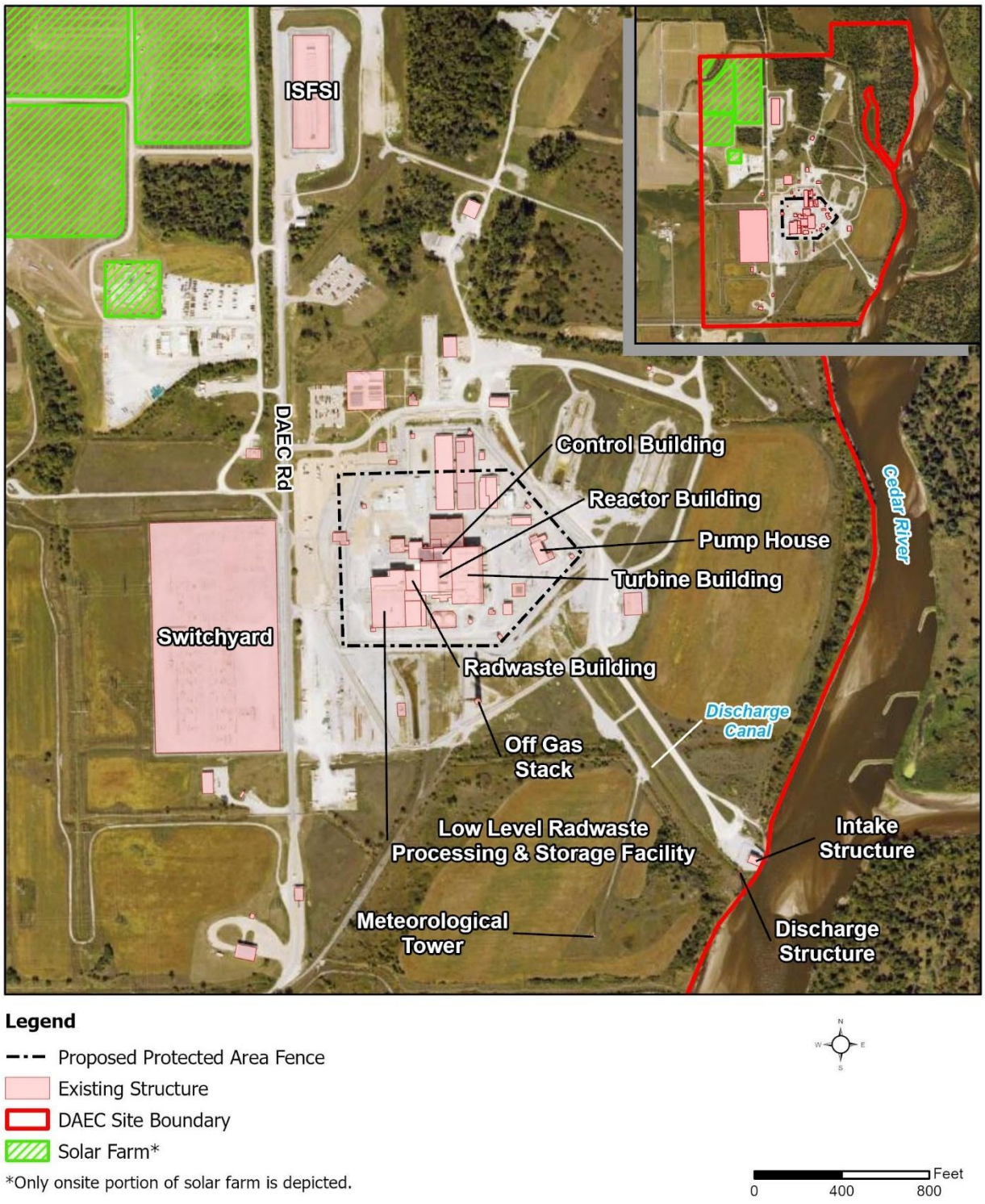


Figure 2-2 Duane Arnold Energy Center Layout and Site Boundary. Source: NextEra 2025-TN13199.

2.2 Alternatives

The NRC regulations in 10 CFR 51.30(a)(1)(ii) (TN10253) state that an EA shall include a brief discussion of alternatives as required by NEPA. Although NEPA Section 102(2)(C) provides requirements for EISs rather than EAs, the NRC's consideration of alternatives in this EA was influenced by that section. NEPA Section 102(2)(C) requires discussion of a reasonable range of alternatives to the proposed action, including an analysis of any negative environmental impacts of not implementing the proposed action (i.e., the no-action alternative), that are technically and economically feasible and meet the purpose and need of the proposal.

The NRC's decision-making authority for the proposed actions is limited to deciding whether to approve the licensing and regulatory requests in support of the reauthorization of power operations at DAEC; therefore, there are no alternatives to the proposed actions that meet the purpose and need of the proposal. However, as part of its analysis of the no-action alternative, the NRC staff evaluates the environmental impacts of a reasonable range of energy generation options. This approach comports with the direction provided by the Commission in the Staff Requirements Memorandum for SECY-24-0046 (NRC 2025-TN12641).

2.2.1 No-Action Alternative

As described in Chapter 1, DAEC was shut down and fuel was removed from the reactor vessel in 2020. Under the no-action alternative, the NRC would not approve the licensing and regulatory requests in support of the reauthorization of power operations at DAEC. Under this scenario, DAEC would not be authorized to resume power operations and would continue to function as a plant in decommissioning status as outlined in the facility's post-shutdown decommissioning activities report (PSDAR) (NextEra 2020-TN13207). The no-action alternative would not meet the purpose and need of the proposed actions. The NRC staff's analysis of any negative environmental impacts of not implementing the proposed actions considers two factors (1) impacts of not restarting DAEC (i.e., continuing in decommissioning status) and (2) impacts of energy generation options.

2.2.1.1 Impacts of Not Restarting DAEC

Prior to the cessation of power generation activities and the removal of fuel from the reactor vessel in 2020, NEDA submitted a PSDAR to the NRC (NextEra 2020-TN13207) in accordance with 10 CFR 50.82(a)(4) (TN249), to outline the proposed decommissioning activities and describe potential associated environmental impacts. In its PSDAR, NEDA concluded that the environmental impacts associated with the planned site-specific decommissioning activities at DAEC would be bounded by appropriate, previously issued environmental impact statements, including the 2010 SEIS (NRC 2010-TN13201). As described in Section 3.16 of this EA, Section 7.0 of the 2010 SEIS (NRC 2010-TN13201), which is incorporated here by reference, evaluates the impacts of decommissioning DAEC at the end of its license renewal term in 2034. Based on its review of information in NUREG-0586, Supplement 1, *Generic Environmental Impact Statement on Decommissioning of Nuclear Facilities: Regarding the Decommissioning of Nuclear Power Reactors, Final Report* (the Decommissioning GEIS) (NRC 2002-TN7254), the PSDAR (NextEra 2020-TN13207), the 2013 LR GEIS (NRC 2013-TN2654), the 2024 LR GEIS (NRC 2024-TN10161), and NUREG-2266, *Environmental Evaluation of Accident Tolerant Fuels with Increased Enrichment and Higher Burnup Levels, Final Report* (NRC 2024-TN10333), the NRC staff has determined that if DAEC continues in its current decommissioning status, this would not alter the previously determined SMALL impacts from decommissioning identified in

the 2010 SEIS (NRC 2010-TN13201). Therefore, under the no-action alternative, the environmental impacts of not restarting DAEC would be NOT SIGNIFICANT.

2.2.1.2 Impacts of Energy Generation Options

As described in Section 1.2.1, NEDA signed a 25-year power purchase agreement with Google to supply carbon-free energy from DAEC to Google's cloud and artificial intelligence infrastructure in Iowa. In the 2025 DAEC ER (NextEra 2025-TN13199), NEDA stated that a reasonably foreseeable consequence of the no-action alternative is the pursuit of other energy options. The 2025 DAEC ER (NextEra 2025-TN13199) notes that new baseload generation is unlikely to be available on or before the date that the NRC would potentially approve the set of licensing and regulatory requests supporting the reauthorization of power operations at DAEC. According to NEDA, the resultant power needs could potentially be offset through demand-side management, delaying the scheduled retirement of one or more existing power plants, or purchased power.

In the 2024 LR GEIS (NRC 2024-TN10161: Section 2.3, Section 2.4, Appendix D), the NRC staff describes energy sources potentially capable of replacing or offsetting the generating capacity of a nuclear reactor as well as their associated environmental impacts. These sections of the 2024 LR GEIS are incorporated here by reference. Table 2.4-1 and Table 2.4-2 of the 2024 LR GEIS summarize the construction and operational environmental impacts of replacement energy options compared to the continued operation of a nuclear power plant. In most cases, the construction and operation of new replacement power facilities would have greater environmental impacts than those associated with the continued operation of a nuclear power plant. For example, major construction projects would typically be required for new energy generation options (e.g., fossil fuel, new nuclear, renewables) whereas minor construction (e.g., refurbishment) could be needed for the license renewal of an existing nuclear power plant. However, the specific impacts of a new energy generation option would vary according to the specific technology selected and the site-specific resource conditions. Nonetheless, in most cases, the construction and operation of new replacement power facilities would have greater environmental impacts than those associated with both the activities related to the preparations for the resumption of power operations and the resumption of power operations at DAEC.

2.2.2 Comparison of the Environmental Impacts of the Proposed Actions and the No-Action Alternative

In Chapter 3, the NRC staff concludes that the potential effects from the proposed actions to prepare for and resume power operations at DAEC would be NOT SIGNIFICANT. Under the no-action alternative, the reasonably foreseeable environmental effects of not restarting DAEC (i.e., continuing in decommissioning status) would be NOT SIGNIFICANT. However, the no-action alternative would necessarily also include the pursuit of other energy options. The ultimate decision about which energy option(s) to implement falls to the power plant owners and State, utility, system, and, where authorized, Federal (other than NRC) energy-planning decision-makers. As discussed in Section 2.2.1.2, energy generation options have the potential to have greater environmental impacts in any number of the applicable resource areas when compared to the proposed actions. Therefore, based on its review of the reasonably foreseeable environmental effects of the proposed actions and the no-action alternative, the NRC staff concludes that the environmentally preferred alternative comprises the proposed actions.

3 AFFECTED ENVIRONMENT AND ENVIRONMENTAL IMPACTS

3.1 Organizational Approach for Resource-Specific Environmental Impact Significance Determinations

This section provides the organizational structure for the NRC staff's analysis of the reasonably foreseeable environmental effects (impacts) of the proposed actions in accordance with the environmental review process summarized in Section 1.3. As stated in Section 1.3.3, the NRC staff considered the potential environmental effects related to preparations for the resumption of power operations at DAEC, including any new construction, and the potential incremental environmental effects from the resumption of power operations for the remainder of the operating term of the DAEC RFL. In doing so, and based on the scope of the proposed actions, the NRC staff focused its EA analysis on resource areas with the potential for significant environmental impacts. The NRC staff evaluated previous environmental documents and effects analyses with regard to each resource area along with their relevance to the potential environmental effects of the proposed actions at the DAEC site. For the resource areas listed below, the NRC staff determined that the potential for significant impacts from the proposed actions was unlikely or that any impacts would be bounded by prior environmental review(s). Therefore, the NRC staff provides only a brief discussion of these resource areas in Chapter 3.

- land use and visual resources (Section 3.2)
- socioeconomic conditions (Section 3.10)
- nonradiological human health (Section 3.11.2)
- uranium fuel cycle and transportation (Section 3.13)
- postulated accidents (Section 3.14)
- decommissioning (Section 3.16)

3.1.1 The Affected Environment of the Proposed Federal Actions

As described in Section 1.3.3, the environmental baseline or affected environment for DAEC and the proposed actions under the NRC staff's evaluation are the environmental conditions at the point in time prior to the commencement of the restart project in 2025. Where appropriate, the NRC staff also considered reasonably foreseeable actions or projects and relevant ongoing environmental trends. Following the shutdown and removal of fuel in 2020, NEDA initiated planned decommissioning activities in accordance with the PSDAR that it had previously submitted to the NRC (NextEra 2020-TN13207). NEDA opted to pursue SAFSTOR, meaning that the reactor facility was placed and maintained in a safe condition that allows for decontamination at a later date. In this configuration, systems that are not required to support spent nuclear fuel storage, heating, ventilation, and air conditioning, emergency plan activities, or site security are drained, de-energized, and secured.

DAEC remains in a decommissioning status as of the date of this EA. Therefore, the affected environment is defined for each resource area given this baseline. In some instances, such as describing the human-built environment, substantial information from the 2010 SEIS (NRC 2010-TN13201) has been cited or incorporated by reference, where appropriate and determined to remain valid. Some information was updated, as appropriate, with source documentation cited for clarity.

The transition to decommissioning status after the permanent cessation of operations at DAEC resulted in a reduction of full-time employees from approximately 386 employees in 2019 to 39 employees in 2025 (NextEra 2025-TN13199). Following its decision to pursue the resumption of

power operations at DAEC, NEDA developed a staffing plan that is expected to gradually increase site and fleet staff to support inspections, renovations, and the proposed startup and operations (NextEra 2025-TN13199).

While the present decommissioning status reflects the current affected environment at DAEC, each resource area includes a specific and relevant discussion on various aspects of the affected environment to make an environmental significance determination for the following:

- Impacts from preparations for the resumption of power operations, described in Section 3.1.2.
- Impacts from the resumption of power operations, described in Section 3.1.3. These are incremental impacts as compared to the 2010 SEIS, which already evaluates the environmental impacts of power operations at DAEC through the end of the current operating license term under the DAEC RFL.
- GHG emissions and climate change, described in Appendix D.
- Activities related to the eventual return to decommissioning status, described in Section 3.16.

3.1.2 Impacts from Preparations for the Resumption of Power Operations

Following the decision to pursue the resumption of power operations at DAEC, NEDA started a comprehensive evaluation to assess the status of plant systems. This process includes a review of the system diagrams, past work orders, shutdown planning documents, and maintenance procedures (NextEra 2025-TN13199). Plant systems, structures, and components are expected to be tested and maintained to support technical specification operability and licensing basis functionality. NEDA anticipates including plant systems where configuration control was not maintained during shutdown in a return-to-service plan (NextEra 2025-TN13208). Separate from and outside the scope of the NRC staff's environmental review as documented in this EA, the NRC staff will carefully review the regulatory and licensing documents for the plant, inspect new and restored components necessary to operate safely, and continue ongoing oversight to ensure the sufficiency of all plant systems and programs.

When considering the impacts related to the preparations for the resumption of power operations, NEDA identified the planned activities necessary to restore DAEC to the operating condition that existed prior to shutdown, as described in Section 2.2.1 of the 2025 DAEC ER (NextEra 2025-TN13199). DAEC site preparation activities are expected to take place from 2025 through 2028. This timeframe considers planning and inspection activities occurring throughout 2025 and implementation of specific work activities required to return plant systems, structures, and components to service, as well as other activities necessary to support the resumption of power operations.

Nearly all activities for the resumption of power operations are expected to include construction of several new buildings and restoration, upgrades, and maintenance occurring within already disturbed areas (NextEra 2025-TN13199). Figure 3-1 is a map identifying the locations of previously disturbed areas at the DAEC site based on land disturbance shown in historical construction aerial photographs (NextEra 2026-TN13298).

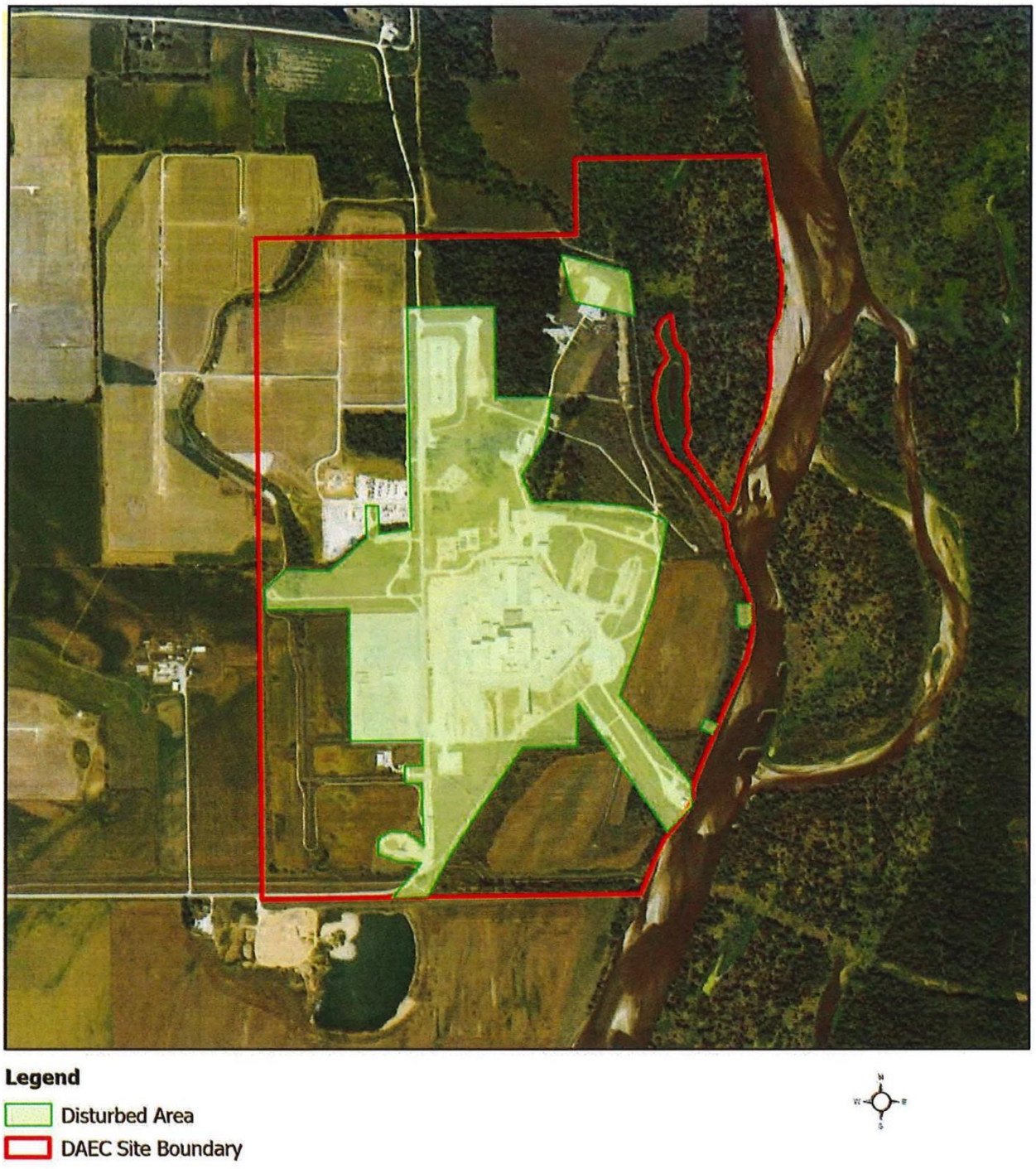


Figure 3-1 Map of Previously Disturbed Areas at the Duane Arnold Energy Center Site. Source: NextEra 2026-TN13298.

NEDA has identified one activity that may occur in an undisturbed area, which is the potential southward expansion of the existing switchyard. Because the original plant-to-switchyard connections were removed following shutdown in 2020, there are no transmission lines connecting the generating unit to the onsite switchyard at DAEC; therefore, new onsite transmission infrastructure is required to support the resumption of power operations. NEDA currently anticipates restoring the original route in the same transmission line configuration that existed during prior DAEC operations. If approvals for the original route cannot be obtained, NEDA will construct a 161 kilovolt (kV) transmission line along a new route south of the plant and expand the existing switchyard to the south, which would disturb approximately 4.3 ac of land (NextEra 2025-TN13199, NextEra 2026-TN13298). The two potential transmission line configuration options are shown in Figure 3-2 below, with additional detail provided in Figure 2.1-3a and Figure 2.1-3b of the 2025 DAEC ER (NextEra 2025-TN13199), which are incorporated here by reference.

Many of the completed, ongoing, or planned plant modification and site preparation activities involve minor ground disturbance and are listed and described in Table 3-1. All planned activities are listed in Tables A through D in Enclosure 1 to NEDA's response to an NRC staff RAI, which is incorporated here by reference (NextEra 2026-TN13298). The NRC staff considered these activities when evaluating the reasonably foreseeable environmental effects of the proposed actions. Figure 3-3 and Figure 3-4 show the locations of these activities.

Table 3-1 Facility Modifications and Activities Supporting Preparations for the Resumption of Power Operations at the Duane Arnold Energy Center

Activities	General Location	Ground Disturbance (Acreage)	Ground Disturbance (Depth)
Expansion of existing DAEC switchyard	Outside of the previously disturbed area. Expansion of southern and/or northern equipment at existing substation.	4.33	4–6 ft
Proposed laydown area	Between protected area and switchyard	4.06	4–6 ft
Demolition of cooling tower basins	Northeast of the protected area and within previously disturbed area	2.46	10 ft (± 5 ft)
Demolition of protected area building foundation (building removed previously), demolition of warehouses to the west and east, demolition of small building foundation west of warehouse, and demolition of mechanical and electrical shops	Within protected area	1.93	10 ft (± 5 ft)
Move protected area fence	Within protected area	1.45	4–6 ft
Cooling tower expansion and construction, including cooling tower motor control center buildings and transformers	Northeast of protected area and within previously disturbed area	1.08	10 ft (± 5 ft)

Activities	General Location	Ground Disturbance (Acreage)	Ground Disturbance (Depth)
Re-route low volume industrial wastewater stream from outfall #5 to sedimentation basin	Final design is pending	<1	4–20 ft
River dredging (maintenance)	Cedar River near intake structure	<1	
Construction of new maintenance and civil shop	Within protected area	0.97	10 ft (± 5 ft)
Spare transformer storage area	Southeast of the substation expansion	0.87	4–6 ft
Plant support center foundation demolition (building removed previously)	North of protected area and within previously disturbed area	0.67	10 ft (± 5 ft)
Demolition of construction support center (building removed previously)	Within protected area	0.67	10 ft (± 5 ft)
Demolition of transmission structures (pending final facility study)	Within protected area	0.67	10 ft (± 5 ft)
Construction of a new training center and an in-processing center at location of existing plant support center	North of protected area and within previously disturbed area	0.65	10 ft (± 5 ft)
Training building parking lot	North of protected area and within previously disturbed area	0.60	4–6 ft
Construction of new outside warehouse for spare parts and equipment to support plant operation (non-radioactive)	Within protected area	0.50	10 ft (± 5 ft)
Construction of a new protected area building	Within protected area	0.48	10 ft (± 5 ft)
Demolition of former sewage treatment facility (abandoned in place)	North of protected area	0.37	10 ft (± 5 ft)
Construction of turbine grating (physical security feature)	Within protected area	0.21	4–6 ft
Transformer Bay demolition/reconstruction	Switchyard	0.20	4–6 ft
Construction of new FLEX building	Within previously disturbed area	0.17	10 ft (± 5 ft)
Demolition of FLEX building south of the existing substation	South of existing substation	0.15	10 ft (± 5 ft)
New maintenance training building	North of protected area	0.13	10 ft (± 5 ft)
Installation of emergency diesel generators and diesel tanks	Within protected area	0.07	4–6 ft
Relocating Well B	Current location is south of existing substation. Well would likely be moved east.	0.04	~285–370 ft
New “VFD” housing for variable speed drives for circulating pumps in new auxiliary building	Within protected area	0.03	4–6 ft

Activities	General Location	Ground Disturbance (Acreage)	Ground Disturbance (Depth)
Relocation of blast and ballistics rated enclosures (like-kind replacement)	Inside protected area	0.01	4–6 ft
Existing roadway repair and resurfacing	Within previously disturbed area	N/A	4–6 ft
New transmission lines from DAEC to the switchyard (final design still pending)	Above-ground lines expected to exit east of turbine building, then be routed south of the protected area and west to the switchyard	N/A	up to 25 ft
Excavations of river water supply buried piping to perform program carbon steel license renewal exams	West of and adjacent to intake structure, east of and adjacent to pump house	N/A	4–20 ft
Excavation to support removal and replacement of “C” well discharge buried piping	Southwest of low-level rad waste processing building to “C” well head	N/A	4–20 ft
Excavation of well water system header to evaluate well water buried piping to perform ductile iron exam	North of rad waste low-level processing facility and south of administration building	N/A	4–20 ft
Excavation of fire protection buried piping ring header to perform license renewal cast iron exams at fire pump discharge	East of turbine building and west of pump house	N/A	4–20 ft
Excavation of fire protection buried piping ring header to perform license renewal ductile iron exams	South side of warehouse	N/A	4–20 ft
Excavation of condensate service water buried piping to perform license renewal stainless steel exams	South side of reactor building	N/A	4–20 ft
Excavation to support maintenance of production well piping (Wells A and D)	North of protected area (Well D) and north of switchyard (Well A)	N/A	4–20 ft

DAEC = Duane Arnold Energy Center; FLEX = Diverse and Flexible Coping Strategies; N/A = not applicable; VFD = variable frequency drive.

Source: NextEra 2026-TN13298.

Figure 3-2 Duane Arnold Energy Center Existing Site Arrangement. Source: IUC 2025-TN13209.

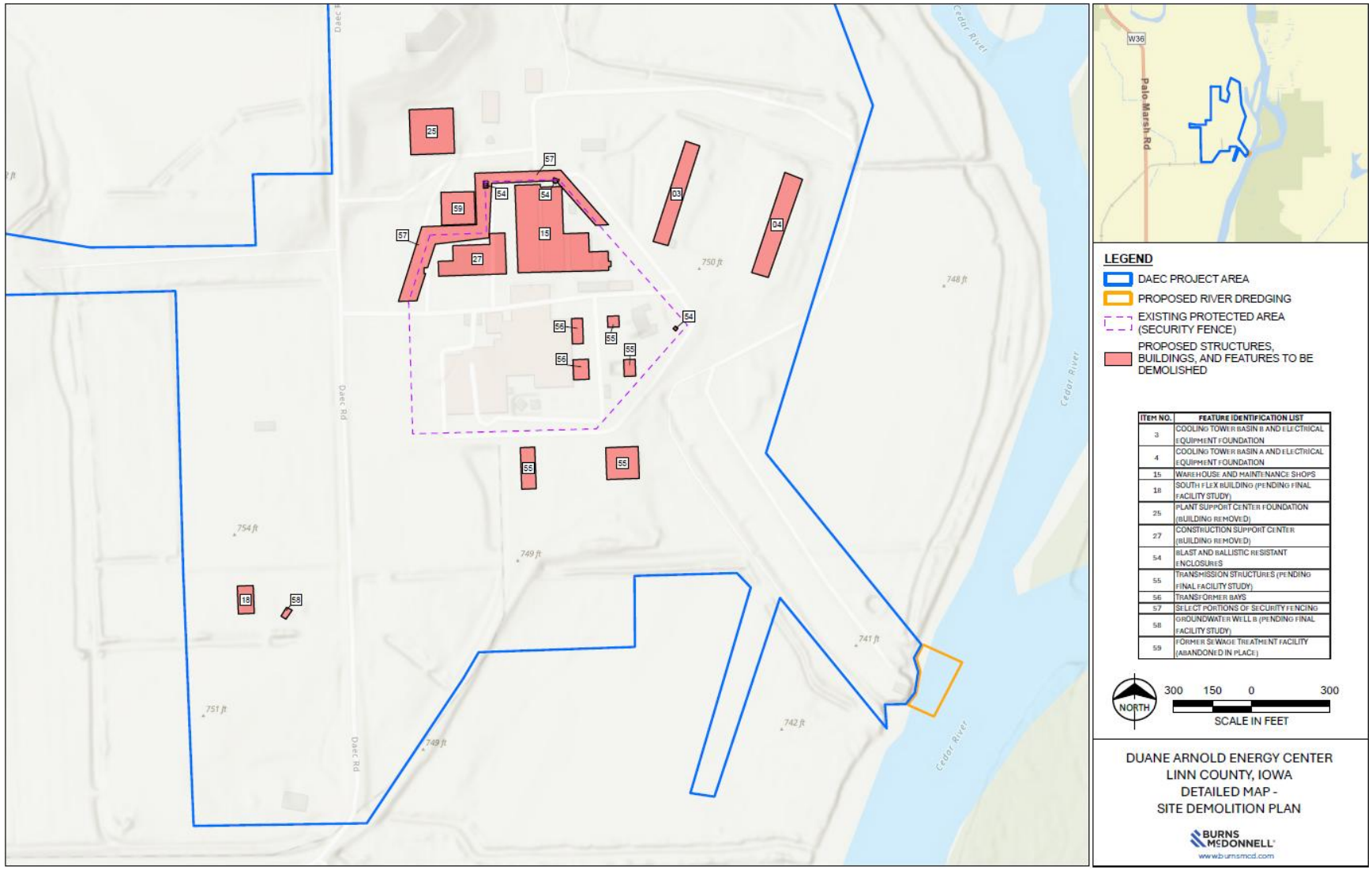
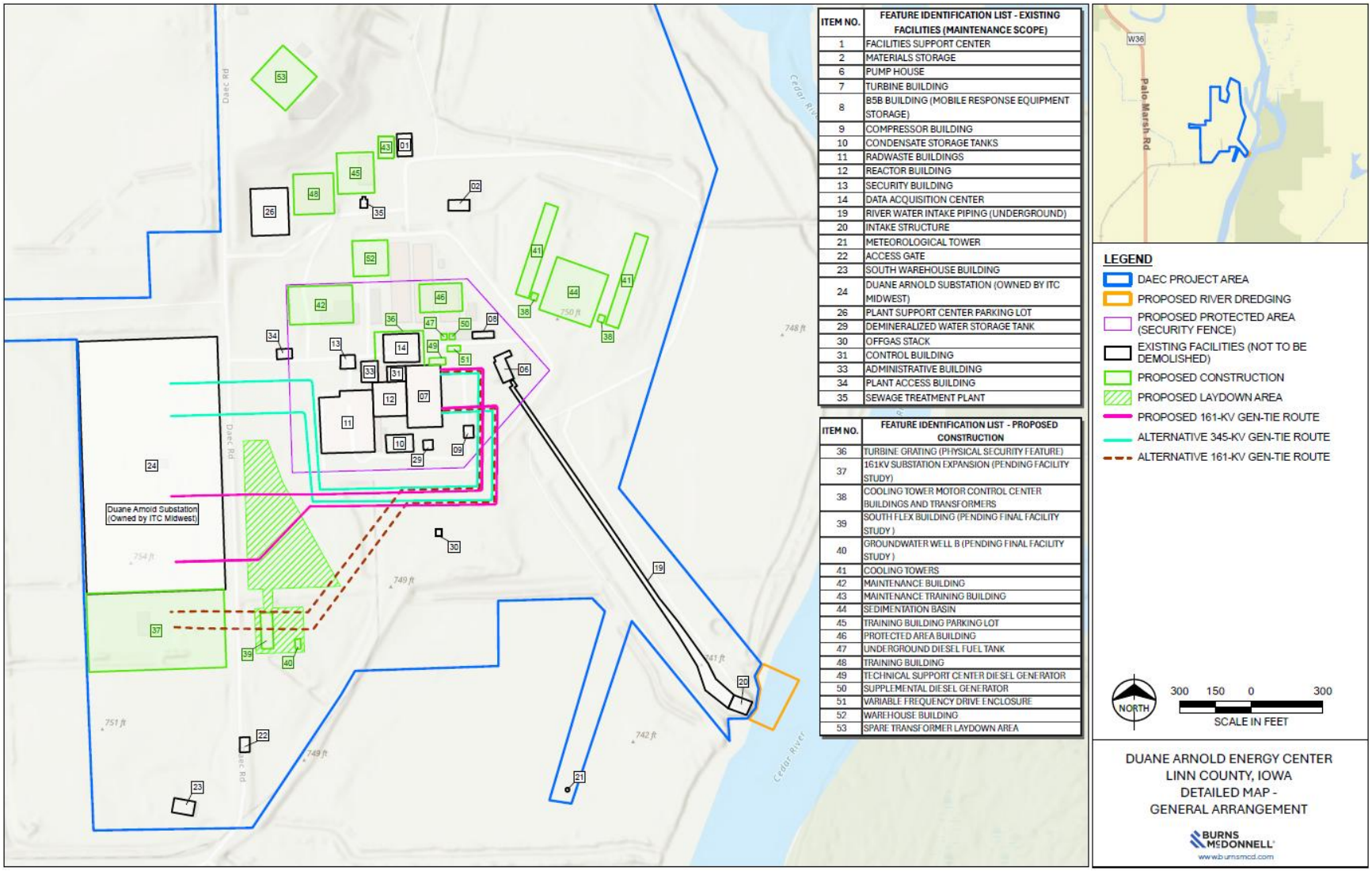


Figure 3-3 Duane Arnold Energy Center Site Demolition Plan. Source: IUC 2025-TN13209.



ITEM NO.	FEATURE IDENTIFICATION LIST - EXISTING FACILITIES (MAINTENANCE SCOPE)
1	FACILITIES SUPPORT CENTER
2	MATERIALS STORAGE
6	PUMP HOUSE
7	TURBINE BUILDING
8	B5B BUILDING (MOBILE RESPONSE EQUIPMENT STORAGE)
9	COMPRESSOR BUILDING
10	CONDENSATE STORAGE TANKS
11	RADWASTE BUILDINGS
12	REACTOR BUILDING
13	SECURITY BUILDING
14	DATA ACQUISITION CENTER
19	RIVER WATER INTAKE PIPING (UNDERGROUND)
20	INTAKE STRUCTURE
21	METEOROLOGICAL TOWER
22	ACCESS GATE
23	SOUTH WAREHOUSE BUILDING
24	DUANE ARNOLD SUBSTATION (OWNED BY ITC MIDWEST)
26	PLANT SUPPORT CENTER PARKING LOT
29	DEMINERALIZED WATER STORAGE TANK
30	OFFGAS STACK
31	CONTROL BUILDING
33	ADMINISTRATIVE BUILDING
34	PLANT ACCESS BUILDING
35	SEWAGE TREATMENT PLANT

ITEM NO.	FEATURE IDENTIFICATION LIST - PROPOSED CONSTRUCTION
36	TURBINE GRATING (PHYSICAL SECURITY FEATURE)
37	161KV SUBSTATION EXPANSION (PENDING FACILITY STUDY)
38	COOLING TOWER MOTOR CONTROL CENTER BUILDINGS AND TRANSFORMERS
39	SOUTH FLEX BUILDING (PENDING FINAL FACILITY STUDY)
40	GROUNDWATER WELL B (PENDING FINAL FACILITY STUDY)
41	COOLING TOWERS
42	MAINTENANCE BUILDING
43	MAINTENANCE TRAINING BUILDING
44	SEDIMENTATION BASIN
45	TRAINING BUILDING PARKING LOT
46	PROTECTED AREA BUILDING
47	UNDERGROUND DIESEL FUEL TANK
48	TRAINING BUILDING
49	TECHNICAL SUPPORT CENTER DIESEL GENERATOR
50	SUPPLEMENTAL DIESEL GENERATOR
51	VARIABLE FREQUENCY DRIVE ENCLOSURE
52	WAREHOUSE BUILDING
53	SPARE TRANSFORMER LAYDOWN AREA

Figure 3-4 Duane Arnold Energy Center Site Proposed Construction and Laydown Areas. Source: IUC 2025-TN13209.

3.1.3 Impacts from the Resumption of Power Operations

Power operations could resume at DAEC if the NRC were to approve the exemption request and the LARs. These approvals would permit NEDA to transition DAEC from a facility in decommissioning status to an operating facility under the DAEC RFL. NEDA plans to resume power operations using the same management practices that were in use prior to decommissioning (NextEra 2025-TN13199).

When evaluating the potential environmental impacts from the resumption of power operations, the NRC staff reviewed and incorporated by reference analyses in the 2010 SEIS (NRC 2010-TN13201), and other relevant environmental documents, where appropriate. These previous NEPA analyses helped support the individual significance determinations for the proposed actions discussed in this EA. In many instances, the NRC staff's impact determination of SMALL[1] in the 2010 SEIS for a particular resource area informed the NRC staff's basis for a "NOT SIGNIFICANT" determination for that resource area in this EA. This is because the impacts discussed for the resumption of power operations are largely the same as those discussed in the 2010 SEIS, which already evaluates the environmental impacts of power operations at DAEC through the end of the current operating license term under the DAEC RFL. The NRC staff considered if there were any incremental environmental impacts as compared to the 2010 SEIS and also considered any potential new and significant information that could affect the analysis for each resource area, including from other relevant NEPA documents as referenced in Section 1.3.4.

3.2 Land Use and Visual Resources

The NRC staff evaluated the potential land use and visual resources effects from the proposed actions by comparing the effects of these activities with the effects from similar activities analyzed in other environmental documents including the information sources cited in Section 1.3.4. Other source documentation used is cited as applicable. This information supports the NRC staff's significance determination for land use and visual resources effects.

3.2.1 Affected Environment

As described in the 2010 SEIS (NRC 2010-TN13201), DAEC is located on approximately 500 ac, 8 mi northwest of Cedar Rapids, Iowa, on the west bank of the Cedar River. The site is approximately 2.5 mi north-northeast of Palo, Iowa, in Linn County (see Figure 2-1). The 158 ac industrial zoned portion of the DAEC site has remained unchanged since shutdown. DAEC facilities include the reactor, turbine-generator, control, low-level radioactive waste, and administration buildings. A switchyard, substation, and a large parking lot are located to the west. A discharge canal runs from the cooling tower area to the river, where the plant's intake and pump house are located. A small sanitary sewage treatment facility is located to the north, and an off-gas stack is located to the south (see Figure 2-2).

[1] The NRC regulations define SMALL environmental effects (impacts) as follows: Environmental effects are not detectable or are so minor that they will neither destabilize nor noticeably alter any important attribute of the resource. For the purposes of assessing radiological impacts, the Commission has concluded that those impacts that do not exceed permissible levels in the Commissions regulations are considered SMALL.

The most visible structures at the DAEC site are the reactor, turbine-generator, control, low-level radioactive waste, and administration buildings, the pump house, and the off-gas stack. The off-gas stack and the reactor building are the tallest onsite structures.

The resumption of power operations would result in occasional reappearances of vapor plumes under certain atmospheric conditions (Ryznar et al. 1980-TN11923). Vapor plumes are more frequently seen in winter months, or during the night and early morning when temperatures are lower, and humidity levels rise. Winds can cause plumes to dissipate close to the ground.

3.2.2 Environmental Impacts from Preparations for the Resumption of Power Operations

Preparations for the resumption of power operations activities, as summarized in Section 3.1.2, were reviewed to determine their land use or visual resources effects. These activities would be consistent with the human designated use and industrial appearance of the DAEC site. Based on this, the NRC staff has determined the proposed actions would not alter the industrial land use and visual appearance of DAEC and any impacts from restart preparation activities would be NOT SIGNIFICANT.

3.2.3 Environmental Impacts from the Resumption of Power Operations

Environmental impacts from the resumption of power operations would only occur within the developed areas of the DAEC site on land zoned for industrial use. Activities in support of the proposed actions would be consistent with the human designated use and industrial appearance of the nuclear power plant site and would be similar to those that occurred during previous DAEC operation.

The visual appearance of DAEC has been well established and remains unchanged during decommissioning. The resumption of power operations would include the occasional reappearance of vapor plumes from the cooling towers. As explained in Section 3.2.1, vapor plumes are more frequently seen in winter months, or during the night and early morning when temperatures are lower and humidity levels rise.

Based on the above information, the NRC staff has determined that the proposed actions would not alter the industrial land use and visual appearance of DAEC, and any impacts related to the resumption of power operations at DAEC would be NOT SIGNIFICANT.

3.3 Meteorology, Air Quality, and Noise

The NRC staff evaluated the potential meteorological, air quality, and noise effects from the proposed actions by comparing the effects of these activities with the effects from similar activities analyzed in other environmental documents including the information sources cited in Section 1.3.4. Other source documentation used is cited as applicable. This information supports the NRC staff's significance determination for meteorology, air quality, and noise effects.

3.3.1 Affected Environment

Regional Climatology

As described in the 2010 SEIS (NRC 2010-TN13201), the DAEC site is in a humid continental climate region zone, characterized by hot humid summers, cold, relatively dry winters, and wet springs. Iowa is exposed to incursions of bitterly cold air masses from the Arctic in the winter and warm, humid air masses from the south in the summer (Frankson et al. 2022-TN11050). Precipitation varies, with the southeastern portion of the State receiving around 41 in. annually compared to 26 in. in the northwest (NOAA 2026-TN13369). Annual average temperature ranges between 44 and 52 degrees Fahrenheit (°F) (NOAA 2026-TN13370).

Meteorology

DAEC's onsite meteorological tower was abandoned in May 2022; NEDA plans to restore the meteorological tower for the resumption of power operations (NextEra 2026-TN13298). The NRC staff obtained climatological data from the Waterloo, Iowa weather station. The station is approximately 50 mi from DAEC and is used to characterize the region's climate because of its relative location and long period of record. The mean annual temperature from the Waterloo weather station for the 1951–2024 period is 47.1°F with a mean monthly temperature ranging from a low of 16.9°F in January and a high of 73.3°F in July (NOAA 2026-TN13373). The mean total precipitation from the Waterloo weather station for the 1951–2024 period is 33.8 in., with a mean monthly total precipitation ranging from a low of 0.95 in. in January to a high of 4.88 in. in June (NOAA 2026-TN13373). The mean annual wind speed from the Waterloo weather station is 9.5 miles per hour (mph), with a prevailing wind direction from the northwest (NOAA 2026-TN13373).

Linn County experiences severe weather, including tornadoes, hail, and thunderstorm winds. The following severe weather events have been reported in Linn County from January 1950 to January 2026 (NOAA 2026-TN13375):

- tornadoes: 64 events
- hail: 364 events
- thunderstorm winds: over 500 events
- flash floods: 58 events

Regional Air Quality

DAEC falls within the Northeast Iowa Intrastate Air Quality Control Region (40 CFR 81.256) (TN7226). Linn County, Iowa, where DAEC is located, is in attainment for all criteria pollutants (40 CFR 81.316; EPA 2026-TN13376). There are no Prevention of Significant Deterioration Class I areas located within a 100 mi radius of the DAEC site. Table 3-2 presents Linn County air emissions.

Table 3-2 Annual Air Emissions, Linn County, Iowa (tons)

County	CO	SO_2	NO_x	PM_{10}	$PM_{2.5}$	VOCs
Linn	25,370	2,720	6,040	8,130	2,240	10,850

CO = carbon monoxide; NO_x = nitrogen oxides; PM_{10} = particulate matter less than 10 microns; $PM_{2.5}$= particulate matter less than 2.5 microns; SO_2= sulfur dioxide; VOCs = volatile organic compounds.
Source: EPA 2020-TN13385.

In accordance with the Clean Air Act (42 U.S.C. § 7401-TN4539), Federal agencies may not issue a license or a permit in a designated maintenance or nonattainment area that does not conform to an applicable State Implementation Plan. Under the General Conformity Rule, a conformity determination may need to be completed for projects that are located in or near a maintenance or nonattainment area. If project emissions are below de minimis levels (40 CFR 93.153) (TN2495), a conformity analysis is not required. As discussed above, Linn County is in attainment for all criteria pollutants. Therefore, the General Conformity Rule does not apply to the proposed actions.

Noise

Noise is unwanted sound and can be generated by many sources. Sound intensity is measured in logarithmic units called decibels (dB). A dB is the ratio of the measured sound pressure level to a reference level equal to a normal person's threshold of hearing. Most people barely notice a difference of 3 dB or less. Another characteristic of sound is frequency or pitch. Noise may be composed of many frequencies, but the human ear does not hear very low or very high frequencies. To represent noise as closely as possible to the noise levels people experience, sounds are measured using a frequency-weighting scheme known as the A-scale. Sound levels measured on this A-scale are given in units of A-weighted decibels (dBA).

Primary offsite noise sources in the immediate vicinity of DAEC include vehicle traffic and agricultural equipment (NextEra 2026-TN13298). The nearest noise sensitive receptors include a resident approximately 0.5 mi west of the reactor building and the Wickiup Hill Conservation Area County Park approximately 1 mi east of the reactor building (NextEra 2019-TN13389).

3.3.2 Environmental Impacts from Preparations for the Resumption of Power Operations

Meteorology and Air Quality

The activities related to the preparations for the resumption of power operations, summarized in Section 3.1.2, were reviewed to determine any impacts related to meteorology and air quality. The identified activities include construction of several new buildings and restoration, upgrades, and maintenance that involve ground disturbance. Ground-disturbing activities, operation of construction equipment, operation of onsite combustion equipment, and worker vehicles have the potential to affect air quality. Ground disturbance will result in fugitive dust emissions. Construction equipment will result in engine exhaust emissions. Vehicle exhaust emissions will result from the workforce commuting to and from the site during restart preparation. Additionally, during restart preparation activities, onsite combustion equipment (including a diesel pump, diesel generators, and auxiliary boiler) will be periodically operated (NextEra 2025-TN13199, NextEra 2026-TN13298). The NRC staff calculated emissions from workers commuting, operation of construction equipment, and ground-disturbing activities based on estimated workforce, estimated ground disturbance presented in Table 3-1, and duration of activities provided in Table A to Enclosure 1 in NEDA's response to an NRC staff RAI (NextEra 2026-TN13298). Table 3-3 presents annual estimated air pollutant emissions over the course of preparation activities at DAEC from worker vehicles, ground-disturbing activities, and use of construction equipment and onsite combustion equipment. These estimated air emissions represent less than 1.5 percent of county emissions (see Table 3-2) and are below 100 tons/year.

Based on this information, the NRC staff anticipates that the meteorology and air quality impacts from restart preparation activities at DAEC would be NOT SIGNIFICANT.

Table 3-3 Air Pollutant Emissions Estimates from Preparation Activities (tons/year) at Duane Arnold Energy Center

Activity	CO	NO_x	SO_x	PM_{10}	$PM_{2.5}$	VOCs
Ground-Disturbing Activities[(a)]	N/A	N/A	N/A	45.4	5.7	N/A
Construction Equipment[(b)]	10.6	25.3	0.02	1.4	1.4	3.2
Onsite Combustion Equipment[(c)]	0.2	10.7	0.7	0.2	0.2	0.9
Worker Vehicles[(d)]	49.3	1.5	0.09	0.6	0.1	4.0
Total	60.1	37.5	0.8	47.6	7.4	8.1

CO = carbon monoxide; DAEC = Duane Arnold Energy Center; EA = environmental assessment; N/A = not applicable; NEDA = NextEra Energy Duane Arnold, LLC; NO_x = nitrogen oxides; NRC = U.S. Nuclear Regulatory Commission; PM_{10} = particulate matter less than 10 microns; $PM_{2.5}$ = particulate matter less than 2.5 microns; SO_x = sulfur oxides; TSP = total suspended particulate; VOCs = volatile organic compounds.

(a) The NRC staff calculated total suspended particulate based on U.S. Environmental Protection Agency (EPA) AP-42 emission factor, TSP (ton) = 1.2 ton/acre/month, estimated ground disturbance presented in Table 3-1 of this EA, and estimated duration of each activity as presented in Table A to Enclosure 1 in NextEra 2026-TN13298. This results in TSP emissions of 340 tons or an average of 113 tons/year over the course of preparation activities. Of the TSP, only a portion will become airborne with aerodynamic diameters of less than 2.5 µm and 10 µm. The NRC staff determined that 5 percent and 40 percent of TSP will result in $PM_{2.5}$ and PM_{10}, respectively, based on Zhao et al. 2017 (TN12317). $PM_{2.5}$ and PM_{10} are conservative in that the emission factor assumes a semiarid climate and ground disturbing activities will be intermittent.

(b) The NRC staff calculated emissions from construction equipment. NEDA did not have detailed information with respect to construction equipment, fuel type, engine size, or total hours of operation for the activities identified in Table 3-1 of this EA. The NRC staff made the following assumptions in estimating emissions: construction equipment would consist of common equipment needed for earthwork (excavator, front end loader, or backhoe); equipment conservatively assumed to be used 8 hours a day for the entire duration of activity identified as presented in Table A to Enclosure 1 in NextEra 2026-TN13298; most conservative 2007 composite emission factors (in pounds per hour [lb/hr]) from AQMD Undated-TN13007 were used; and total emissions were averaged over a period of 3 years to obtain a ton/year rate.

(c) Emissions are based on historical data from operation of onsite combustion equipment used at DAEC following shutdown. Highest values from Table 3.7-1 in NextEra 2025-TN13199 are presented here.

(d) The NRC staff calculated worker vehicles exhaust emissions for 1,309 workers traveling 40 mi a day for a 365-day work year and applied CO, NO_x, PM, and VOC emission factors from Burnham 2021-TN12951 and SO_2 emission factor from Cai et al. 2013-TN13008 for gasoline passenger car model year 2010.

Noise

Noise impacts from preparations for the resumption of power operations could result from the operation of construction equipment, demolition of structures, and worker vehicles. Noise from these activities would be intermittent and short-term. Any increases in noise levels as a result of additional vehicular noise would primarily occur along Power Plant Road and Palo Marsh Road during work shift schedules. NEDA estimates an additional 1,000 workers during preparation activities. These staffing levels are similar to those observed during previous refueling outages at DAEC where site employment increased by 1,000 workers (NRC 2010-TN13201). Therefore, noise levels from workforce vehicular traffic would be similar to those previously experienced during outages. As discussed in Section 3.1.2, NEDA will conduct ground-disturbing activities, demolition, and construction of new buildings (NextEra 2025-TN13199, NextEra 2026-TN13298). The maximum noise levels from equipment used for these activities can reach 88.8 dBA (FHWA 2006-TN10181). Noise levels attenuate rapidly with distance. When distance is doubled from a point source, noise levels decrease by 6 dBA (DOT 2017-TN6567). At a distance of 1,000 ft, sound levels would drop to 58 dBA and at 2,000 ft, sound levels drop to 52 dBA. Furthermore, increases in noise levels would be limited to the DAEC site and would be intermittent. Based on this information, the NRC staff anticipates that noise impacts from restart preparation activities at DAEC would be NOT SIGNIFICANT.

3.3.3 Environmental Impacts from the Resumption of Power Operations

Meteorology and Air Quality

Sources of air emissions from the resumption of power operations will primarily be from worker vehicles, onsite combustion equipment, and operation of the cooling towers. DAEC's cooling system will consist of new mechanical draft cooling towers (NextEra 2025-TN13199). DAEC previously operated mechanical draft cooling towers that were damaged during a severe windstorm in 2020. NEDA plans to replace the cooling towers prior to restart with new mechanical draft cooling towers that are planned to perform similarly to the original system (NextEra 2025-TN13199, NextEra 2026-TN13298). Cooling towers remove excess heat by evaporating water. Upon exiting the tower, water vapor mixes with the surrounding air, and this process can lead to condensation and formation of a visible plume. During winter months, a plume was visible because of operation of the mechanical draft cooling towers (NextEra 2026-TN13298). However, the plume remained onsite and did not impact local roads (NextEra 2026-TN13298). Cooling towers emit particulate matter as water evaporates from water droplets that contain dissolved solids. Table 3-4 presents estimated annual particulate matter from the cooling towers.

During DAEC power operations, NEDA will operate combustion equipment onsite intermittingly. Onsite combustion equipment at DAEC will include diesel generators, a fire pump, and an auxiliary boiler (NextEra 2025-TN13199, NextEra 2026-TN13298; NRC 2026-TN13390). Operation of the onsite combustion equipment will require air permits from the Linn County Health Department. NEDA does not anticipate that an air permit will be required for the cooling towers (NextEra 2026-TN13298). Table 3-4 presents estimated annual air pollutant emissions from onsite combustion equipment, cooling towers, and worker vehicles. Total annual air emissions are minor and less than 100 tons/year.

Table 3-4 Air Pollutant Emissions Estimates from Resumption of Power Operation (tons/year) at Duane Arnold Energy Center

Activity	CO	NO_x	SO_x	PM_{10}	$PM_{2.5}$	VOCs
Cooling Towers[(a)]	N/A	N/A	N/A	3.2	3.2	N/A
Onsite Combustion Equipment[(b)]	0.2	7.9	0.5	0.2	0.2	0.6
Worker Vehicles[(c)]	18.3	0.6	0.03	0.2	0.04	1.5
Total	18.5	8.5	0.53	3.6	3.4	2.1

CO = carbon monoxide; DAEC = Duane Arnold Energy Center; N/A = not applicable; NO_x = nitrogen oxides; NRC = U.S. Nuclear Regulatory Commission; PM_{10} = particulate matter less than 10 microns; $PM_{2.5}$ = particulate matter less than 2.5 microns; SO_x = sulfur oxides; VOCs = volatile organic compounds.

(a) The NRC staff calculated particulate matter emissions for the cooling towers using the following equation: particulate emissions (lb/hr) = water circulation (gallons per minute [gal/min]) × drift rate × total dissolved solids (parts per million [ppm])/1,000,000 × 60 min/hour × 8.345 pounds per gallon (lb/gal). Water circulation is 155,000 gallons per minute (gpm) per cooling tower, drift is 0.001%, total dissolved solids is 470 milligrams per liter (mg/L) (NRC 2010-TN13201; USGS 2021-TN13391). Particulate matter emissions are less than 10 and 2.5 microns conservatively assumed to be total particulate matter emissions.

(b) Emissions are based on historical data from operation of onsite combustion equipment used at DAEC prior to shutdown. Highest values from Table 4.7-1 in NextEra 2025-TN13199 were rounded and presented here.

(c) The NRC staff calculated exhaust emissions from worker vehicles for 386 workers traveling 40 mi a day (NextEra 2025-TN13199) for a 365-day work year and applied CO, NO_x, PM, and VOC emission factors from Burnham 2021-TN12951 and SO_2 emission factor from Cai et al. 2013-TN13008 for gasoline passenger car model year 2010.

Small amounts of ozone and substantially smaller amounts of nitrogen oxides are produced during corona, a phenomenon that occurs when air ionizes near isolated irregularities on the conductor surface of transmission lines. Field studies have shown that high voltage lines up to 765 kV do not generate emissions above ambient measurements (Lee et al. 1989-TN7481; TVA 2013-TN7899; NRC 2015-TN5842). DAEC transmission lines are expected to be restored as 161 kV or 345 kV (NextEra 2025-TN13199). Therefore, the NRC staff does not expect that the transmission lines that will be associated with the operation of DAEC will be a significant contributor of ozone or nitrogen oxides.

Estimated emissions from the resumption of power operations at DAEC represent less than 1 percent of Linn County emissions (see Table 3-2). Based on the above information, the NRC staff anticipates that meteorological and air quality impacts from the resumption of power operations would be NOT SIGNIFICANT.

Noise

Primary noise sources from the resumption of power operations will include cooling towers, transformers, circuit breakers, and worker vehicle traffic (NextEra 2026-TN13298; AEC 1973-TN13202; NRC 2010-TN13201). Noise from worker vehicles would be intermittent during work shift schedules. The resumption of power operations will result in a peak workforce of 386 workers. These staffing levels are similar to prior to the shutdown of DAEC (NextEra 2025-TN13199). Therefore, noise levels from workforce vehicular traffic would be similar to those previously experienced during power operations at DAEC. Air operated circuit breakers can have source sound levels of 146 dBA (Masterson and Themann 2024-TN13392). However, this sound level is not continuous, and it is reached at operator locations (i.e., immediate surrounding location). The cooling tower previously operating at DAEC had a noise pressure level of 87 dBA at a distance of 50 ft (AEC 1973-TN13202). NEDA anticipates that the new mechanical draft cooling towers will perform similarly to the original system (NextEra 2025-TN13199, NextEra 2026-TN13298). Assuming a steady and continuous equivalent sound intensity level of 87 dBA for every hour for the new cooling towers, the day-night sound level would be 93.4 dBA at a distance of 50 ft from the cooling towers. Noise levels attenuate rapidly with distance. When distance is doubled from a point source, noise levels decrease by 6 dBA (DOT 2017-TN6567). The nearest residence to the cooling towers is approximately 3,100 ft away (NextEra 2026-TN13298). Therefore, the NRC staff does not expect day-night sound level at the nearest residence to exceed 65 dBA, which the Federal Housing Administration guideline finds acceptable outside a residence (24 CFR Part 51-TN1016). During the 5-year period prior to shutdown, NEDA did not receive any noise complaints with respect to operations of the facility (NextEra 2026-TN13298).

Based on the above information, the NRC staff concludes that noise impacts from the resumption of power operation at DAEC would be NOT SIGNIFICANT.

3.4 Surface Water Resources

The NRC staff evaluated the potential surface water resources effects from the proposed actions by comparing the effects of these activities with the effects from similar activities analyzed in other environmental documents including the information sources cited in Section 1.3.4. Other source documentation used is cited as applicable. This information supports the NRC staff's significance determination for surface water resources effects.

3.4.1 Affected Environment

As shown in Figure 2-1 and Figure 2-2, DAEC is situated on the western bank of a north–south segment of the Cedar River in Linn County, Iowa within the Central Lowland physiographic province. Topography in the region is characterized by smoothly contoured landforms of low to moderate relief (NextEra 2019-TN13393). The facility is located in a rural setting, with the nearest city, Cedar Rapids, approximately 8 mi to the southeast (NextEra 2023-TN13394). The drainage area contributing to the site is approximately 6,250 square miles (mi^2) (NextEra 2019-TN13393). The Cedar River flows into the Iowa River approximately 130 mi downstream of the site.

Section 2.1 describes the location, layout, and cooling system of DAEC, including the intake and discharge structures and source of plant water use. Additional details related to the cooling and auxiliary water system are described in Section 2.1.5 of the 2010 SEIS (NRC 2010-TN13201), which is incorporated here by reference. NEDA is replacing the cooling towers, which were removed after being damaged in 2020, but the design has not been finalized.

Cedar River flow is monitored approximately 15 mi downstream of DAEC by the United States Geological Survey (USGS) at station 05464500, which has a contributing drainage area of 6,510 mi^2. Flow at the DAEC site is expected to be comparable to the flow measured at this location because the drainage areas differ by less than 5 percent and no major tributaries enter the river between DAEC and the gaging station (NRC 2010-TN13201). USGS station 05464420 is located 2 mi downstream of DAEC; however, it has been active for less than 20 years. Therefore, due to the similarity of data, the NRC staff selected USGS station 05464500 for this analysis due to its long (over 120-year) data record. Figure 3-5 presents the average annual flow measured at USGS station 05464500 for water years 1903–2025. The mean annual discharge over this period is approximately 4,240 cubic feet per second (cfs). On average, April is the high-flow month, and January is the low-flow month with approximate flows of 7,246 and 1,781 cfs, respectively (USGS 2025-TN13564).

The use of surface water from the Cedar River to support plant operations has declined significantly since plant shutdown in August 2020. Under normal operating conditions, approximately 5,887 million gallons per year (Mgy) was withdrawn from the Cedar River for the circulating water and service water systems (NRC 2010-TN13201; NextEra 2025-TN13199). Following shutdown, withdrawals dropped to 2,846 Mgy in 2020 and 96.4 Mgy in 2021, with no surface water withdrawals recorded from August 2022 through December 2024 (NextEra 2025-TN13199). NEDA is required to maintain monthly water use records and to submit them annually to the Iowa Department of Natural Resources (DNR). Potable and sanitary water is supplied from onsite groundwater wells, rather than surface water.

Plant effluent is discharged to the Cedar River under National Pollutant Discharge Elimination System (NPDES) permit No. 5700104 (EPA No. IA0003727), which authorizes discharges during plant shutdown through three external outfalls. This permit is valid from March 1, 2022, to February 28, 2027. The permit and its supporting documentation (IADNR 2022-TN13396) describe the nature of permitted discharges, which exclude stormwater, cooling tower blowdown, and low-volume wastewater. The segment (IA-02-CED-457) of the Cedar River that DAEC discharges to is not listed as impaired and has Iowa DNR designated uses of Class A1 (primary contact recreation), Class BWW1 (warmwater aquatic life), and Class HH (human health/fish consumption) (IADNR 2026-TN13397). No formal enforcement actions were issued regarding DAEC's NPDES permit in the last 5 years (2020 through 2024) (EPA 2026-TN13398; NextEra 2026-TN13298). Current shutdown conditions do not expose stormwater to industrial

activity (NextEra 2025-TN13199). DAEC maintains a stormwater pollution prevention plan (SWPPP) to manage stormwater discharges from the site. Inadvertent releases of oil and oil product discharges are managed under the site spill prevention, control, and countermeasures (SPCC) plan. There are no potable water supplies taken from the Cedar River downstream of DAEC (NextEra 2025-TN13199).

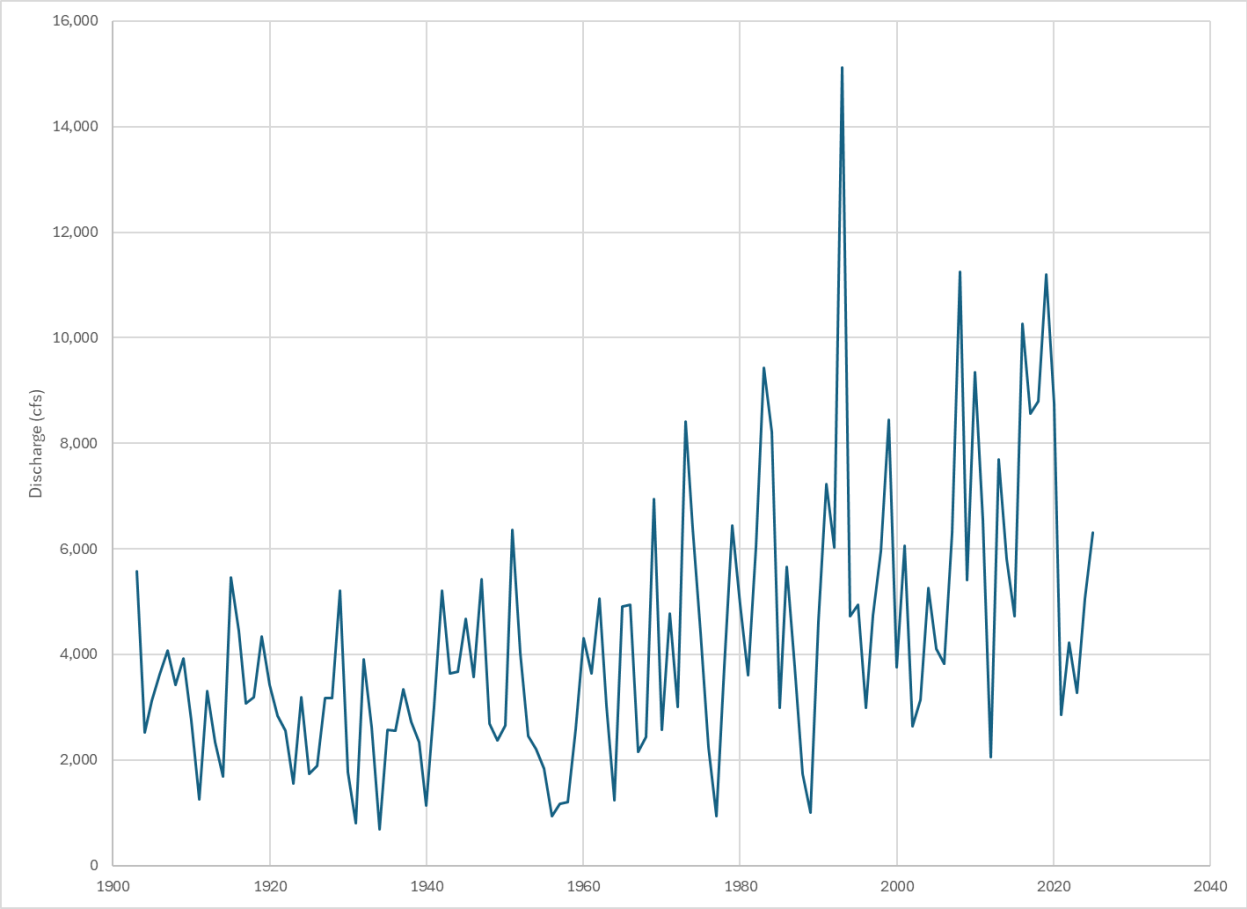


Figure 3-5 Annual Average Cedar River Discharge at Cedar Rapids, Iowa for Water Years 1903–2025. Source: USGS 2026-TN13395.

3.4.2 Environmental Impacts from Preparations for the Resumption of Power Operations

The activities related to the preparations for the resumption of power operations at DAEC are described in Section 3.1.2.

NEDA anticipates that onsite staffing levels during restart preparation activities will be similar to those observed during previous outages. The types and volumes of waste generated by the preparation activities are expected to be consistent with those typical of a pre-shutdown outage (NextEra 2025-TN13199). Potable water will be supplied from onsite groundwater sources rather than from surface water.

Planned construction activities will primarily be conducted in previously disturbed areas. The only activity that may occur in an undisturbed area is the potential expansion of the existing switchyard, which may extend southward approximately 4.3 ac. At this time, NEDA has not

determined if the switchyard will be expanded. Construction activities will be conducted after NEDA obtains coverage under Iowa DNR NPDES General Permit No. 2 for "Storm water discharge associated with construction activity." Additionally, NEDA would obtain and comply with a Sovereign Lands Construction Permit from Iowa DNR for any work in or near the floodplain. Site preparation activities may increase stormwater runoff carrying sediment and other pollutants into the Cedar River. NEDA does not anticipate significant changes to the current land cover or drainage patterns from construction activities (NextEra 2026-TN13298). NEDA utilizes best management practices (BMPs) to minimize stormwater pollution potential. These BMPs include good housekeeping, preventive maintenance, spill prevention and response procedures, inspections, employee training, facility security, management of runoff, sediment and erosion control, and stormwater monitoring (NextEra 2026-TN13298). NEDA also maintains an SPCC plan that includes practices to minimize hazards to human health and the environment by preventing and controlling oil spills. The NRC staff expects impacts on surface water resources from ground-disturbing activities to be temporary, localized, and minor due to NEDA's use of existing internal procedures and compliance with applicable Federal, State, and local permit requirements. As described, NEDA's planned activities are similar to those outlined in Section 4.5.1.1.1, "Surface Water Use and Quality (Non-Cooling System Impacts)," of the 2024 LR GEIS (NRC 2024-TN10161). In the 2024 LR GEIS, the NRC staff concluded that the impacts on surface water quality from non-cooling systems for license renewal are SMALL, provided that BMPs are implemented.

NEDA indicates that the water demand for most restart activities (e.g., dust suppression, concrete mixing, etc.) will be met from site groundwater wells while Cedar River water will be used to fill cooling towers, spent fuel pool, the reactor vessel, and piping (NextEra 2025-TN13199). The circulating water system holds 2.4 million gallons (Mgal), and the fuel storage pool, well, and pit together hold 572,600 gallons (gal) (NextEra 2021-TN13399, NextEra 2019-TN13400). DNR-issued Water Use Permit No. 3046-R7 authorizes DAEC to withdraw up to 12,575 Mgy from the Cedar River and supports planned water use during the current decommissioning status, preparations for resumption of power operations, and resumption of power operations. NEDA's permitted withdrawal rate represents a small fraction of river discharge, even under low flow conditions. Moreover, Permit No. 3046-R7 states that NEDA shall limit withdrawals to quantities that prevent material damage to downstream users.

NEDA's current NPDES permit authorizes discharges to the Cedar River during plant shutdown but excludes cooling tower blowdown and low-volume wastewater discharges. NEDA plans to submit an NPDES renewal application in 2026 that reflects conditions should power operations resume. NEDA does not expect any changes to environmental interfaces, new sources, or significant differences in emissions or effluents, including their volumes or mass, compared to power operations before the 2020 plant shutdown (NextEra 2025-TN13199). NEDA anticipates receiving a renewed NPDES permit in 2028. Additionally, NEDA will submit a Notice of Intent for coverage under Iowa NPDES General Permit No. 1, which governs stormwater discharges associated with industrial activity. At present, no industrial activities at the facility are exposed to stormwater. NEDA has reached out to Iowa DNR and is awaiting confirmation that the facility's existing Clean Water Act (CWA) Section 401 Water Quality Certification remains valid should power operations resume (NextEra 2026-TN13298).

NEDA will inspect intake and discharge structures before resuming operations to confirm that they are operable, and the stormwater system will continue to undergo routine inspections under the site's SWPPP. Maintenance dredging is planned for the area around the intake structure and does not require a CWA Section 404 permit (NextEra 2026-TN13298). Spoil materials will be managed outside of the floodplain (NextEra 2025-TN13199).

As noted in Section 3.5.2, construction dewatering may be needed for excavation, trenching, or placing pipes where shallow groundwater is encountered. When dewatering is required, NEDA must obtain the necessary permits and follow all requirements for discharging water to State surface waters or to the ground surface (NextEra 2026-TN13298).

Based on its review of the information summarized above, including the authorizations and permits required to be obtained, the NRC staff concludes that surface water resources impacts from restart preparation activities at DAEC would be NOT SIGNIFICANT.

3.4.3 Environmental Impacts from the Resumption of Power Operations

Upon the resumption of power operations at DAEC, NEDA anticipates maintaining a workforce of approximately 400 full-time employees, consistent with staffing levels prior to the plant's 2020 shutdown. Accordingly, potable water use and wastewater discharges are expected to be similar to historical operational levels. Potable and sanitary water demand will be met using onsite groundwater sources rather than surface water (NextEra 2025-TN13199). All sanitary wastewater generated onsite will continue to be managed through the plant's existing treatment system.

NEDA does not expect any changes to environmental interfaces, new sources, or significant differences in emissions or effluents, including their volumes or mass, compared to operations before the plant's 2020 shutdown (NextEra 2025-TN13199). During power operations, impacts to surface water quality from plant discharges would be regulated under DAEC's NPDES permit. NEDA plans to submit an NPDES permit revision application in 2026 to encompass plant effluents under operational conditions (NextEra 2025-TN13199). NEDA anticipates conducting maintenance dredging on an as-needed basis to maintain intake functionality. Historically, maintenance dredging has occurred approximately once every 2 years (NextEra 2026-TN13298).

NEDA maintains and implements an SWPPP that includes BMPs to minimize exposure of industrial activities to stormwater. These BMPs include good housekeeping, preventive maintenance, spill prevention and response procedures, inspections, employee training, facility security, management of runoff, sediment and erosion control, and stormwater monitoring (NextEra 2026-TN13298). NEDA also maintains an SPCC plan that includes practices to minimize hazards to human health and the environment by preventing and controlling oil spills. No potable water is withdrawn from the Cedar River downstream of DAEC (NextEra 2025-TN13199).

Water Use Permit 3046-R7 authorizes NEDA to withdraw up to 12,575 Mgy from the Cedar River (NextEra 2025-TN13199). Upon the resumption of power operations at DAEC, NEDA expects total raw water withdrawals from the Cedar River to be 5,887 Mgy (11,200 gpm), with total consumptive use due to makeup evaporation and blowdown losses at the cooling towers to be approximately 4,257 Mgy (8,100 gpm), consistent with previous operational levels (NextEra 2025-TN13199). NEDA also expects the performance and water consumption rate of the new mechanical draft cooling towers to be similar to previous operations at approximately 8,100 gpm (equivalent to 18 cfs) (NextEra 2025-TN13199). This consumptive water use rate represents less than 3 percent of the daily 90-percent exceedance flow (approximately 712 cfs) at the Cedar Rapids gaging station (USGS 2025-TN13564). The 90-percent exceedance flow value is one indicator of hydrologic drought as it signifies a rate of stream flow that is equaled or exceeded 90 percent of the time. In the 2010 SEIS, the NRC staff concluded that water use conflicts associated with surface water withdrawals at DAEC would be SMALL, including during

periods of low flow. NEDA was previously authorized to release water upstream of DAEC from Pleasant Creek Reservoir during low-flow conditions. Because this authority was never exercised during historical operations, NEDA has chosen not to renew the corresponding Water Use Permit 3533-R4, which expired in 2024 (NextEra 2026-TN13298). In the 2010 SEIS (NRC 2010-TN13201), the NRC staff concluded that the impact to surface water resources from operating DAEC for an additional 20 years would be SMALL. Based on its review of the information summarized above, the NRC staff concludes that surface water resources impacts related to the resumption of power operations at DAEC would be NOT SIGNIFICANT.

3.5 Groundwater Resources

The NRC staff evaluated the potential groundwater resources effects from the proposed actions by comparing the effects of these activities with the effects from similar activities analyzed in other environmental documents including the information sources cited in Section 1.3.4. Other source documentation used is cited as applicable. This information supports the NRC staff's significance determination for groundwater resources effects.

3.5.1 Affected Environment

Neither the 2025 DAEC ER (NextEra 2025-TN13199) nor the 2010 SEIS (NRC 2010-TN13201) contains a specific section on the geologic environment. However, information on site-specific hydrogeology, a part of the subsurface geologic environment, is included in Section 3.2.1 of the 2025 DAEC ER with multiple references to the DAEC Defueled Safety Analysis Report (NextEra 2021-TN13399). The DAEC Defueled Safety Analysis Report also contains site-specific hydrogeologic information that informs the discussion of groundwater resources related to potential effects of the proposed actions. Understanding site hydrogeology is important because hydrogeologic characteristics control groundwater flow and the transport of radionuclides should spills or inadvertent releases occur during plant operations. Section 4.5.1.2.7 of the 2024 LR GEIS (NRC 2024-TN10161) states that the magnitude of impacts from inadvertent releases of radionuclides depends on the magnitude of the leak or spill, radionuclides and their concentrations, hydrogeology, distance to receptors, and response time necessary to identify and stop the leak.

Figure 3-5 is a generalized northwest-southeast cross-section that illustrates the hydrogeologic units at the DAEC site. It shows the boreholes on which it is based from B-34 on the northwest to B-36 on the southeast and the unconsolidated surficial alluvium (i.e., floodplain deposits of the Cedar River) and glacial till that underlie the site. The Holocene age (0.012 million years to the present) alluvium and the Pleistocene age (2.58 to 0.012 million years) glacial till overlie limestone and dolomitic limestone bedrock of the Wapsipinicon Formation of Middle Devonian age (393.3 to 382.7 million years) and the Gower Formation of Upper Silurian age (about 427.4 to 419.2 million years) (NextEra 2025-TN13199, NextEra 2019-TN13393).

The alluvium grades from silty fine sand and clayey fine sand to fine to coarse sand with some gravel and occasional cobbles and boulders. The alluvium averages 20 ft thick and the cross-section illustrates variations in thickness detected in boreholes from northwest to southeast. The sandy sediments in the alluvium form the uppermost and shallowest aquifer at the site. The relatively flat plain on which the site is located is approximately 750 ft above mean sea level (NextEra 2019-TN13393). The glacial till ranges in thickness from 12–80 ft and consists primarily of silty clay with pockets of sand and gravel and occasional cobbles and boulders. The till contains a relatively impervious clayey horizon that forms an aquiclude under most of the site with a maximum thickness of about 60 ft (NextEra 2025-TN13199, NextEra

2021-TN13399). Depth to weathered limestone bedrock ranges from 25–100 ft below ground surface (bgs) at the DAEC site and it forms the lower (intermediate) aquifer (NextEra 2025-TN13199). These two relatively shallow aquifers underlie the site and are separated by the clayey horizon in the till (NextEra 2025-TN13199, NextEra 2021-TN13399). As further described below, the deeper non-weathered Devonian-Silurian bedrock aquifer (i.e., limestone and dolomitic limestone) shown in the cross-section is the source of groundwater for DAEC.

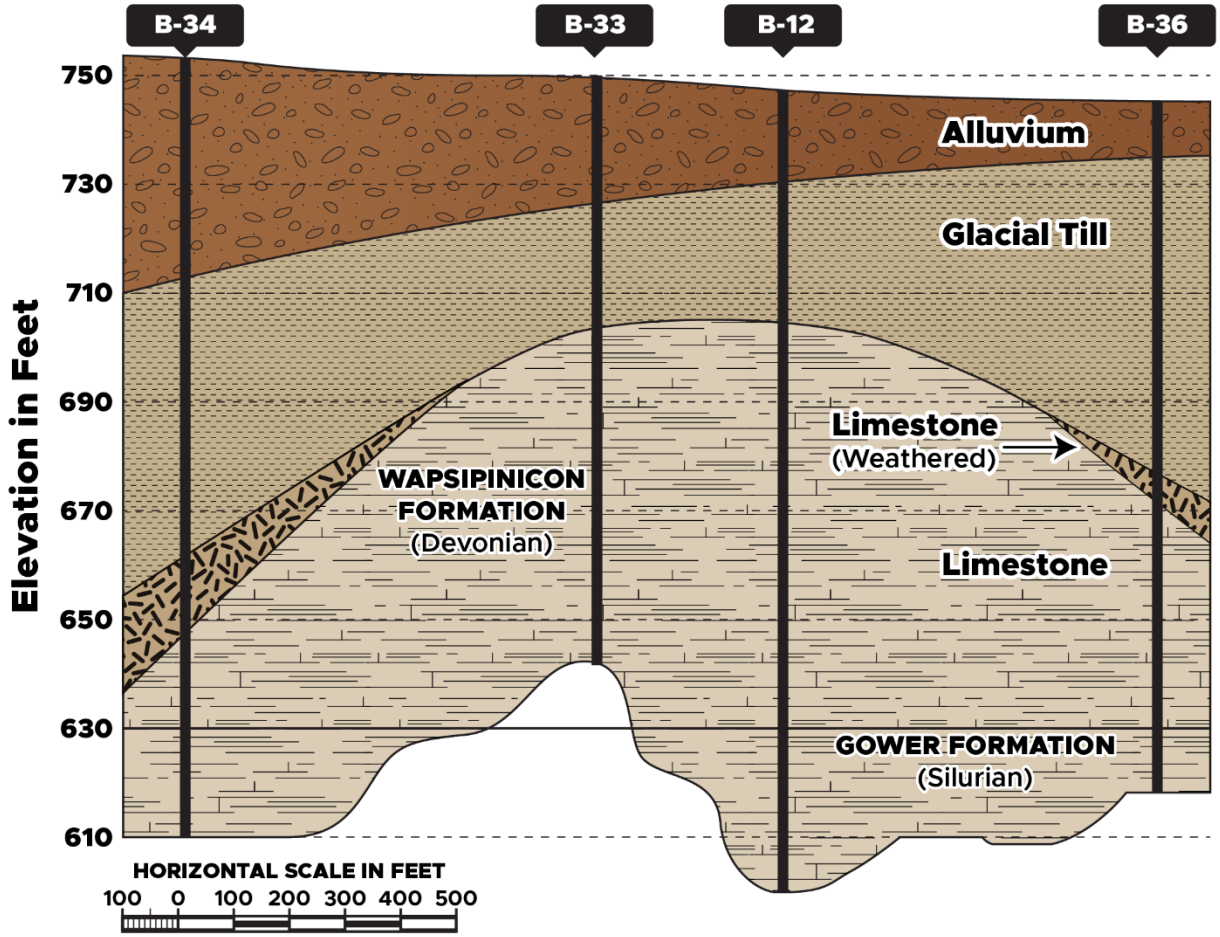


Figure 3-6 Hydrogeologic Cross-Section of the Duane Arnold Energy Center Site. Adapted From: NextEra 2021-TN13399: Figure 2.5-7.

No groundwater potentiometric surface maps are available for the DAEC site from 2020 through 2024 (NextEra 2025-TN13199). However, available information suggests that excavations currently intersect the water table at depths ranging from 10–20 ft bgs across the site. Seasonally, high water table conditions may be present at depths shallower than 10 ft, particularly near the Cedar River floodplain (NextEra 2026-TN13298). Water table conditions are also sensitive to and vary due to rainfall, snow melt, and surface runoff (NextEra 2021-TN13399). In the village of Palo, 2.5 mi south-southwest of DAEC, the water table reportedly lies at approximately 12 ft bgs (NextEra 2021-TN13399).

Groundwater flow in both surficial aquifers is generally southeasterly beneath the DAEC site toward the Cedar River (NextEra 2025-TN13199, NextEra 2021-TN13399). The alluvial aquifer is recharged by precipitation and locally by periodic flooding or river recharge (NRC 2010-

TN13201). The intermediate aquifer that is formed by weathered bedrock is a source of recharge to the underlying deeper non-weathered bedrock aquifer (NextEra 2025-TN13199).

Offsite private wells located west and north of DAEC are hydraulically upgradient of the plant and some are within about 1 mi of the site boundary. Private wells located south-southwest of the plant are cross-gradient to site groundwater (NRC 2010-TN13201; NextEra 2021-TN13399). Therefore, none of these offsite wells would be affected by effluents or inadvertent releases from DAEC associated with restart preparations or the resumption of power operations.

The engineered backfill associated with the safety-related structures of the DAEC nuclear island consists of a medium sand that is similar in permeability to the natural alluvium. This backfill provides a preferential flow path between the shallow upper and lower aquifers that occur in the alluvium and weathered bedrock, respectively. Major facility structures impede groundwater flow, such as the reactor building that is founded on bedrock 50 ft bgs (NextEra 2025-TN13199).

The non-weathered bedrock Silurian-Devonian aquifer is formed by limestone and dolomitic limestone beneath the site (NRC 2010-TN13201, NextEra 2025-TN13199) (see Figure 3-6). This aquifer is the source of groundwater for DAEC's supply wells, as described below. Groundwater in the bedrock is under confined (artesian) conditions and the direction of flow is toward the river (NRC 2010-TN13201). Based on long-term groundwater monitoring results at DAEC, vertical groundwater gradients in the bedrock aquifer are downward and related to effects of regional groundwater withdrawals (NextEra 2025-TN13199).

As described in Section 3.2.1.1 of the 2010 SEIS, four water supply wells provided water for multiple purposes at DAEC prior to plant shutdown. These uses included demineralizer makeup, potable water, and cool water makeup to the air-cooling system to assist with the removal of heat from system components during startup, normal operation, and shutdown. The wells are designated A, B, C, and D and have total depths ranging from 285 to 380 ft (NRC 2010-TN13201). Information from Section 3.2.1.1 of the 2010 SEIS regarding well uses, descriptions, and operations is incorporated here by reference. Groundwater was used as a backup water source for emergency reactor injection, fire protection systems, and the reactor building closed cooling water heat exchangers (NextEra 2025-TN13199).

During previous operations prior to plant shutdown, groundwater withdrawals totaled approximately 1,510 gpm. These withdrawal rates are equivalent to about 2.1 million gallons per day (Mgd). Approximately 90 percent of this groundwater demand was for the air-cooling system.

In February 2022, NEDA installed a new water supply well to provide potable and sanitary water for site employees at the security building. The well was installed to a depth of 240 ft to support a withdrawal rate of 20 gpm. The well was installed under an Iowa DNR private water well construction permit (Permit No. 58665). The water from the well does not require treatment for potability (NextEra 2025-TN13199, NextEra 2026-TN13298). Since plant shutdown in 2020, Well B has been used to provide water for sanitary (non-potable) purposes at less than 400 gallons per week for about 30 people (NextEra 2026-TN13298). From 2020 through 2024, the average groundwater withdrawal rate at DAEC ranged from a high of about 2.04 Mgd in 2020 to a low of 0.025 Mgd in 2023. DAEC's Water Use Permit (No. 3046-R7) from Iowa DNR authorizes up to 1,575 Mgy, equivalent to 4.4 Mgd from four water supply wells, with a rate not to exceed a combined maximum rate of 3,000 gpm from the four wells (NextEra 2025-TN13199).

NEDA maintains 56 shallow and intermediate monitoring wells across the DAEC site that are included in the radiological groundwater protection program (GWPP) for the site. Groundwater monitoring results are reported in annual radiological environmental operating reports (AREORs) and annual radioactive material release reports (ARMRRs). These wells are installed to monitor the shallow unconfined and intermediate portions of the surficial aquifer, as previously described (NextEra 2025-TN13199). While the 56 wells are sampled annually, the 31 monitoring wells located closer to, and downgradient of, plant systems with the highest potential risk to groundwater are sampled more frequently as plant systems return to operational status (NextEra 2026-TN13298). The 31 sentinel wells provide early detection of an underground leak within and outside of the protected area (NextEra 2025-TN13199).

In 2024, 33 samples of non-potable groundwater were collected and analyzed from 33 monitoring wells and tritium was the only byproduct of plant operations identified. Concentrations of tritium ranged from less than 174 picocuries per liter (pCi/L) to 386 pCi/L at monitoring well MW-22A. Monitoring well MW-22A monitors the upper shallow aquifer within the protected area and downgradient of the power block/reactor building. Tritium was not identified in any potable drinking water well onsite, at offsite wells, or in Cedar Rapids municipal drinking water (Microbac 2025-TN13402). These measured concentrations are a small fraction of the maximum contaminant level (MCL) of 20,000 pCi/L for tritium specified by the U.S. Environmental Protection Agency (EPA).

Over the last 5 years (i.e., 2020 to 2024), there have been no inadvertent abnormal releases of radionuclides due to spills or leaks at DAEC (NRC 2026-TN13403). However, as summarized in Section 3.2.1.2 of the 2025 DAEC ER (NextEra 2025-TN13199) and in the following paragraphs, NEDA identified, investigated, and remediated prior inadvertent releases of tritium to groundwater at the site.

Between December 2015 and February 2016, tritium concentrations increased substantially. In monitoring well MW-08A, tritium increased from 210 pCi/L (sample from 12/15/2015) to 65,862 pCi/L (sample from 02/25/2016) (NextEra 2025-TN13199). The maximum tritium concentration observed in a sample from October 25, 2016 in MW-08A was 63,959 pCi/L. In monitoring well MW-22A located immediately west of MW-08A, the highest tritium concentration observed in a sample from September 20, 2016 was 296,589 pCi/L (NextEra 2016-TN13404, NextEra 2017-TN13405). These measurements led NEDA to identify a tritium plume in the shallow, upper surficial aquifer less than 25 ft bgs (NextEra 2017-TN13406, NextEra 2017-TN13405). The plume originated along the south-southeast end of the turbine building and extended to the southeast along the groundwater flow gradient. NEDA attributed the source of the tritium to a break in cast iron piping embedded in the base mat of the turbine building. Corrective actions, including repairing the piping in 2016, were followed by inspections and coating of system drains and sumps in 2019 (NextEra 2025-TN13199). Location of the turbine building is shown in Figure 2-2.

In 2016, NEDA commissioned the construction of an extraction well and remediation system at DAEC, as described in Section 3.2.1.2 of the 2025 DAEC ER (NextEra 2025-TN13199). The system, which consisted of three extraction wells (i.e., EW-01A, EW-02A, and EW-03A) and supporting equipment, functioned to extract, dilute, monitor, and discharge remediated groundwater to the Cedar River along with DAEC's normal cooling water blowdown. The wells were installed in the area southeast of the turbine building and in the southeast portion of the owner-controlled area to align with the groundwater flow direction. Specifically, well EW-01A was placed inside the protected area to remove tritiated groundwater from the narrow plume while EW-02A and EW-03A extracted uncontaminated groundwater for diluting the tritiated

groundwater from EW-01A (NextEra 2018-TN13407). Each well was permitted to operate at a maximum withdrawal rate of 25,000 gallons per day (gpd). System operation began in February 2017. Over the course of system operation, the results of weekly composite sampling and analysis revealed only the presence of tritium in extracted groundwater and no gamma-emitting isotopes. Effluent releases from the system were reported in DAEC's ARMRRs. By June 2022, tritium concentrations in onsite groundwater were reduced to below 2,000 pCi/L. As a result, the extraction well and remediation system was deactivated in 2022 (NextEra 2025-TN13199, NextEra 2018-TN13407).

As reflected in the 2024 GWPP monitoring results reported in the AREOR (Microbac 2025-TN13402), the concentration of tritium in the shallow groundwater beneath the site remains very low. The NRC staff concludes that residual tritium in the upper surficial aquifer does not pose a threat to onsite drinking water or offsite water users.

3.5.2 Environmental Impacts from Preparations for the Resumption of Power Operations

As described in Section 3.1.2, the applicant is planning preparation activities to restore DAEC to the operating conditions that existed in 2020 prior to plant shutdown. Preparation activities for the resumption of power operations are expected to include upgrades, maintenance, and some new buildings. As discussed in Section 2.2.1 of the 2025 DAEC ER, planned ground disturbances for the preparation activities are expected to primarily occur in previously disturbed areas. This would have the effect of reducing impacts on soils. Table 3-1 summarizes the planned ground-disturbing activities associated with the preparations for the resumption of power operations. These include the installation of cooling towers, roadway improvements, and building construction (e.g., office buildings and maintenance facilities). Specific to groundwater, supply well B will be relocated to the east from its current location to support cooling tower work (NextEra 2026-TN13298). The NRC staff expects that impacts to soil, surface water, and underlying groundwater would be mitigated with stormwater construction permits, associated construction SWPPPs with BMPs to manage runoff and control erosion, and adherence to internal procedures related to ground disturbance. As stated in Section 2.2.1 of the 2025 DAEC ER (NextEra 2025-TN13199), NEDA plans to apply for authorizations and comply with all permit requirements for these activities. These permits are summarized in Table A-1.

NEDA plans to use groundwater for industrial purposes for restart activities at DAEC. There are no groundwater uses for preparations for resumption of power operations that are not anticipated to be continued during the resumption of power operations. As noted in Section 3.5.1, DNR Water Use Permit (No. 3046-R7) authorizes up to 1,575 Mgy, equivalent to 4.4 Mgd, from water supply wells A, B, C, and D with a rate not to exceed a combined maximum rate of 3,000 gpm from the four wells for cooling, construction, potable, and sanitary purposes (NextEra 2025-TN13199). Section 4.2.1.1 of the 2025 DAEC ER states that this permit supports groundwater use during preparations for and the resumption of power operations (NextEra 2025-TN13199). As preparation activities continue and staffing levels increase, NEDA plans to pursue a potable water permit for each building as it is returned to service. Maintenance will be performed on the four supply wells to bring them back into service. Similar to previous operations, groundwater from the four water supply wells may require treatment, such as softening, charcoal filtration, and/or hypochlorite for disinfection (NextEra 2026-TN13298).

As stated in Section 4.2.1.1 of the 2025 DAEC ER, preparation for the resumption of power operations is expected to require a workforce similar to that needed during prior planned outages. NEDA expects that the temporary increase in staffing will cause potable groundwater

use to increase. NEDA anticipates approximately 1,000 additional workers onsite during these preparations that are expected to last from 2025 to the fourth quarter of 2028 (NextEra 2025-TN13199).

As cited in the previous section, the NRC staff determined that excavation activity could intersect the water table at depths of 10–20 ft bgs across the site. In addition, NEDA confirmed the following: (1) construction dewatering may be necessary for restart activities related to facility excavation, trenching, and pipe placement that extends below 10–20 ft below average plant grade; (2) dewatering may be necessary for work at depths above 10 ft on a seasonal basis, particularly in or near the floodplain of the Cedar River, (3) NEDA would obtain and comply with a Sovereign Lands Construction Permit from Iowa DNR for any work in or near the floodplain; (4) NEDA would obtain and comply with the requirements of NPDES General Permit 9 from Iowa DNR for dewatering discharges to surface waters of the State and the ground surface, as required; and (5) site-specific procedures would be employed to detect and manage any contaminated groundwater encountered (NextEra 2026-TN13298). The NRC staff anticipates that groundwater impacts from preparations for the resumption of power operations would be localized and of relatively short duration, including from any necessary dewatering activities.

Based on its review of the information summarized above and other information sources cited in this EA, the NRC staff concludes that groundwater resources impacts from restart preparation activities at DAEC would be NOT SIGNIFICANT.

3.5.3 Environmental Impacts from the Resumption of Power Operations

Upon the resumption of power operations at DAEC, groundwater use is expected to be similar to conditions prior to plant shutdown in 2020, as stated in Section 4.2.1.2 of the 2025 DAEC ER (NextEra 2025-TN13199). During previous operation, groundwater was supplied for industrial and potable purposes from DAEC's four water supply wells on a schedule that involved pumping one or two wells at a time. Approximately 1,400 gpm was used by the air-cooling system, 100 gpm was used for demineralizer makeup, and less than 10 gpm was used for potable supply (NRC 2010-TN13201; NextEra 2025-TN13199). DAEC's Water Use Permit 3046-R7 described in Section 3.5.1 supports groundwater use during the resumption of power operations. This permit authorizes groundwater withdrawals at DAEC up to 1,575 Mgy at a maximum total rate of 3,000 gpm from DAEC's four water supply wells (Well A, Well B, inactive Well C, and Well D) for cooling, construction, potable, and sanitary purposes.

NEDA monitors onsite groundwater in accordance with DAEC's GWPP, as discussed in Section 3.2.1.2 of the 2025 DAEC ER and summarized in Section 3.5.1. Tritium is the only residual byproduct identified in groundwater samples from previous reactor operations. As stated in Section 4.2.1.2 of the 2025 DAEC ER (NextEra 2025-TN13199) and as verified by the NRC staff based on its review of site AREORs (NRC 2026-TN13403), the maximum detected tritium concentrations in the last 5 years have steadily decreased from 51,271 pCi/L in monitoring well MW-08A in 2020 to 386 pCi/L in MW-22A in 2024. Maximum tritium concentrations in groundwater have been below the EPA MCL of 20,000 pCi/L since 2022. The groundwater gradient and direction of groundwater flow in aquifers underlying DAEC is southeast toward the Cedar River. Tritium was not detected above the lower limit of detection in 2020 through 2024 in monitoring well MW-33A, which is located farthest downgradient to the boundary of the owner-controlled area and the Cedar River, indicating that tritium is not migrating offsite (NextEra 2025-TN13199). A total of 31 site monitoring wells included in DAEC's GWPP provide early detection of an underground leak within and outside of the protected area.

NEDA conducts characterization studies of DAEC site geology and hydrology and updates the site conceptual model as necessary to reflect conditions based on current site design and environmental factors. This may result in the establishment of new sampling locations based on risk assessments. Should an inadvertent radiological release occur that could impact groundwater, NEDA states that internal procedures related to remedial actions, notification, reporting, investigation, and documentation would be followed (NextEra 2025-TN13199).

Based on its review of the information summarized above and other information sources cited in this EA, the NRC staff concludes that groundwater resources impacts associated with the resumption of power operations at DAEC would be NOT SIGNIFICANT.

3.6 Terrestrial Ecological Resources

The NRC staff evaluated the potential terrestrial ecological resources effects from the proposed actions by comparing the effects of these activities with the effects from similar activities analyzed in other environmental documents including the information sources cited in Section 1.3.4. Other source documentation used is cited as applicable. This information supports the NRC staff's significance determination for terrestrial ecological resources effects. Supplemental information describing the terrestrial environment, including State-listed species and invasive species, can be found in Appendix F.

3.6.1 Affected Environment

The DAEC terrestrial environment is described in Sections 2.1, 2.2.6, 2.2.7, 3.0, 4.6, and 4.7 and Appendix D of the 2010 SEIS (NRC 2010-TN13201); Sections 2.1, 2.2, 3.2, 3.3, 4.3, and 5.3 of the 2025 DAEC ER (NextEra 2025-TN13199); and Sections 2.7.2, 2.7.3, 4.3, 5.3, and 5.5 of the 1973 final environmental statement (FES) (AEC 1973-TN13202). Those descriptions are incorporated here by reference. Supplemental information describing the terrestrial environment can be found in Appendix F.

3.6.2 Environmental Impacts from Preparations for the Resumption of Power Operations

Preparations for the resumption of power operations would occur from 2025 until December 2028. Noise from equipment and vehicle traffic would increase over this time. Since the increased vehicle use and truck deliveries would be temporary and would utilize previously established roadways, the anticipated impacts on wildlife from increased noise and traffic would be minor. The estimated footprint of disturbance for the proposed activities is shown in Figure 3-3 and Figure 3-4.

The applicant proposes specific activities to prepare for the resumption of operations, including demolition, replacement of structures in-kind, maintenance, and upgrades (NextEra 2026-TN13298). The NRC staff reviewed these activities and associated documentation provided by the applicant and conducted an independent analysis of the terrestrial habitats that would be disturbed. The activities would disturb a total of approximately 25 ac, of which there is a potential to disturb 4.3 ac of sparsely vegetated area outside of previously disturbed areas (NextEra 2026-TN13298, see also Table 3-1 of this EA). Proposed preparation activities, including those in sparsely vegetated areas, are largely within previously disturbed areas, inside existing facilities and structures, or within the protected area. NEDA's excavation, trenching, and ground-disturbance controls procedure requires an environmental department review prior to ground disturbing activities. NEDA's corporate headquarters and the environmental department

require consultation when disturbance is proposed in previously undisturbed areas (NextEra 2026-TN13298). Disturbance of vegetated areas would be necessary for the expansion of the switchyard. The applicant and any contractor would have to obtain relevant permits for the work including a Construction General Permit. Currently, NEDA does not need depredation permits to manage certain wildlife during the shutdown; however, they may reapply for one during power operations (NextEra 2026-TN13298). NEDA will continue to manage the site with select use of herbicides and mowing for security and safety reasons and does not propose any plantings or special management areas (NextEra 2026-TN13298).

The NRC staff concludes that terrestrial ecological resources impacts from restart preparation activities would be NOT SIGNIFICANT because: (1) the proposed disturbed area, approximately 25 ac, lies primarily within developed or previously disturbed parts of the DAEC site; (2) these activities are unlikely to alter patterns of wildlife use and migration across the site; and (3) required permit conditions and BMPs from Federal, State, and local agencies will minimize impacts to terrestrial resources. Section 3.8 presents the NRC staff's analysis for federally protected ecological resources.

3.6.3 Environmental Impacts from the Resumption of Power Operations

In its 2010 SEIS (NRC 2010-TN13201), the NRC staff evaluated DAEC operational impacts to terrestrial resources using the 1996 LR GEIS (NRC 1996-TN288). Since the publication of the 2010 LR SEIS, the NRC has reorganized and updated terrestrial resources issues in the 2013 LR GEIS (NRC 2013-TN2654) and the 2024 LR GEIS (NRC 2024-TN10161). For the analysis in this section, the NRC staff incorporates by reference its 2010 analysis (NRC 2010-TN13201) and NEDA's 2025 DAEC ER analysis of terrestrial resources (NextEra 2025-TN13199), which used the 2024 LR GEIS (NRC 2024-TN10161). The NRC staff independently evaluated whether earlier analyses of terrestrial resources issues related to operational effects under the 2010 SEIS would significantly differ under resumed operations and whether any new information should be considered.

Out of the seven applicable terrestrial resources operational issues in the 2024 LR GEIS (summarized in NRC 2024-TN10161: p. 2-8), the NRC staff will not provide a detailed analysis of four issues. The NRC staff has determined that the following four terrestrial resources operational issues would have impacts that would be minimal and not different from those of past operations or as compared to the plant in decommissioning status: (1) bird collisions with plant structures and transmission lines, (2) transmission line right-of-way management impacts on terrestrial resources (for in-scope transmission lines), (3) cooling tower impacts on terrestrial plants, and (4) electromagnetic effects on terrestrial plants and animals (for in-scope transmission lines).

The NRC staff analyzed, in detail below, three terrestrial resources operational issues that were not previously analyzed or could be different as compared to the plant in decommissioning status: (1) exposure of terrestrial organisms to radionuclides (not analyzed in the 2010 SEIS), (2) non-cooling system impacts on terrestrial resources (not analyzed in the 2010 SEIS, potentially different from non-operating conditions), and (3) water use conflicts with terrestrial resources (plants with cooling ponds or cooling towers using makeup water from a river). In addition to these three terrestrial issues, Section 3.8 presents the NRC staff's analysis for federally protected ecological resources.

3.6.3.1 Exposure of Terrestrial Organisms to Radionuclides

The 2010 SEIS (NRC 2010-TN13201) did not address the terrestrial resources operational issue of exposure of terrestrial organisms to radionuclides at DAEC because that document was a supplement to the 1996 LR GEIS (NRC 1996-TN288), which did not include the issue. Nuclear power plants may release radionuclides into the environment through several pathways (NRC 2024-TN10161: pp. 4-49 to 4-52). During normal operations, nuclear power plants can release gaseous emissions that deposit small amounts of radioactive particulates in the surrounding environment. Nuclear power plants can also release radionuclides as liquid effluents into water, and terrestrial plant roots can absorb radionuclides from shallow groundwater or surface waters. Animals may experience exposure to ionizing radiation through (1) inhalation; (2) direct contact with air, water, or other media; or (3) ingestion of contaminated food, water, or soil.

The 2010 SEIS describes the DAEC radiological environmental monitoring program (REMP), which has been ongoing since 1975 (NRC 2010-TN13201). The NRC staff reviewed NEDA's analysis of this issue (NextEra 2025-TN13199) and reviewed DAEC AREORs from 2016 to 2020, before the reactor shutdown (NextEra 2017-TN13406, NextEra 2017-TN13429, NextEra 2018-TN13430, NextEra 2019-TN13431, NextEra 2020-TN13432). In 2016, a tritium plume was discovered in the shallow aquifer. As described in Section 3.5.2, NEDA implemented corrective actions, including repairs to the piping in 2016 followed by inspections and coating of system drains and sumps in 2019 (NextEra 2025-TN13199). No other measurable levels of radiation above baseline levels attributable to operations of DAEC were found through routine monitoring conducted in the DAEC vicinity from 2016 to 2020. While the reactor was in decommissioning status in 2020, monitoring did not detect measurable levels of radiation above baseline levels. Based on its review of the information summarized above, the NRC staff concludes that exposure of terrestrial organisms to radionuclides from the resumption of power operations would be NOT SIGNIFICANT.

3.6.3.2 Non-Cooling System Impacts on Terrestrial Resources

The 2010 SEIS (NRC 2010-TN13201) did not address the issue of non-cooling system impacts on terrestrial resources because the 1996 LR GEIS (NRC 1996-TN288) only included it as an issue to analyze for refurbishment. According to the 2024 LR GEIS (NRC 2024-TN10161: Section 4.6.1.1), non-cooling system impacts on terrestrial resources can include impacts that result from site and landscape maintenance activities, stormwater management, elevated noise levels, and other ongoing operations and maintenance activities that would occur during operations on and near a plant site. The NRC staff reviewed NEDA's analysis of terrestrial resource issues in the 2025 DAEC ER (NextEra 2025-TN13199), DAEC's NPDES permit (IADNR 2022-TN13396), and nonradiological environmental reports from 2015 to 2020 (NextEra 2017-TN13406, NextEra 2017-TN13429, NextEra 2018-TN13430, NextEra 2019-TN13431, NextEra 2020-TN13432).

The NRC staff determined that NEDA will utilize site-specific programs (e.g., SWPPP and NPDES) and BMPs at the DAEC site to decrease environmental effects and to reduce the occurrence of inadvertent releases of nonradiological contaminants (NRC 2024-TN10842). Therefore, the NRC staff concludes that non-cooling system impacts on terrestrial resources from the resumption of power operations would be NOT SIGNIFICANT.

3.6.3.3 Water Use Conflicts with Terrestrial Resources (Plants with Cooling Ponds or Cooling Towers Using Makeup Water from a River)

Water use conflicts occur when the amount of water needed to support riparian communities is diminished as a result of demand for agricultural, municipal, or industrial use or decreased water availability due to droughts, or a combination of these factors. In this EA, the NRC staff analyzes surface water resources use conflicts in Section 3.4.3 and water use conflicts regarding aquatic resources in Section 3.7.3.

DAEC utilizes a cooling tower system that replaces any evaporated water with water from the Cedar River. DAEC does not have cooling ponds. As discussed in Section 3.4.3, NEDA is authorized to withdraw up to 12,575 Mgy from the Cedar River and expects water withdrawals from the Cedar River to be consistent with what they had been prior to shutdown (NextEra 2025-TN13199). This expected consumptive water use rate would be less than 3 percent of the daily 90-percent exceedance flow at the Cedar Rapids gaging station. During low-flow periods, the withdrawal rate and consumptive rate are higher proportions of the river flow but are still relatively low since DAEC returns most of the withdrawn water minus evaporative loss to the river (NRC 2010-TN13201: Section 3.7.3).

Terrestrial riparian communities that could be impacted by diminished water availability are the terrestrial resources associated with the wetlands and surface water habitats on the DAEC site (Figure F-1). Onsite there are approximately 65.5 ac of wetlands, which mostly consist of freshwater forested/shrub wetlands (87 percent of onsite wetlands), adjacent to the Cedar River.

In Section 3.4.3, the NRC staff concluded that surface water use conflicts would be NOT SIGNIFICANT due to the low percentage of proposed water usage and the historical water usage of DAEC. Considering that drawdown of the river during extreme conditions is relatively low and that significant groundwater drawdowns are not proposed for construction, the NRC staff determined that the expected impact on wetlands from water use is negligible. Therefore, the NRC staff concludes that the impact from water use conflicts with terrestrial resources would be NOT SIGNIFICANT.

3.7 Aquatic Ecological Resources

The NRC staff evaluated the potential aquatic ecological resources effects from the proposed actions by comparing the effects of these activities with the effects from similar activities analyzed in other environmental documents including the information sources cited in Section 1.3.4. Other source documentation used are cited as applicable. This information supports the NRC staff's significance determination for aquatic ecological resources effects. Supplemental information describing the aquatic ecological resources environment, including State-listed species and invasive species, can be found in Appendix F.

3.7.1 Affected Environment

This section describes the aquatic ecological resources of the affected environment. The DAEC aquatic ecological resources environment is described in Sections 2.7, 3.3, 3.4, 3.6, 5.4, and 6.2 of the 1973 FES (AEC 1973-TN13202), Sections 2.1.5, 2.1.6, 2.2.5, 4.5, and 4.7.1 of the 2010 SEIS (NRC 2010-TN13201), and Sections 2.2, 3.2.2, 3.3.2, 3.3.3, 4.3.2, and 4.3.3 of the 2025 DAEC ER (NextEra 2025-TN13199). Those descriptions are incorporated here by reference. Supplemental information can be found in Appendix F.

3.7.1.1 Site and Vicinity

DAEC is located along the western shore of Cedar River, which provides the source and receiving body for the plant's cooling-water system. The Cedar River is the largest tributary of the Iowa River, originating in Dodge County, Minnesota and flowing southeast to its confluence with the Iowa River near Conesville, Iowa. The west bank of the Cedar River experiences higher flow rates than those of the east bank. The hydraulic characteristics of the river transport sediment towards the east bank of the river. Modifications to the river were conducted to preserve these conditions, including the construction of an overflow barrier, submerged Iowa vanes, and spur dikes.

The portion of the Cedar River (segment IA 02-CED-457) near DAEC is classified by the Iowa DNR as a Class A1, BWW-1, and HH water under Iowa water quality standards (IADNR 2026-TN13397). Class A1 waters support primary contact recreational use, Class BWW-1 waters support warm water aquatic life, and Class HH waters are designated for human health protection due to the consumption of fish or drinking water from the aquatic resource. Sampling conducted on October 7, 2011 downriver from DAEC found a benthic macroinvertebrate index of biological integrity score of 45, which is considered fair (IADNR 2026-TN13410).

Fish species collected during the 2020 Iowa DNR monitoring survey, 7 mi downriver of DAEC, indicate that species composition and relative abundance still resemble that of the 1980s fisheries sampling completed at the DAEC site and nearby Lewis Access (McDonald 1983-TN13411, McDonald 1984-TN13412; IADNR 2020-TN13413). During the 2020 survey, 976 total fishes were captured and identified via electrofishing and a Fish Index of Biotic Integrity of excellent was calculated.

The aquatic biological communities of Cedar River, including plankton, macrophytes, benthic invertebrates, and fish, are described in detail in Appendix F, Section F.2.

3.7.2 Environmental Impacts from Preparations for the Resumption of Power Operations

3.7.2.1 Site and Vicinity

Potential activities associated with preparations for the resumption of power operations at DAEC that could impact aquatic resources include the refilling of cooling systems, site preparation and construction activities, and dredging activities.

Site preparation and construction activities are anticipated to be primarily limited to already developed or previously disturbed areas. However, there is a potential for increased sedimentation and stormwater runoff to enter aquatic resources onsite and in the vicinity. Planned stormwater drainage management would continue to follow BMPs with the monitoring of outfalls to prevent pollutants from entering stormwater (see Section 3.4.2). NEDA maintains an excavation, trenching, and ground disturbance controls procedure that provides controls for excavating activities conducted at DAEC to ensure compliance with Iowa DNR stormwater construction requirements (NextEra 2026-TN13298). Due to the location of the construction work inland and the adherence to internal procedures and permit requirements, potential impacts to surface water quality from the proposed site preparation and construction activities are expected to be minimal, localized, and of short duration.

Dredging will likely have to occur in the Cedar River in front of the intake structure in preparation for the resumption of power operations. During previous operating periods, dredging operations would be conducted over this less than 1 ac area between zero to three times per year

depending on the rate of sediment accumulation. Dredging is conducted using a long arm excavator operating from the bank of the river. Dredged material is loaded into the back of a truck where the material is dewatered as it is transported to the disposal site located in an upland portion of the DAEC site. NEDA plans to conduct dredging in a similar manner as was conducted during prior operation. NEDA has confirmed that no CWA Section 404 permit is required for this activity (NextEra 2026-TN13298). Dredging has the potential to result in increased sedimentation and turbidity downstream of the activity as well as direct impacts to aquatic resources located within the footprint of the dredging. However, impacts associated with dredging are expected to be temporary and of short duration and will not have a noticeable effect on the aquatic ecology of the Cedar River.

NEDA anticipates no changes to the water intake system from the Cedar River, relative to the previously operating system. A description of the cooling-water intake system can be found in the 2010 SEIS (NRC 2010-TN13201). Inspections of the intake and discharge structures will be conducted prior to refilling the cooling tower basins. Depending on what these inspections find, there is a potential for some repair, cleaning, or maintenance activities to occur. However, these activities would be conducted within the pumphouse structure and no in-river work associated with these activities is anticipated (NextEra 2026-TN13298).

DAEC holds an Iowa DNR Water Use Permit (3046-R7) which authorizes annual Cedar River withdrawals up to 12,575 Mgy at a maximum rate of 27,000 gpm. This permit is currently active and supports surface water withdrawals during preparations for and the resumption of power operations at DAEC. NEDA would have to withdraw approximately 2.4 Mgal of water from the Cedar River to initially fill the cooling tower basins in preparation for restart. The timing of such filling of the cooling tower basins is anticipated to occur between October 2027 and June 2028. The estimated flow rate during filling is approximately 6,000 gpm (NextEra 2026-TN13298). Depending on the timing of these activities, the diversion of water to fill the cooling tower basins could represent 0.5 percent of Cedar River flow during seasonally low January flows or 0.1 percent of flow during seasonally high June flows, based on the average monthly flow from 2009 through 2025 for USGS gage station 05464315 (USGS 2026-TN13417).

DAEC's operational intake flow is 11.25 Mgd, which corresponds to a velocity of 0.98 feet per second (fps) at the trash racks and 1.13 fps at the traveling screens (NextEra 2026-TN13298). Considering that the flow rate during cooling tower basin refill is approximately 76.8 percent of the flow rate during operations, the NRC staff estimates the velocity at the trash racks to be approximately 0.75 fps and 0.87 fps at the traveling screens. EPA data show that 96 percent of studied fish can avoid an intake structure when the intake velocity is 0.5 fps or less (EPA 2014-TN10834). Although DAEC's maximum through-screen velocity (1.13 fps) is higher than EPA's conservative 0.5 fps screening value, EPA does not treat 0.5 fps as a strict threshold. Instead, it is a generalized metric that should be interpreted alongside site-specific conditions. At DAEC, the zone where velocities fall below 0.5 fps extends 2 to 6 ft from the intake, or less than 3 percent of the river width. This limited area of influence substantially reduces the number of fish likely to encounter the intake at non-avoidable velocities.

Site-specific biological data also support low impingement potential. Iowa DNR's 2025 surveys show a fish community dominated by mobile riverine species (e.g., river carpsucker, smallmouth bass, catfish) that are generally capable of avoiding localized flow fields such as those at DAEC (IADNR 2026-TN13414). Population abundances upstream and downstream of the plant indicate healthy, resilient communities where small losses would not affect overall population status (see Section F.2.1).

Taken together, the small spatial footprint of the intake's influence and the swimming abilities and abundances of local species support the conclusion that, even with velocities exceeding 0.5 fps at the screen face, impingement impacts associated with basin refilling would not noticeably affect Cedar River fish communities in the vicinity of the plant.

The potential impacts related to withdrawals of water from the Cedar River would be minimal, as described below for the resumption of power operations. As NEDA would be expected to comply with permit requirements for water withdrawals and internal procedures designed to minimize sedimentation due to construction activities, the NRC staff concludes that the impacts on aquatic organisms from restart preparation activities at DAEC would be NOT SIGNIFICANT.

3.7.2.2 Important Aquatic Species and Habitats

The Iowa DNR conducts regular monitoring of biologic conditions within the Cedar River. The most recent and closest fish studies conducted downstream of DAEC, in October 2005 at the Bertram site (REMAP #185) and in 2020 at the Cedar Rapids site (REMAP #410), did not identify any State-listed fish species. The 2020 survey at the Cedar Rapids site collected three individuals of the redhorse family that were not identified at the species level; therefore, it is possible that a State-listed redhorse species (i.e., the black redhorse) was present (IADNR 2020-TN13413, IADNR 2005-TN13565). The black redhorse prefers clear streams of small to medium size and is intolerant of pollution, siltation, turbidity, and low gradients (IADNR 2026-TN13415). While it is possible that the black redhorse may occur in the vicinity of DAEC, the potential for impacts to these fish species from activities at the site would be NOT SIGNIFICANT due to the regulatory mechanisms in place to protect aquatic resources, including the NPDES permit, and the minimal potential for instream sedimentation. Dredging activities may cause localized turbidity, but the small area and method of excavation are expected to minimize the spatial and temporal extent of these impacts. Additionally, there are eight State-listed mussels that may occur within Linn County (Table F-2). However, the habitat within the Cedar River in the vicinity of the DAEC site is not anticipated to provide ideal habitat for mussel species due to the sandy substrate of the riverbed. Therefore, the potential for impact to State-listed mussel species from restart preparation activities would be NOT SIGNIFICANT.

3.7.3 Environmental Impacts from the Resumption of Power Operations

The impacts from the resumption of power operation at DAEC would be similar to those described in the 2010 SEIS (NRC 2010-TN13201), which is incorporated here by reference. In Section 3.3.2 of the 2025 DAEC ER, NEDA states that no additional aquatic studies have been conducted and that the descriptions and discussions of aquatic resources in the 2010 SEIS remain valid (NextEra 2025-TN13199). The NRC staff has not identified any new and significant information during its independent review of the 2025 DAEC ER (NextEra 2025-TN13199) and other available information.

The NRC staff used the 2024 LR GEIS (NRC 2024-TN10161) to consider the types of impacts that the aquatic environment could experience upon the resumption of power operations at DAEC. The NRC staff determined that seven of these aquatic resources issues should be evaluated in detail for DAEC because the resumption of power operations would cause a change in baseline conditions compared to the plant's current, non-operational status and there is the potential for aquatic species or habitats to be affected. These seven issues are: (1) impingement mortality and entrainment of aquatic organisms, (2) effects of thermal effluents on aquatic organisms, (3) exposure of aquatic organisms to radionuclides, (4) effects of dredging on aquatic resources, (5) water use conflicts with aquatic resources, (6) impacts of transmission line right-

of-way (ROW) management on aquatic resources, and (7) effects of nonradiological contaminants on aquatic organisms.

3.7.3.1 Site and Vicinity

3.7.3.1.1 Impingement Mortality and Entrainment of Aquatic Organisms (Plants with Cooling Towers)

The impacts related to impingement and entrainment from the resumption of power operations at DAEC would be similar to those described in Section 5.4.1 of the 1973 FES (AEC 1973-TN13202), which is incorporated here by reference. This issue was previously assessed in the 2010 SEIS as a generic Category 1 issue and was considered to be SMALL. Additional site-specific analysis is conducted in this EA due to the change in conditions associated with transitioning from a decommissioning to an operational status. If approved and power operations resume, the resumed water intake would impinge and entrain aquatic organisms from Cedar River. Section 2.1 of this EA and the 2010 SEIS (NRC 2010-TN13201) describe the DAEC cooling and auxiliary water systems in detail. Smaller organisms, such as fish eggs and larvae, can pass through the 3/16 in. mesh of the traveling screens and be entrained. Due to the closed-cycle nature of the plant's water system, it can be assumed that most of the entrained organisms would not survive.

A description of the susceptibility of organisms to impingement and entrainment can be found in the 2024 LR GEIS (NRC 2024-TN10161). The magnitude of the impact that impingement and entrainment create on the aquatic environment depends on the plant-specific characteristics of the cooling system as well as the local aquatic community. Relevant nuclear power plant-based characteristics include location of the cooling-water intake structure, intake velocities, withdrawal volumes, screening device technologies, and the presence or absence of a fish return system. Relevant characteristics of the aquatic community include species present in the environment, life history characteristics, population abundances and distributions, special species statuses and designations, and regional management objectives.

Cooling-water intake from Cedar River to DAEC was previously authorized under NPDES permit no. 5700104. The NPDES permit was modified in 2020 to reflect the plant's decommissioning status and would need to be reinstated through a permit modification prior to the resumption of power operations. In support of this permit modification request, NEDA performed a CWA Section 316(b) compliance study to demonstrate that the plant complies with the best technology available (BTA) standards for impingement mortality and entrainment to minimize adverse environmental impacts in accordance with 40 CFR Subpart J under Section 316(b) of the CWA. As part of the study, NEDA indicates that the configuration and operation of the closed-cycle recirculating system at DAEC is the primary proposed mechanism for reducing impingement and entrainment mortality, and NEDA further proposes that this system represents BTA with no further impingement mortality or entrainment reduction measures being warranted. NEDA intends to submit the study to the Iowa DNR with the NPDES permit renewal application package in 2026. The most recent previous NPDES permit associated with DAEC power operations was issued in 2015 and indicated that, based on the Iowa DNR's best professional judgement, the closed-cycle cooling system represents interim BTA for both impingement mortality and entrainment (NextEra 2026-TN13298).

DAEC's actual intake flow during power operations is 11.25 Mgd and the designed intake flow is 17.28 Mgd. The maximum consumptive use of water is less than 7,000 gpm. The maximum calculated velocity through the bar rack is 0.98 fps and the maximum calculated through-screen

velocity is 1.13 fps at the traveling screen. Compared to a plant utilizing once-through cooling, the use of the recirculating towers reduces the cooling water usage by 97.37 percent (NextEra 2026-TN13298).

There have been no aquatic studies conducted at DAEC since the 2010 SEIS (NextEra 2026-TN13298). The Iowa DNR has conducted surveys of the stretch of the Cedar River in the vicinity of DAEC with the latest survey being done in 2025 (IADNR 2026-TN13414). That study sampled four locations between La Porte City and Palo, Iowa and collected a total of 428 fish across 16 samples, identifying 17 species. Sampling occurred on three dates in 2025, June 2, 2025, July 14, 2025, and September 22, 2025. Results from these efforts indicate that river carpsucker and smallmouth bass make up the majority of the fish population in this stretch of the river (36 and 29 percent, respectively). From the site downstream of DAEC, 59 fish were collected, which consisted of flathead catfish (24), smallmouth bass (19), channel catfish (10), walleye (3), bluegill (1), shovelnose sturgeon (1), and river carpsucker (1). From the site upstream of DAEC, 189 fish were collected, composed of river carpsucker (132), shorthead redhorse (12), smallmouth bass (12), smallmouth buffalo (7), flathead catfish (6), channel catfish (6), bluegill (5), walleye (3), bigmouth buffalo (2), shovelnose sturgeon (1), quillback carpsucker (1), largemouth bass (1), and freshwater drum (1).

EPA data show that 96 percent of studied fish can avoid an intake structure when the intake velocity is 0.5 fps or less (EPA 2014-TN10834). As noted in Section 3.7.2.1, the approximate area of influence from the DAEC intake within the 0.5 fps velocity contour extends approximately 2 ft in radius at mean river depth (approximately 0.8 percent of river width) and 6 ft in radius at minimum river depth (approximately 2.7 percent of river width) (NextEra 2026-TN13298). Small fish and other aquatic organisms that are unable to swim against the current, at the intake, would be drawn inside and impinged on the traveling screens and trash racks or, if small enough, entrained. While the intake velocity is greater than 0.5 fps approaching the intake structure, the area of influence is relatively small compared to the width of the river and the resulting impingement is expected to be a relatively small amount in relation to nearby populations within the river. EPA recognizes that intake velocities not exceeding 0.5 fps are generally protective of aquatic biota from entrainment as well (EPA 2014-TN10834). Since plankton recover and reproduce rapidly, the small amount entrained and killed in the cooling-water system would have a minimal effect on the productivity of the river.

Based on its review of the information summarized above, the NRC staff concludes that the impacts of impingement and entrainment on aquatic organisms resulting from the proposed resumption of power operations at DAEC would be NOT SIGNIFICANT.

3.7.3.1.2 Effects of Thermal Effluents on Aquatic Organisms (Plants with Cooling Towers)

The issue of the effects of thermal effluents on aquatic organisms was previously assessed in the 2010 SEIS as a generic Category 1 issue and was considered to be SMALL. Additional site-specific analysis is conducted in this EA due to the change in conditions associated with transitioning from a decommissioning to an operational status. In the 1973 FES (AEC 1973-TN13202), the NRC staff discussed the modeled thermal plume that was anticipated to be produced by DAEC power operations, which discussion is incorporated here by reference. Modeling indicated that the mixing zone would be less than 1 ac with no more than 25 percent of the river width affected. The thermal plume was measured during the 1976 operational ecology study of the Cedar River, conducted 2 years after the initiation of power operations. In this study, the thermal plume was mapped during river discharge of approximately 800 cfs and station output of 80 percent capacity. The study found that the maximum extent of the 1°F

excess isotherm was measured to extend 500 ft downstream and 60 ft offshore from the discharge structure, encompassing approximately 0.35 ac. The maximum extent of the 5°F excess isotherm was measured to extend 250 ft downstream and 50 ft offshore, encompassing approximately 0.14 ac (McDonald 1976-TN13416). The proposed new mechanical draft cooling towers are expected to function similarly to those that had previously operated onsite. Therefore, the NRC staff expects that the thermal analyses presented in the 1973 FES and the 1976 study would be representative of restart conditions.

The current thermal mixing zone in DAEC's current, non-operating status is not mapped but is defined in NPDES Permit No. 5700104 as 25 percent of the 7Q10 flow (i.e., lowest 7-day average flow that occurs once every 10 years) at the discharge point (IADNR 2022-TN13396). Prior to any discharge beyond the scope of what is currently authorized by DAEC's NPDES permit, an NPDES permit renewal application would have to be submitted and approved by Iowa DNR. NEDA expects this permit to be updated to reincorporate cooling tower blowdown and process wastewater discharges into the permit that were previously removed when DAEC ceased operations.

In addition to the primary discharge of thermal effluent into the Cedar River, DAEC also discharges a small portion of thermal effluent into the intake structure for deicing purposes in the winter via Outfall 003. Outfall 003 is located within the intake structure directly adjacent to the travelling screens. The outfall is utilized during the winter months, approximately December 1 through March 1, to prevent the buildup of ice within the intake structure. This discharge is authorized by DAEC's NPDES permit, and NEDA maintains an internal procedure governing the discharge from this outfall. The NPDES permit does not define any limits or special conditions associated with this outfall; however, the volume of thermal effluent discharged from Outfall 003 is less than the volume withdrawn by the intake pumps and all water discharged from Outfall 003 is anticipated to be taken back in by the intake pumps with no blowdown (NextEra 2026-TN13298; IADNR 2022-TN13396).

Based on its review of the information regarding the thermal plume from similar, previous power operations and compliance with the operational NPDES permit once it is issued, the NRC staff concludes that thermal impacts on aquatic organisms resulting from the proposed resumption of power operations at DAEC would be NOT SIGNIFICANT.

3.7.3.1.3 Exposure of Aquatic Organisms to Radionuclides

The NRC requires nuclear power plants to maintain a REMP as per requirements specified in 10 CFR Part 50, Appendix I, 10 CFR Part 20 (TN283), and 10 CFR Part 72 (TN4884), and through plant-specific technical specifications. These collectively require that licensees establish and implement a REMP to obtain data on measurable levels of radiation and radioactive material. REMP reports reviewed by the NRC staff from the last 5 years of DAEC power operations (2016 through 2020) did not show any measurable levels of radiation, above baseline environmental levels, detected in the vicinity of DAEC. If power operations resume, NEDA would be required to remain in compliance with NRC radiological effluent limits and reimplement the REMP, which would ensure that aquatic organisms' exposure to any radionuclides are within acceptable limits.

Based on its review of the information summarized above, the NRC staff concludes that the effects of radiological contaminants on aquatic organisms resulting from the proposed resumption of power operations at DAEC would be NOT SIGNIFICANT.

3.7.3.1.4 Effects of Dredging on Aquatic Resources

The effects of dredging are assessed under Section 3.7.2 and with the resumption of power operations are expected to continue at levels similar to those before the cessation of power operations. Therefore, the NRC staff concludes that the effects of dredging on aquatic resources resulting from the proposed resumption of power operations at DAEC would be NOT SIGNIFICANT.

3.7.3.1.5 Water Use Conflicts with Aquatic Resources (Plants with Cooling Ponds or Cooling Towers Using Makeup Water From a River)

Water use conflicts for aquatic ecological resources have not previously been addressed at DAEC. Water use conflicts occur when the amount of water needed to support aquatic resources is diminished from demand for agricultural, municipal, or industrial use, decreased water availability due to droughts, or a combination of these factors. In Section 4.6.1.2.10 of the 2024 LR GEIS (NRC 2024-TN10161), the NRC staff provides background information for this issue, which is incorporated here by reference.

In the 2010 SEIS (NRC 2010-TN13201), the NRC staff evaluated "Water use conflicts (plants with cooling ponds or cooling towers using makeup water from a small river with low flow)" as a surface water quality issue. The NRC staff determined that the impacts of these water use conflicts would be SMALL during the license renewal term. Section 3.4 provides additional information regarding water use conflicts and flow data under the surface water use conflict section.

DAEC's consumptive water use influences aquatic organisms in the Cedar River primarily through water withdrawals needed to support its closed-loop cooling system. Although the plant would recirculate most cooling water through mechanical draft cooling towers, it withdraws makeup water from the river to replace evaporative losses (NextEra 2025-TN13199). DAEC holds an Iowa DNR Water Use Permit (3046-R7), which authorizes annual Cedar River withdrawals up to 12,575 Mgy. Under normal power operations, a maximum of 11,200 gpm of water was withdrawn from the Cedar River. Of this, 8,100 gpm was lost to evaporative dissipation, and 3,100 gpm was returned to the Cedar River. In support of the potential resumption of power operations, the cooling towers will be replaced. The new cooling towers are anticipated to be similar in design and function to the original cooling towers, requiring no change in the required make-up water needs.

DAEC previously held a water use permit that authorized the release of water from the Pleasant Creek Reservoir (Iowa DNR Water Use Permit 3533-R4). However, this permit expired on March 13, 2024 and is not anticipated to be renewed in support of the potential resumption of power operations at DAEC because water released from the Pleasant Creek Reservoir was never needed during historical DAEC power operations to augment low-flow conditions in the Cedar River (NextEra 2026-TN13298).

Based on its review of the 2025 DAEC ER, available data, and site-specific information (Appendix A), no significant water use conflicts on aquatic resources were identified. The NRC staff finds that impacts from the resumption of power operations at DAEC would result in no more than minor, localized impacts on aquatic resources. Water withdrawals are expected to be similar to those for prior power operations and within permitted limits as directed by Iowa DNR Water Use Permit (3046-R7). Water withdrawals are not expected to result in measurable degradation of aquatic habitat or flow regimes. Therefore, the NRC staff concludes that for

aquatic resources water use conflicts, the impacts from the proposed resumption of power operations at DAEC would be NOT SIGNIFICANT.

3.7.3.1.6 Impacts of Transmission Line Right-of-Way Management on Aquatic Resources

The original plant-to-switchyard connections from previous power operations were removed following the cessation of power operations and new onsite transmission infrastructure would be required to support the resumption of power operations. Two options are proposed for the layout of the transmission lines and are described in Section 2.1 of the 2025 DAEC ER (NextEra 2025-TN13199). For the proposed transmission lines, the Option 1 route involves new transmission towers within existing disturbed areas and the expansion of the switchyard into an undisturbed area. The Option 2 route would reuse the existing transmission towers and be completely within previously disturbed areas (NextEra 2026-TN13298). Onsite, NEDA would continue to manage the site with select use of herbicides and mowing for security and safety reasons (NextEra 2026-TN13298). NEDA also plans to continue its previously existing SPCC Plan, SWPPP, and related BMPs to minimize any potential impacts of upland maintenance activities on aquatic resources. Based on its review of the information summarized above, the NRC staff concludes that the impacts of transmission line ROW management on aquatic resources related to the resumption of power operations at DAEC would be NOT SIGNIFICANT.

3.7.3.1.7 Effects of Nonradiological Contaminants on Aquatic Organisms

The potential effects of nonradiological contaminants on aquatic organisms that could occur from nuclear power plant operations initially became a concern because some nuclear power plants used heavy metals in condenser tubing that could leach from the tubing and expose aquatic organisms to these contaminants (NRC 2024-TN10161). Because aquatic organisms can bioaccumulate heavy metals, even when exposed at low levels, this can be toxic to fish and other animals that consume contaminated organisms. Condenser tubes at DAEC are composed of stainless steel and are not anticipated to be modified as part of restart activities (NextEra 2026-TN13298). Stainless steel condenser tubes do not leach metals to the cooling-water discharge, therefore, heavy metals leaching from condenser tubing is not anticipated to be a concern at DAEC.

Previous NPDES permits for the power operations of DAEC had authorized the use of molluscicide treatment for zebra mussels. However, NEDA does not anticipate the use of molluscicides after the resumption of power operations and, if NEDA must utilize molluscicides during power operations, that would require approval and modification of the site's NPDES permit (NextEra 2026-TN13298).

The current NPDES permit for DAEC in its decommissioning status has limits set for carbonaceous biochemical oxygen demand, total suspended solids, total residual chloring, total nitrogen, potential of hydrogen, and *Escherichia coli*, *Ceriodaphnia* sp. and *Pimephales* sp. based acute toxicity. While the proposed resumption of power operations would mean restarting cooling water discharges from DAEC into the Cedar River, the concentrations of contaminants at the outfall would be regulated by the NPDES permit. Also, no impacts to the aquatic environment from these contaminants were observed during previous DAEC power operations.

Based on its review of the information summarized above, the NRC staff concludes that the effects of nonradiological contaminants on aquatic organisms during the proposed resumption of power operations at DAEC would be NOT SIGNIFICANT.

3.7.3.2 Important Aquatic Species and Habitats

As noted in Table F-2, eight State-listed fish species may occur within Linn County. However, the Iowa DNR conducts regular monitoring of biologic conditions within the Cedar River and the most recent and closest fish studies conducted downstream of DAEC in October 2005 at the Bertram site (REMAP #185) and in 2020 at the Cedar Rapids site (REMAP #410) did not identify any State-listed fish species (IADNR 2005-TN13565, IADNR 2020-TN13413). The 2020 survey at the Cedar Rapids site collected three individuals of the redhorse family that were not identified down to the species level; therefore, it is possible that a State-listed redhorse species (i.e., the black redhorse) was present. The black redhorse prefers clear streams of small to medium size and is intolerant of pollution, siltation, turbidity, and low gradients (IADNR 2026-TN13415). The potential for impact to State-listed fish species from entrainment, impingement, thermal or chemical discharges, and other operational activities is expected to be NOT SIGNIFICANT due to the design of the closed cycle cooling system.

Dredging activities are expected to continue on an as-needed basis during DAEC power operations to maintain intake functionality. Historically, dredging has occurred once every two years on average (NextEra 2026-TN13298). Dredging may cause localized turbidity but the small area, low frequency, and mechanical method of excavation are expected to minimize the spatial and temporal extent of these impacts. Impacts from dredging activities on State-listed aquatic species would be NOT SIGNIFICANT due to the regulatory mechanisms in place to protect aquatic resources, including the Sovereign Lands Construction Permit, and the minimal potential for instream sedimentation.

Additionally, there are also eight State-listed mussels that may occur within Linn County (Table F-2). Potential impacts could include entrainment of the larval forms, entrainment or impingement of the fish host, and thermal or chemical impacts to individuals that settle near the discharge. However, the habitat within the Cedar River in the vicinity of the DAEC site is not believed to be ideal habitat for mussel species due to the sandy substrate of the riverbed.

Based on its review of the information summarized above, the NRC staff concludes that any potential impacts to State-listed species from entrainment, impingement, thermal or chemical discharges, or other activities resulting from the proposed resumption of power operations at DAEC would be NOT SIGNIFICANT.

3.8 Federally Protected Ecological Resources

The NRC staff must consider the effects of the proposed actions on ecological resources protected under several Federal statutes and must consult with the U.S. Fish and Wildlife Service (FWS) and the National Marine Fisheries Service (NMFS) or the National Oceanic and Atmospheric Administration (NOAA) prior to acting in cases where an agency action may affect those resources. These statutes include the following:

- Endangered Species Act of 1973, as amended (TN1010)
- Magnuson-Stevens Fishery Conservation and Management Act (MSA) (TN9966)
- National Marine Sanctuaries Act (NMSA) (TN7197)

In the following sections, the NRC staff summarizes its findings with respect to federally protected ecological resources protected under these statutes and the outcome of the related consultations with the FWS, NMFS, and NOAA, as applicable. Additional information, including the biological evaluation, concerning these resources can be found in Appendix F.

3.8.1 Endangered Species Act: Federally Listed Species and Critical Habitats under U.S. Fish and Wildlife Service Jurisdiction

The NRC staff evaluated the potential effects of the proposed actions at the DAEC site on federally listed species and critical habitat under FWS jurisdiction. Table 3-5 identifies each applicable species, the NRC staff's ESA effect determinations, the Federal status of the species, and whether the species is potentially present in the action area. The NRC staff used the FWS Information for Planning and Consultation (IPaC) system's Northern Long-eared Bat and Tricolored Bat Range-wide Determination Key (DKey) and Rusty Patched Bumble Bee Range-wide DKey to determine that the proposed action is not likely to adversely affect the northern long-eared bat (*Myotis septentrionalis*) or rusty patched bumble bee (*Bombus affinis*) and to obtain the FWS's concurrence with this determination on April 27, 2026 (FWS 2026-TN13408, FWS 2026-TN13409). The NRC staff also evaluated the potential impacts to two butterflies that are proposed for Federal listing as threatened, western regal fritillary (*Argynnis idalia occidentalis*) and monarch butterfly (*Danaus plexippus*). The NRC staff determined that the proposed actions would have no effect on or are not likely to adversely affect these species. The ESA requires Federal agencies to confer with the FWS in cases where a proposed action is likely to jeopardize the continued existence of a proposed species. The ESA does not require Federal agencies to seek the FWS's concurrence for "not likely to adversely affect" determinations for proposed species. Therefore, the NRC has fulfilled its ESA Section 7(a)(2) consultation obligations with respect to federally listed species and critical habitats under FWS jurisdiction for the proposed actions.

Table 3-5 Effect Determinations for Federally Listed Species and Critical Habitats Under U.S. Fish and Wildlife Service Jurisdiction Potentially Present in the Action Area of the Duane Arnold Energy Center Restart

Species	Federal Status[a]	Potentially Present in the Action Area?	Service	NRC Effect Determination[b]	FWS Concurrence Date[c]
northern long-eared bat (*Myotis septentrionalis*)	FE	Yes	FWS	NLAA	04/27/2026
rusty patched bumble bee (*Bombus affinis*)	FE	Yes	FWS	NLAA	04/27/2026
western regal fritillary (*Argynnis idalia occidentalis*)	FPT	No	FWS	NE	N/A
monarch butterfly (*Danaus plexippus*)	FPT	Yes	FWS	NLAA	N/A

FE = federally endangered; FPT = proposed for Federal listing as threatened; FWS = U.S. Fish and Wildlife Service; N/A = not applicable; NE = no effect; NLAA = may affect, not likely to adversely affect; NMFS = National Marine Fisheries Service; NRC = U.S. Nuclear Regulatory Commission.

(a) Indicates protection status under the Endangered Species Act (TN1010).

(b) The NRC staff makes its effect determinations for federally listed species in accordance with the language and definitions specified in the FWS and NMFS Endangered Species Consultation Handbook (FWS and NMFS 1998-TN1031).

(c) Indicates the date FWS concurred with the NRC staff's effect determinations (FWS 2026-TN13408, FWS 2026-TN13409). The ESA does not require Federal agencies to seek FWS concurrence for NLAA determinations for proposed species; therefore, the FWS concurrence date for those species is marked "N/A."

3.8.2 Endangered Species Act: Federally Listed Species and Critical Habitats under National Marine Fisheries Service Jurisdiction

No federally listed species or designated critical habitats under NMFS jurisdiction occur within the action area. Therefore, the NRC staff concludes that no further coordination or consultation with NMFS under ESA Section 7 is required for the proposed actions.

3.8.3 Magnuson-Stevens Fishery Conservation and Management Act: Essential Fish Habitat

Under the MSA (TN9966), the Fishery Management Councils and NMFS have designated essential fish habitat (EFH) for certain federally managed species by life stage. EFH is defined as the waters and substrate necessary for spawning, breeding, feeding, or growth to maturity (16 U.S.C. 1802(10)-TN12474). The NRC staff verified that no EFH occurs within the affected area. Therefore, the NRC staff concludes that the proposed actions would have no effect on EFH.

3.8.4 National Marine Sanctuaries Act: Sanctuary Resources

Congress enacted the NMSA (TN7197) in 1972 to protect areas of the marine environment that have special national significance. The NMSA established the National Marine Sanctuary System and authorized the Secretary of Commerce to designate sanctuaries within that system, which now includes 18 sanctuaries covering more than 629,000 mi^2 of marine and Great Lakes waters (NOAA Undated-TN13145). No national marine sanctuaries occur within the affected area for the proposed actions; therefore, the NRC staff concludes that the proposed actions would have no effect on sanctuary resources.

3.9 Historic and Cultural Resources

The NRC staff evaluated the potential effects of the proposed actions on historic and cultural resources as part of the NHPA Section 106 (TN4157) undertaking and NEPA action by comparing the effects of these activities with the effects from similar activities analyzed in other environmental documents including the information sources cited in Section 1.3.4. Other source documentation used is cited as applicable. This information supports the NRC staff's significance determination for historic and cultural resources effects.

3.9.1 Affected Environment

In Section 2.2.9 of the 2010 SEIS (NRC 2010-TN13201), which is incorporated here by reference, the NRC staff evaluated and described the historic and archaeological background, cultural resources surveys, and identified historic properties at the DAEC site. The area of potential effects (APE) for the license renewal action evaluated as part of the 2010 SEIS included the entire 500 ac DAEC site. The NRC staff identified, confirmed, and validated only minor changes in the known affected environment as part of its environmental review summarized in this EA. The following sections reflect new information since the publication of the 2010 SEIS (NRC 2010-TN13201).

3.9.1.1 Area of Potential Effects

The APE for this project includes the entire 500 ac DAEC site (Figure 3-7) that may be affected by activities related to both the preparations for and the resumption of power operations at

DAEC. The APE also includes a 0.5 mi buffer, which allows the NRC staff to evaluate the potential impacts to historic and cultural resources and historic properties located nearby but outside of the DAEC site boundary.

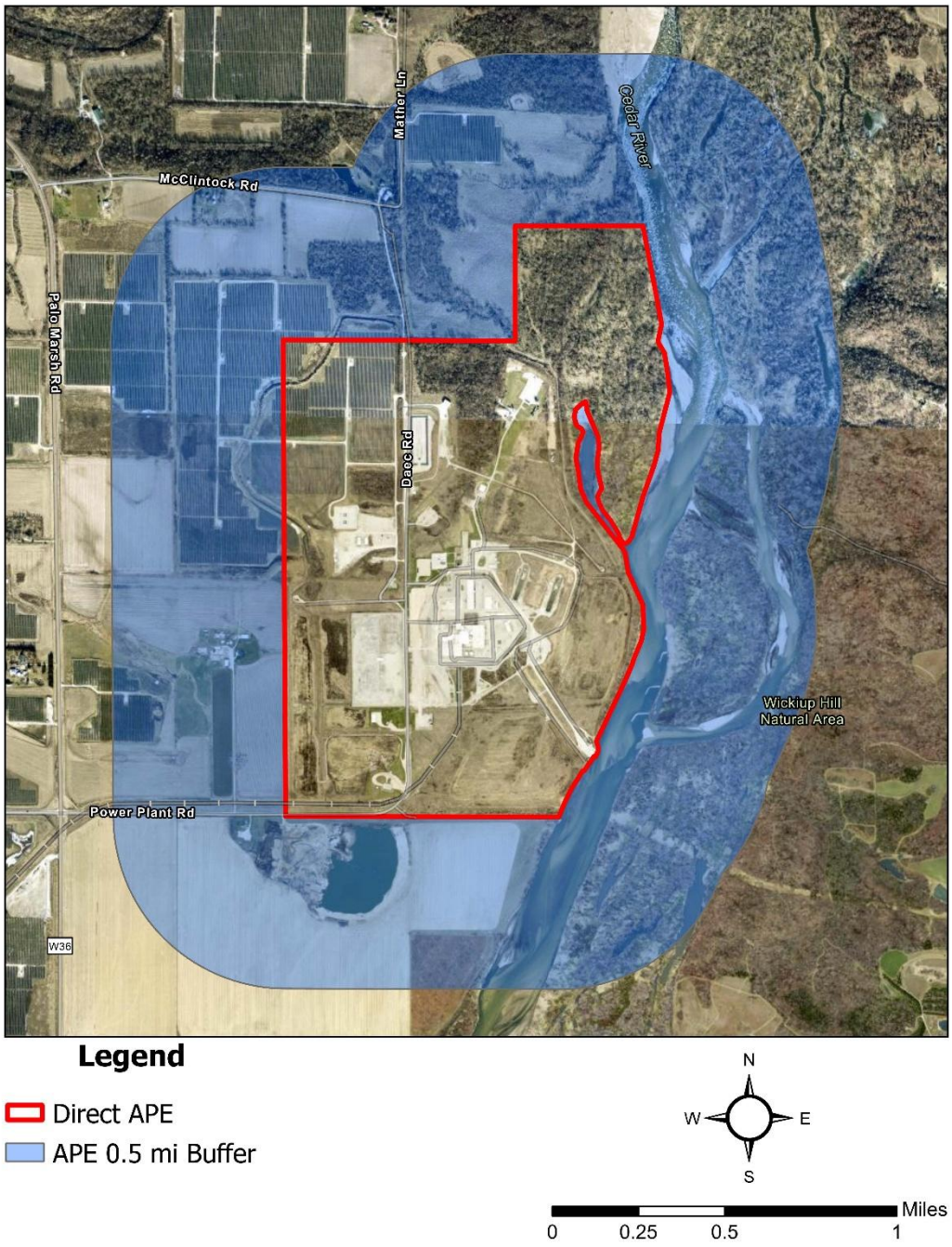


Figure 3-7 Area of Potential Effects and 0.5 mi Buffer Area at the Duane Arnold Energy Center Site. Adapted From NextEra 2025-TN13199.

3.9.1.2 Cultural Background

Section 2.2.9.1 of the 2010 SEIS (NRC 2010-TN13201) describes the long-term cultural history and chronology for this portion of eastern Iowa along the Cedar River, specifically because Indigenous peoples have lived in this region for at least the past 10,000 years. Recent archaeological summaries of the cultural context within Iowa support this interpretation (Whittaker et al. 2015-TN13324). The NRC staff characterizes the cultural chronology in the 2010 SEIS, which included a "Paleoindian" or "First Peoples" period between 11,500–8500 Before Common Era (BCE), an "Archaic" period between 8000–800 BCE, a "Woodland" period between 800 BCE–1250 Common Era (CE), and an "Oneota" period between 1250–1700 CE, followed by a post-contact/historic period from 1700 CE to present (NRC 2010-TN13201). Approximately 184 ac of the Wickiup Hill Natural Area—an area of significance to Indian Tribes—is located within the 0.5 mi APE buffer across the Cedar River from the DAEC site.

3.9.1.3 Identified Historic and Cultural Resources and Historic Properties

Historic and cultural resources are the remains of past human activities and include precontact and historic era archaeological sites, districts, buildings, structures, and objects. NEPA requires Federal agencies to consider the potential effects of their actions on the affected human environment, which includes aesthetic, historic, and cultural resources as these terms are commonly understood (e.g., sacred sites). For NEPA compliance, impacts on cultural resources that are not eligible for or listed in the National Register of Historic Places (NRHP) would also need to be considered. Separately, Section 106 of the NHPA requires Federal agencies to take into account the effects of their undertakings on historic properties and consult with the appropriate parties as defined in 36 CFR 800.2. Historic properties are defined as cultural resources which are eligible or listed in the NRHP (36 CFR 800.16(l)(1)) (TN513). The NRHP criteria to evaluate the eligibility of a property are set forth in 36 CFR 60.4. The 2010 SEIS (NRC 2010-TN13201) and the 2025 DAEC ER (NextEra 2025-TN13199) describe the extent of archaeological and architectural cultural resource surveys that occurred at the DAEC site between 1973 and 2010. Since 2010, three additional archaeological and two additional architectural cultural resource surveys have updated the inventory of known cultural resources at the DAEC site. To confirm these updates, the NRC staff conducted a digital review of Iowa's I-Sites archaeological and architectural site files in February 2026, along with a review of NEDA's records as part of the 2025 DAEC ER (NextEra 2025-TN13199). These updates, summarized below, primarily relate to the DAEC reactor building and associated facilities and archaeological sites 13LN362, 13LN363, and 13L365.

In 2022, NEDA completed a historic architectural survey of the DAEC site and facilities to evaluate their potential eligibility for listing in the NRHP (NextEra 2025-TN13199). The survey recorded DAEC as a potential historic property, but it was determined to be ineligible after consultation with the Iowa State Historic Preservation Office (SHPO) (NextEra 2026-TN13298). A subsequent built environment survey, conducted in 2026 as part of DOE EDF's Section 106 undertaking, also concluded that none of the recorded properties at the DAEC site are eligible for listing in the NRHP (Singer and McCaig 2026-TN13327).

All three archaeological sites at the DAEC site (13LN362, 13LN363, and 13L365) are associated with the post-contact/historic period and are the remnants of Euro-American habitation sites including a potential boat landing. While 13LN362 is currently identified as ineligible for listing in the NRHP, both 13LN363 and 13LN365 are identified as potentially eligible. These three sites have been recorded at various times since the early 1990s (LBG 2008-TN13419), including a recent reinvestigation of 13LN363 conducted for the Duane Arnold Solar Project (NextEra 2025-TN13199). Within the 0.5 mi APE buffer, eight cultural resources

(archaeological sites) have been recorded. Within 1 mi of the DAEC site, there are an additional 34 known cultural resources sites, including archaeological sites and historic structures. Six of these sites, all located within the Wickiup Hill Natural Area across the Cedar River from DAEC, have been formally nominated and are listed in the NRHP (Numbers 10007333 through 10007338). These include the Wickiup Hill Late Woodland Village Site (13LN517), the Wickiup Hill Middle to Late Archaic Camp Site (13LN85), and the Wickiup Hill Mound Groups 1 (13LN522), 2 (13LN87), 3 (13LN1231), and 4 (13LN88).

3.9.1.4 Consultation

The NRC notified the Advisory Council on Historic Preservation (ACHP) and initiated NHPA Section 106 consultation with the Iowa SHPO and 29 federally recognized Indian Tribes, as described in Appendix C. Following the initiation of NHPA Section 106 consultation on May 14, 2026, a federally recognized Indian Tribe responded on May 15, 2026, with questions about the undertaking. The NRC responded to the Indian Tribe's inquiry on May 20, 2026. The Iowa SHPO acknowledged receipt of the initiation letter on May 18, 2026, provided instructions for documenting the consultation through Iowa's electronic portal, and requested clarification regarding the differences between the NRC and DOE EDF undertakings. On May 18, 2026, another federally recognized Indian Tribe requested to review the draft EA and asked to participate in determinations and evaluation of historic properties. On May 20, 2026, a federally recognized Indian Tribe requested an additional meeting with the NRC to continue consultation, which was followed by another meeting request on May 21, 2026. The ACHP acknowledged receipt of the NRC's notification letter on June 1, 2026 (ACHP 2026-TN13418). A federally recognized Indian Tribe responded by letter on June 6, 2026, stating that they had no objection to the project as currently proposed but requested immediate notification in the event of any inadvertent discoveries.

The NRC held a virtual Tribal information meeting on June 16, 2026, so that the NRC staff and DOE EDF staff could share information about the proposed DAEC restart undertaking and answer questions. Four federally recognized Indian Tribes participated in the meeting. Following the meeting, on June 17, 2026, the NRC distributed a summary of the meeting along with presentation slides to all 29 federally recognized Indian Tribes with which NHPA Section 106 consultation has been initiated (NRC 2026-TN13566).

3.9.2 Environmental Impacts from Preparations for the Resumption of Power Operations

Section 3.1.2 and Figure 3-1 describe the activities that NEDA is completing as part of the preparations for the resumption of power operations at DAEC. Several of these activities are expected to be ground-disturbing. These ground-disturbing activities include the construction of new cooling towers, a FLEX building, maintenance and civil shop, maintenance training facility, re-energizing and connecting transmission lines between the reactor facility and the switchyard, and potential expansion of the switchyard, among others. NEDA also plans to demolish several existing structures and conduct ground-disturbing activities associated with the creation of laydown areas and other utility activities (e.g., buried pipe modifications) (see Table 3-1). In some areas, ground-disturbance will occur to a depth of approximately 20 ft (NextEra 2026-TN13298). However, planned areas of ground-disturbance (see Figure 3-1 and Figure 3-5) have historically been extensively disturbed by the original facility construction and operation of DAEC (NextEra 2026-TN13298). Additionally, prior to facility construction, the DAEC site had undergone extensive ground-disturbance and environmental modification due to 19th and 20th century farming activities (see NRC 2010-TN13201; NextEra 2026-TN13298, NextEra 2020-TN13420).

While there is the potential for ground-disturbance as part of a possible expansion of the DAEC switchyard, the Iowa SHPO noted that this area has had numerous previous disturbances and grading, making the area unlikely to yield significant archaeological sites (NextEra 2026-TN13298).

DAEC has an active cultural resources protection plan (CRPP), along with excavation, trenching, and ground disturbance controls, to manage and protect known cultural resources at the site and to address the potential for inadvertent discovery of additional cultural resources or human remains (NextEra 2026-TN13298). As part of the potential resumption of power operations at DAEC, NEDA is revising the CRPP and its associated land disturbance map (used for site planning purposes; see Figure 3-1) to incorporate updated archaeological and architectural information and to update points of contact for inadvertent discovery notifications, including notification to the NRC as the responsible Federal agency (NextEra 2026-TN13298).

Since the DAEC buildings and structures are ineligible for listing in the NRHP and since ground disturbance associated with building activities would occur in previously disturbed areas, archaeological sites 13LN362, 13LN363, and 13L365 would be avoided and managed per the DAEC CRPP. DAEC also has excavation controls for future work. Therefore, the NRC staff concludes that under NHPA Section 106 the proposed undertaking would have no adverse effect on historic properties and that under NEPA the impacts to historic and cultural resources from restart preparation activities would be NOT SIGNIFICANT.

3.9.3 Environmental Impacts from the Resumption of Power Operations

As part of the license renewal NHPA Section 106 consultations conducted in 2008–2009, NEDA developed the CRPP designed to ensure adequate review and protection of known and potentially unidentified cultural resources at the DAEC site. As discussed above, this CRPP is currently being modified as part of the restart undertaking. NEDA also has active excavation, trenching, and ground-disturbance controls as part of DAEC sitewide procedures (NextEra 2026-TN13298), as was the case in 2010 and as were evaluated by the NRC staff during the license renewal environmental review (NRC 2010-TN13201). Upon returning to power operations, DAEC would operate in a manner that is consistent with past operations prior to the 2020 cessation of operations, the environmental impacts of which were evaluated in the 2010 SEIS.

Based on its review of the information summarized above, the NRC staff concludes that under NHPA Section 106 the proposed undertaking would have no adverse effect on historic properties and concludes that under NEPA the impacts to historic and cultural resources associated with the resumption of power operations at DAEC would be NOT SIGNIFICANT. Activities would occur in previously disturbed areas, and NEDA maintains procedures and protocols to protect known historic and cultural resources and manage any inadvertent discoveries.

3.10 Socioeconomic Conditions

The NRC staff evaluated the potential socioeconomic effects from the proposed actions by comparing the effects of these activities with the effects from similar activities analyzed in other environmental documents including the information sources cited in Section 1.3.4. Other source documentation used is cited as applicable. This information supports the NRC staff's significance determination for socioeconomic effects.

3.10.1 Affected Environment

This section describes certain socioeconomic conditions that could be affected by the proposed actions. Section 3.4 of the 2025 DAEC ER (NextEra 2025-TN13199) provides more detailed information on regional and local socioeconomic conditions that could be affected by the DAEC restart. This information is incorporated here by reference.

The residential distribution of workers needed for the resumption of power operations would likely be the same as the residential distribution of the current DAEC workforce. Most DAEC workers reside in Linn County and Benton County. Workers from these two counties account for 97 percent of total DAEC employment (NextEra 2025-TN13199). The remaining 3 percent of the workforce commute from and live in counties outside the two-county region. Because most of the DAEC workforce resides in Linn and Benton Counties, these two counties represent the socioeconomic region of influence and the basis for evaluating impacts.

Operating expenditure at DAEC is based on current staffing levels and annual property tax payments. DAEC property tax payments have decreased since transitioning to SAFSTOR (NextEra 2025-TN13199). From 2015 through 2019 (during power operations, prior to reactor shutdown), DAEC tax payments (taxes paid to the State of Iowa in lieu of property tax) averaged $3,090,974 annually. After shutdown, in 2021 and 2022, DAEC paid traditional land parcel-based property tax. Reassessments were finalized and adjustments posted for these 2 years of payments in 2023. In 2022–2023, DAEC continued paying property tax to Linn County (NextEra 2025-TN13199).

3.10.2 Environmental Impacts from Preparations for the Resumption of Power Operations

Socioeconomic impacts from preparations for the resumption of power operations would be similar to those experienced during a typical nuclear power plant refueling outage. Site employment during preparations activities would peak at approximately 1,000 workers before ramping down to the previously established DAEC power operations workforce (NextEra 2025-TN13199). Preparations for the resumption of power operations activities would be temporary and impacts would be similar to those that occurred during previous DAEC refueling outages as described in the 2010 SEIS (NRC 2010-TN13201). NEDA would continue to pay property taxes during preparations for the resumption of power operations at the same levels as paid in the years following shutdown (NextEra 2025-TN13199). Based on its review of the information summarized above, the NRC staff concludes that the socioeconomic impacts from restart preparation activities at DAEC would be like those experienced during previous DAEC refueling outages and would be NOT SIGNIFICANT.

3.10.3 Environmental Impacts from the Resumption of Power Operations

Socioeconomic impacts from the resumption of power operations at DAEC would be similar to those described in the 2010 SEIS (NRC 2010-TN13201). Site employment during power operations would be about 386 workers, roughly the same number of permanent staff employed at DAEC prior to shutdown (NextEra 2025-TN13199). Most of the power operations workforce would reside in Linn and Benton Counties and other similar locations as when DAEC was operating prior to the shutdown in 2020, as described in the 2010 SEIS (NRC 2010-TN13201). NEDA anticipates the resumption of energy generation tax payments on behalf of DAEC to the State of Iowa, in lieu of property tax payments to Linn County, beginning with the resumption of power operations (Q4 2028). The amount of DAEC energy generation tax payments allocated

by the State to local jurisdictions is expected to be approximately $3,000,000 annually, similar to the amount allocated prior to the shutdown in 2020 (NextEra 2025-TN13199).

Other socioeconomic effects from the resumption of power operations at DAEC would include the effects on community services, transportation (e.g., traffic volumes), and the economic impacts of expenditures for goods and services including labor. These impacts are described in the 2010 SEIS (NRC 2010-TN13201), and the NRC staff does not expect the socioeconomic effects to noticeably differ after the resumption of power operations. Based on its review of the information summarized above, the NRC staff concludes that the socioeconomic impacts from the resumption of power operations at DAEC would be similar to those described for DAEC in the 2010 SEIS and would be NOT SIGNIFICANT.

3.11 Radiological and Nonradiological Human Health

The NRC staff evaluated the potential human health effects from the proposed actions by comparing the effects of the proposed actions with the effects from similar activities analyzed in other environmental documents including the information sources cited in Section 1.3.4. Other source documentation used is cited as applicable. This information supports the NRC staff's significance determination for radiological and nonradiological human health effects.

3.11.1 Radiological Human Health

3.11.1.1 Affected Environment

The affected environment with respect to radiological human health is described generically for all nuclear power plants in Section 3.9.1 of the 2024 LR GEIS (NRC 2024-TN10161) and in Section 4.8.1 of the 2010 SEIS (NRC 2010-TN13201). The DAEC site's REMP is also described in Section 4.8.1 of the 2010 SEIS (NRC 2010-TN13201).

Table 3.8-1 of the 2025 DAEC ER presents the REMP results for 2023 and 2024, during which the facility was in a decommissioning status (NextEra 2025-TN13199). The NRC staff conducted a review of the facility's AREORs and annual radioactive effluent release reports from 2015 to 2024 and verified that the reported data is consistent with the data described in Table 3.8-1 of the 2025 DAEC ER (NextEra 2025-TN13199) and the 2010 SEIS (NRC 2010-TN13201). The reported data indicates that effluent releases during the last 5 years of power operations and during decommissioning since 2020 were in compliance with 10 CFR Part 20 (TN283), Appendix I of 10 CFR Part 50 (TN249), and 40 CFR Part 190 (TN739).

Specifically, the NRC staff verified that all annual exposures to an individual member of the public were below 1 millirem (mrem) with an average annual exposure of approximately 0.03 mrem during the operational years of 2015 to 2019, and with an average annual exposure of approximately 0.11 mrem during the decommissioning status from 2020 to 2024. For occupational exposure, the facility's radiation protection program is implemented in accordance with 10 CFR Part 20. As submitted under 10 CFR 20.2206 and published in Appendix C of NUREG-0173, *Occupational Radiation Exposure at Commercial Nuclear Power Reactors and Other Facilities 2024* (NRC 2026-TN13049), average occupational doses during DAEC's power operations and decommissioning from 2015 to 2024 were approximately 0.84 rem, significantly below the occupational exposure limit of 5 rem in 10 CFR 20.1201(a)(1).

3.11.1.2 Environmental Impacts from Preparations for the Resumption of Power Operations

The radiological impacts of normal facility operations are addressed in Section 4.9.1 of the 2024 LR GEIS (NRC 2024-TN10161) for all nuclear power plants and in Section 4.8.1 of the 2010 SEIS (NRC 2010-TN13201) for DAEC. These sections are incorporated here by reference. Any restart preparation activities at the DAEC site are expected to be less than or comparable to those of a refueling outage. As no radiological releases are expected during the activities for the preparations for the resumption of power operations described in Section 3.1.2, there would be no significant radiological impacts to members of the public. Occupational exposures would occur when working within radiation areas in the DAEC site and would be controlled under 10 CFR Part 20. As a result, the NRC staff concludes that the radiological human health impacts from restart preparation activities at DAEC would be NOT SIGNIFICANT.

3.11.1.3 Environmental Impacts from the Resumption of Power Operations

The radiological impacts of normal facility operations for DAEC are addressed in Section 4.8.1 of the 2010 SEIS (NRC 2010-TN13201), where the NRC staff noted that there would be no impacts of radiation exposures to the public during the renewal term beyond those discussed in the 2010 SEIS. This section is incorporated here by reference. Because NEDA plans to operate DAEC similarly to how it was operated before facility shutdown in 2020, with no significantly different radiological environmental impacts, the NRC staff concludes that the environmental and human health impacts of radiological effluent releases from the resumption of power operations at DAEC would be consistent with what was provided in AREORs from 2015 through 2019 (NextEra 2025-TN13199) and, therefore, would be NOT SIGNIFICANT. The operational impacts are minimized by compliance with radiation protection regulations in 10 CFR Part 20 (TN283) and 10 CFR Part 50 Appendix I (TN249) and Occupational Safety and Health Administration (OSHA) regulations (29 CFR Part 1910-TN654) created by the Occupational Safety and Health Act of 1970 (TN4453).

3.11.2 Nonradiological Human Health

3.11.2.1 Affected Environment

The affected environment with respect to nonradiological human health is described generically for all nuclear power plants in Section 3.9.2 of the 2024 LR GEIS (NRC 2024-TN10161) and is incorporated here by reference.

Chemical Hazards: Federal and State environmental agencies regulate the use, storage, and discharge or spills of chemicals at the DAEC site as outlined in Section 2.1.2.4 of the 2010 SEIS (NRC 2010-TN13201). Wastewater treatment discharge and management are regulated by an NPDES permit, which is discussed further is Section 3.4.2. Occupational health impacts at DAEC are managed through a comprehensive industrial safety program that complies with OSHA standards (NextEra 2025-TN13199). For example, NEDA submits OSHA Form 300A annually for reporting the number of recordable injuries and illnesses from hazards at DAEC. For the years 2020 and 2022–2024, DAEC had a recordable injury and illness incident rate of 0.07 per 100 equivalent full-time employees. No data was available for 2021 (NextEra 2025-TN13199).

Microbiological Hazards: As described in Section 3.9.2.2 of the 2024 LR GEIS (NRC 2024-TN10161), microbiological hazards occur when workers or members of the public come into contact with disease-causing microorganisms, also known as etiological agents. Members of the

public could be exposed to microorganisms in thermal effluents at nuclear power plants that use cooling ponds, lakes, canals, or that discharge to publicly accessible surface waters. Thermal discharge to surface waters near DAEC is described in Section 3.7.3. DAEC's thermal discharges would be regulated in accordance with the plant's NPDES permit. Therefore, the waters in the Cedar River near the discharge area are not expected to be inducive to etiological growth, and the public health impact is expected to be minimal.

As described in the 2024 LR GEIS, nuclear power plant workers can be exposed to *Legionella* spp. when performing cooling system maintenance through inhalation of cooling tower vapors because these vapors are often within the optimum temperature range for *Legionella* spp. growth. As discussed in Section 3.8.1.2 of the 2025 DAEC ER (NextEra 2025-TN13199), occupational health impacts are managed through established industrial hygiene practices that comply with OSHA requirements. In Section 4.8.2 of the 2010 SEIS (NRC 2010-TN13201), the NRC concluded that thermophilic microbiological organisms during the license renewal term are not likely to present a public health hazard as a result of DAEC discharges to the Cedar River. Additionally, NEDA would mitigate any industrial safety risks from microbiological organisms in cooling systems using the DAEC OSHA-compliant program under 29 CFR Parts 1910 and 1926 (TN654; TN4455).

Physical Hazards: As described in Section 3.9.2.4 of the 2024 LR GEIS (NRC 2024-TN10161), a physical hazard is an action or condition that can cause harm upon contact. Nuclear power plants have many of the typical occupational hazards found at any other electric power generation sites as workers perform electrical and repair work and maintenance activities and may be exposed to potentially hazardous physical conditions (e.g., falls, excessive heat, cold, noise, electric shock, and pressure). In 2023, the U.S. Bureau of Labor Statistics reported that the national incidence rate for nonfatal occupational injuries and illnesses for the utility industry was 1.8 per 100 full-time workers (BLS 2024-TN11032).

Electric shock hazards and chronic exposure to electromagnetic fields that are produced by the power transmission systems are discussed in Sections 3.9.2.4.1 and 3.9.2.3 of the 2024 LR GEIS (NRC 2024-TN10161) and Sections 4.8.3 and 4.8.4 of the 2010 SEIS (NRC 2010-TN13201). Occupational workers and members of the public could be exposed to acute electric shock from transmission lines or electrical equipment needed to support the facility. The in-scope transmission lines at DAEC were removed after shutdown in 2020. The onsite switchyard remains energized and the existing 161 kV and 345 kV transmission tie-ins remain in place. During the preparation for the resumption of power operations, the in-scope transmission lines are expected to be restored as determined by a load study, which may be either 161 kV or 345 kV. When this is complete, the in-scope transmission lines could cross the main access road to the facility (DAEC Road), which is publicly accessible (NextEra 2025-TN13199). The design of the in-scope transmission lines is anticipated to adhere to applicable National Electrical Safety Code standards (NextEra 2025-TN13199). Occupational hazards at DAEC are managed according to OSHA requirements. There are no Federal standards limiting exposure to electromagnetic fields from power lines in the United States. Finally, the NRC staff expects that other industrial safety risks, such as confined space entry or electrical system maintenance, would also be mitigated using the site's OSHA-compliant program.

3.11.2.2 Environmental Impacts from Preparations for the Resumption of Power Operations

Based on the information summarized above in Section 3.11.2.1, the NRC staff has determined that the proposed actions would not adversely alter nonradiological human health factors or conditions at DAEC. Section 3.1.2 describes the activities that NEDA is completing in

preparation for the resumption of power operations at DAEC. DAEC continues to have a comprehensive industrial safety program that addresses all applicable OSHA standards (NextEra 2025-TN13199). Therefore, the NRC staff concludes that the nonradiological human health impacts from restart preparation activities at DAEC would be NOT SIGNIFICANT.

3.11.2.3 Environmental Impacts from the Resumption of Power Operations

The environmental effects of reactor operations on nonradiological human health resources as a result of reactor license renewal are described in Section 4.9.1 of the 2024 LR GEIS (NRC 2024-TN10161). As explained in the 2024 LR GEIS, continued reactor operations and refurbishment activities at nuclear power plants have had little or no measurable effect on the environment or human health. The NRC staff expects that DAEC will continue to have a comprehensive industrial safety program that adheres to applicable OSHA standards in 29 CFR Parts 1910 and 1926 (TN654; TN4455). Based on its review of the 2025 DAEC ER (NextEra 2025-TN13199), the NRC staff has verified that the affected environment related to nonradiological human health resources at DAEC has not changed to any significant degree since the 2010 SEIS (NRC 2010-TN13201). Therefore, the NRC staff concludes that the nonradiological human health impacts from the resumption of power operations at DAEC would be NOT SIGNIFICANT.

3.12 Waste Management

The NRC staff evaluated the potential waste management effects from the proposed actions by comparing the effects of these activities with the effects from similar activities analyzed in other environmental documents including the information sources cited in Section 1.3.4. Other source documentation used is cited as applicable. This information supports the NRC staff's significance determination for waste management effects.

3.12.1 Affected Environment

Complete descriptions of DAEC's radioactive waste management and effluent control systems are found in Section 2.1.2 of the 2010 SEIS (NRC 2010-TN13201). The systems include gaseous and liquid effluent control systems that prevent the release of waste emissions to the environment and must meet the regulatory requirements of 10 CFR Part 20 Appendix B (TN283). Additionally, the solid radioactive waste processing system encompasses the systems and processes used to capture and prepare solid waste for transport. As described in Section 2.2.3 of the 2025 DAEC ER (NextEra 2025-TN13199), these systems have not been changed since the issuance of the 2010 SEIS and have been maintained in a preserved condition. Thus, the description from Section 2.2.3 of the 2025 DAEC ER is incorporated here by reference.

Mixed waste, regulated under the Resource Conservation and Recovery Act of 1976, as amended (Resource Conservation and Recovery Act of 1976-TN1281) and Atomic Energy Act of 1954, as amended (42 U.S.C. 2011 et seq.-TN663), includes both radioactive and hazardous waste (EPA 2019-TN6956). Low-level mixed waste has not been generated at DAEC in the past 5 years, and no low-level mixed waste has been shipped offsite (NextEra 2025-TN13199). Table 3.9-1 in the 2025 DAEC ER provides the type and quantity of radiological waste shipped offsite from 2020 through 2024, with no radioactive waste shipped offsite in 2023 or 2024 as the facility was in SAFSTOR (NextEra 2025-TN13199).

Section 2.1.2 of the 2010 SEIS (NRC 2010-TN13201) provides a description of the nonradioactive waste generation and waste management practices at DAEC prior to the shutdown in 2020. Generated nonradioactive waste includes chemical, biocide, sanitary, universal, site stormwater runoff, and lubrication oil waste. DAEC has a nonradioactive waste management program and procedures to handle and dispose of this nonradioactive waste in accordance with Federal, State (i.e., Iowa DNR, Environmental Protection Commission), and applicable regulations. Solid waste is collected and stored onsite, then shipped offsite for disposal.

Section 3.9 of the 2025 DAEC ER (NextEra 2025-TN13199) provides a review of waste management activities at DAEC. Nonradioactive wastes at DAEC are similar to those identified in the 2010 SEIS. DAEC is classified by the EPA as a very small quantity generator of non-acute hazardous waste. The NRC staff expects that NEDA would continue to implement plans and procedures for management of its waste types. Procedures, such as SPCC and SWPPP plans, are in place at DAEC for nonradioactive waste management and for the minimization and management of liquid chemical spills (NextEra 2025-TN13199).

3.12.2 Environmental Impacts from Preparations for the Resumption of Power Operations

Section 3.1.2 lists the planned activities to prepare for the resumption of power operations at DAEC. Both radioactive and nonradioactive waste may be generated as a result of these activities. Section 4.9.1 of the 2025 DAEC ER states that, upon completion of restoration activities, the radioactive waste processing system is expected to be prepared to operate in the same fashion as prior to shutdown (NextEra 2025-TN13199). NEDA maintains plans and procedures for management of radioactive and nonradioactive waste, which are expected to remain in place for restart. There are no planned modifications to DAEC's radioactive waste management system that would increase the amount of radioactive waste generated in relation to the amount generated prior to shutdown and no large-scale projects that NEDA expects would generate a significant amount of radioactive waste (NextEra 2025-TN13199). During the operational years of 2015 to 2019, the average total solid waste shipped offsite was 11,205 cubic feet (ft^3), with a maximum of 19,840 ft^3 in 2016 comprised of 1,020 ft^3 of spent resin and 18,820 ft^3 of dry active waste (NRC 2026-TN13403). Nonradiological waste generated during preparation activities, including construction and demolition debris, will be properly disposed of or recycled by approved, licensed vendors at approved offsite waste management facilities (NextEra 2026-TN13298).

Based on its review of the information in the 2025 DAEC ER (NextEra 2025-TN13199), the NRC staff determined that the proposed actions would not alter the radiological or nonradiological waste management processes or procedures currently in place at DAEC. Therefore, the NRC staff concludes that the radioactive and nonradioactive waste management impacts from restart preparation activities at DAEC would be NOT SIGNIFICANT.

3.12.3 Environmental Impacts from the Resumption of Power Operations

Hazardous waste generation is not expected to increase during the resumption of power operations at DAEC. As described in Section 4.9.2 of the 2025 DAEC ER (NextEra 2025-TN13199), NEDA does not anticipate a significant increase in generation of low-level radioactive waste for the resumption of power operations at DAEC. NEDA expects that DAEC will continue to be classified as a very small quantity generator of hazardous waste (NextEra 2026-TN13298). The type and quantity of waste would be as presented in past DAEC operational

ARMRRs. NEDA does not expect any modifications to the DAEC waste management practices and does not expect any new or different waste streams following the resumption of power operations (NextEra 2026-TN13298).

In addition, the NRC staff has determined that radioactive and nonradiological waste management impacts analyses in the 2024 LR GEIS (NRC 2024-TN10161) are relevant to the proposed actions, including the resumption of power operations at DAEC. Section 4.11.1 of the 2024 LR GEIS describes the environmental effects of reactor operations on radiological and nonradiological waste management as a result of license renewal. As explained in the 2024 LR GEIS, continued reactor operations and refurbishment activities at nuclear power plants have had little or no environmental effect on waste management.

Based on its review of the information in the 2025 DAEC ER (NextEra 2025-TN13199), the NRC staff determined that the waste management affected environment at DAEC has not changed to any significant degree since the 2010 SEIS (NRC 2010-TN13201). As a result, the NRC staff concludes, based its review of the 2025 DAEC ER and the findings of the 2010 SEIS and the 2024 LR GEIS (NRC 2024-TN10161), that the radioactive and nonradioactive waste management impacts from the resumption of reactor power operations at DAEC would be NOT SIGNIFICANT.

3.13 Uranium Fuel Cycle and Transportation

The NRC staff evaluated the potential effects associated with the uranium fuel cycle and related transportation from the proposed actions by comparing the effects of these activities with the effects from similar activities analyzed in other environmental documents including the information sources cited in Section 1.3.4. Other source documentation used is cited as applicable. This information supports the NRC staff's significance determination for the uranium fuel cycle and transportation effects.

The generic radiological and nonradiological environmental impacts of the uranium fuel cycle and transportation of nuclear fuel and wastes are described in detail in Section 4.14.1 of the 2024 LR GEIS (NRC 2024-TN10161) and based, in part, on the generic impacts provided in 10 CFR 51.51(b), Table S-3, "Table of Uranium Fuel Cycle Environmental Data," and in 10 CFR 51.52(c), Table S-4, "Environmental Impact of Transportation of Fuel and Waste to and from One Light-Water-Cooled Nuclear Power Reactor." This information is incorporated here by reference.

3.13.1 Affected Environment

With respect to the uranium fuel cycle and transportation impacts, the affected environment is considered to be common to all nuclear power plants. Table S-3 of 10 CFR Part 51.51(b) and Table S-4 of 10 CFR Part 51.51(c) (TN10253) provide bounding estimates of the impacts of the uranium fuel cycle and transportation of fuel and waste to and from a reactor. In NUREG-2266, *Environmental Evaluation of Accident Tolerant Fuels with Increased Enrichment and Higher Burnup Levels* (NRC 2024-TN10333), the NRC staff evaluated the impacts to the uranium fuel cycle for up to 10 weight-percent (wt%) uranium-235 (U-235) and transportation of fuel and waste for up to 8 wt% U-235 and burnup levels up to 80 gigawatt-days per metric ton uranium (GWd/MTU). The analysis in NUREG-2266 demonstrates that 10 CFR Part 51 Tables S-3 and S-4 are still bounding under these conditions. Although NEDA is not proposing to use accident tolerant fuels or increased enrichment or burnups as part of its requests related to the resumption of power operations at DAEC, the NRC staff relied on NUREG-2266 because it

contains the latest analysis and also bounds the proposed resumption of power operations at DAEC. Additionally, the NRC staff determined that the information referenced in the 2025 DAEC ER (NextEra 2025-TN13199) is consistent with the assumptions and descriptions found in Section 4.14.1 of the 2024 LR GEIS (NRC 2024-TN10161), which is incorporated here by reference.

3.13.2 Environmental Impacts from Preparations for the Resumption of Power Operations

NEDA indicates that the activities to load fuel into the reactor would be similar to those for a typical refueling outage for DAEC. Since all spent fuel at the site has been transferred from the spent fuel pool to the onsite independent spent fuel storage installation, there is no prior fuel available for use in restart. NEDA will not reload any nuclear fuel from the independent spent fuel storage installation, and all new fuel assemblies with the same fuel characteristics will be procured from a vendor and used for core refueling (NextEra 2026-TN13298). Impacts from the uranium fuel cycle were analyzed in Section 6 of the 2010 SEIS (NRC 2010-TN13201), Section 4.14.1 of the 2024 LR GEIS (NRC 2024-TN10161), NUREG-2157, *Generic Environmental Impact Statement for Continued Storage of Spent Nuclear Fuel* (Continued Storage GEIS) (NRC 2014-TN4117), and Sections 2 and 3 of NUREG-2266 (NRC 2024-TN10333). NEDA plans to resume power operations at DAEC using low-enriched uranium fuel enriched to no more than 4.9 wt% U-235, consistent with the final core design prior to shutdown in 2020 and consistent with historical licensing and technical specifications (NextEra 2025-TN13199). Fuel handling and inspection activities would occur within existing plant structures under established radiation protection and industrial safety programs. Thus, based on its review of the information contained in the 2025 DAEC ER (NextEra 2025-TN13199), the NRC staff determined that the proposed actions would not alter previous conclusions regarding the uranium fuel cycle and transportation of fuel and waste to and from the DAEC site. Therefore, the NRC staff concludes that the uranium fuel cycle and transportation impacts from restart preparation activities at DAEC would be NOT SIGNIFICANT.

3.13.3 Environmental Impacts from the Resumption of Power Operations

The NRC staff finds that the impacts to the uranium fuel cycle and subsequent transportation of fresh nuclear fuel and spent fuel and radioactive waste during power operations at DAEC would be consistent with those described in the 2010 SEIS (NRC 2010-TN13201), the 2024 LR GEIS (NRC 2024-TN10161), the Continued Storage GEIS (NRC 2014-TN4117), and the analyses in the NUREG-2266 (NRC 2024-TN10333). These documents describe the impacts bounded by Table S-3 and Table S-4 of 10 CFR Part 51 and impacts of spent fuel at-reactor and away-from-reactor storage. The documents listed above demonstrate that the continued power operations of nuclear power plants have had little or no environmental effects due to the uranium fuel cycle, spent fuel management, and transportation of fuel and waste.

Based on its review of the 2025 DAEC ER (NextEra 2025-TN13199), the NRC staff determined that uranium fuel cycle and transportation affected environment at DAEC has not changed to any significant degree nor has any significant new information been identified since the 2010 SEIS (NRC 2010-TN13201) was prepared. Therefore, the NRC staff concludes that the uranium fuel cycle and the transportation of fuel and waste impacts from the resumption of reactor power operations at DAEC would be NOT SIGNIFICANT.

3.14 Postulated Accidents

The environmental impacts of design-basis accidents (DBAs) and severe accidents are considered for all nuclear power plants, including DAEC. The effects of postulated accidents and consideration of severe accident mitigation alternatives (SAMAs) are discussed in Section 4.9.1.2 of the 2024 LR GEIS and in further detail in Appendix E of the 2024 LR GEIS (NRC 2024-TN10161). A plant-specific analysis of the environmental impacts of postulated accidents, including consideration of SAMAs, was performed for DAEC in Appendix F of the 2010 SEIS (NRC 2010-TN13201). The descriptions in these sections of the 2024 LR GEIS and the 2010 SEIS are discussed below and incorporated here by reference.

The 2024 LR GEIS (NRC 2024-TN10161) summarizes the operational impacts of nuclear power plants within the United States and indicates that the environmental impacts of DBAs and the environmental impacts from the probability-weighted consequences of severe accidents are generic issues with a SMALL environmental impact. SAMAs were previously considered on a site-specific basis for DAEC in the 2010 SEIS. The NRC staff reviewed DAEC current site-specific information and found no new information that would change either the generic SMALL impact determinations for DBAs and severe accidents in the 2024 LR GEIS or the specific determinations of SMALL impacts for DBAs and severe accidents in the 2010 SEIS. NEDA confirmed there would be no changes to the design basis that would require a reevaluation of the SAMA analysis (NextEra 2026-TN13298). Additionally, the NRC has stated in Table B-1 of 10 CFR Part 51 (TN10253) Appendix B that, so long as a previous SAMA analysis has been performed, SAMAs do not warrant further plant-specific analysis because the demonstrated reductions in population dose risk and continued severe accident regulatory improvements substantially reduce the likelihood of finding cost-effective significant plant improvements.

DAEC is included in the NRC staff's generic evaluation presented in the 2024 LR GEIS (NRC 2024-TN10161), where the impacts of postulated accidents were determined to be SMALL for all of the evaluated nuclear power plants. Estimated population dose values for DAEC are provided in Table E.3-1 of the 2024 LR GEIS. The reported values from the 2010 SEIS SAMA analysis illustrate the large reduction of the estimated population dose values from those used in the 1996 LR GEIS (NRC 1996-TN288) that resulted in the SMALL impact determination for severe accidents made generically for all plants. NEDA confirmed to the NRC staff during the environmental audit (NRC 2026-TN13330) that the assumptions used by the NRC staff during the generation of values in Table E.3-1 of the 2024 LR GEIS remain valid. The NRC staff did not identify any new and significant information regarding the NRC staff's NEPA findings for DBAs or severe accidents since the staff's previous environmental analysis of these accidents for DAEC in the 2024 LR GEIS (NextEra 2026-TN13298).

NEDA confirmed that the 2024 LR GEIS (NRC 2024-TN10161) generic findings for severe accidents and SAMAs will remain applicable to DAEC during resumed power operations for the remainder of the term of the DAEC RFL (NextEra 2026-TN13298). Both internal and external events were evaluated in the 2010 SEIS (NRC 2010-TN13201).The current updated model of record for internal event and internal flood risk for DAEC is 2.4×10^{-6}/yr, which is within the 2024 LR GEIS Table E.3-3 SAMA core damage frequency (CDF) range of 1.5×10^{-6}/yr to 5.8×10^{-5}/yr for boiling water reactors and is a reduction over the values used at the time of DAEC license renewal (i.e., 1.08×10^{-5}/yr) (NextEra 2026-TN13298). The current seismic model of record CDF for DAEC is 7.0×10^{-7}/yr, which is unchanged from the value in the 2010 LR SEIS (NextEra 2026-TN13298). The current updated fire probabilistic risk assessment model of record CDF for DAEC is 1.2×10^{-5}/yr. This updated model value is higher than the 2010 SEIS value of 3.0×10^{-6}/yr, as it was updated for the National Fire Protection Association

Standard 805 Performance-Based Fire Protection license amendment (NextEra 2026-TN13298). The current updated value of 1.2×10^{-5}/yr is within the 2024 LR GEIS Table E.3-10 SAMA fire CDF range of 1.2×10^{-6}/yr to 7.3×10^{-5}/yr. The current high wind and tornado model of record CDF for DAEC is 1.4×10^{-7}/yr, which is unchanged from the 2010 SEIS (NextEra 2026-TN13298)

A comprehensive analysis and review of potentially cost-beneficial SAMAs for DAEC was performed by the NRC staff in Appendix F of the 2010 SEIS (NRC 2010-TN13201). Based on NRC staff review and analysis of potential SAMAs and responses to NRC staff RAIs, it was concluded that DAEC made a reasonable, comprehensive effort to identify and evaluate SAMAs. Based on that information and on plant improvements made before the review, the NRC staff concluded that none of the potentially cost-beneficial SAMAs related to adequately managing the effects of aging during the period of extended operation were warranted; therefore, they were not implemented as part of the 2010 license renewal pursuant to 10 CFR Part 54.

On September 9, 2019, the Mitigation of Beyond-Design-Basis Events rule (10 CFR 50.155-TN249) became effective. This rule primarily addresses mitigation strategies for a wide range of potential extreme events, including seismic events, fire, flooding, and other natural phenomena, requiring nuclear power plants to have plans in place to maintain core cooling, containment integrity, and spent fuel pool cooling even when facing events beyond their design basis, including large-scale natural disasters. If the proposed actions are approved, DAEC will again be subject to 10 CFR 50.155 (TN249).

As a result of the NRC's ongoing safety oversight and updates to NRC regulatory requirements, the overall risk of a severe accident has been reduced. Because the NRC's regulations and safety oversight have provided additional severe accident mitigation and have further reduced the risk profile of operating reactors since the SAMA analysis documented in the 2010 SEIS, further SAMA analyses would be unlikely to find any cost-effective significant plant improvements, as discussed in the 2024 LR GEIS (NRC 2024-TN10161).

Based on information in the 2025 DAEC ER, information in the 2010 SEIS (NRC 2010-TN13201), NEDA's response to the NRC's RCIs (NextEra 2026-TN13298), and the fact that the published impacts from postulated accidents are considered bounding, the NRC staff has determined that the proposed actions would not alter the previously determined impacts from DBAs and severe accidents, or the previous SAMA conclusions for DAEC in the 2024 LR GEIS (NRC 2024-TN10161). Therefore, the NRC staff concludes that the postulated accidents impacts from the proposed actions at DAEC would be NOT SIGNIFICANT.

3.15 Greenhouse Gas Emissions and Climate Change

The NRC staff's evaluation considers GHG emissions from the proposed actions including potential climate change effects in the environment through the remainder of the term of the DAEC RFL. The climate change evaluation includes a description of how the baseline environment, defined in Chapter 3, might change as a result of climate change along with a discussion of how the impacts discussed in Chapter 3 would either increase, decrease, or remain the same in this new baseline environment. Potential climate change and GHG impacts are evaluated and described in Appendix D.

3.16 Decommissioning

This section describes the environmental effects associated with the permanent cessation of power operations and the return to the decommissioning of DAEC at a future date. All operating nuclear power plants will permanently cease power operations and be decommissioned at the end of their operating life when a decision is made to permanently cease power operations.

As discussed in Chapter 1, DAEC ceased operations and removed fuel from the reactor in 2020. Prior to cessation of power generation activities and removal of all fuel, NEDA submitted a PSDAR to the NRC (NextEra 2020-TN13207) in accordance with 10 CFR 50.82(a)(4) (TN249) to outline the proposed decommissioning activities and describe the potential associated environmental impacts. In the PSDAR, NEDA concluded that the environmental impacts associated with the planned facility site-specific decommissioning activities would be bounded by appropriate, previously issued environmental impact statements, including the Decommissioning GEIS (NRC 2002-TN7254), the 2010 SEIS (NRC 2010-TN13201), and the 2013 LR GEIS (NRC 2013-TN2654).

The impacts of decommissioning nuclear power plants are evaluated in the Decommissioning GEIS. In the 2010 SEIS (NRC 2010-TN13201), the NRC staff concluded that there were no new and significant impacts beyond those discussed in the 1996 LR GEIS. In the 1996 LR GEIS, the NRC concluded that the impacts of license renewal on terminating reactor operations and decommissioning were SMALL for all nuclear power plants. Since the 2010 SEIS, the impacts of license renewal on terminating reactor operations and decommissioning were again considered to be SMALL for all nuclear power plants in the 2013 LR GEIS. Additionally, in the 2024 LR GEIS (NRC 2024-TN10161), the NRC, after review, reconfirmed decommissioning impacts to be SMALL for all nuclear power plants. Also published in 2024, NUREG-2266 reached the same conclusion that the Decommissioning GEIS would be bounding but for even higher enrichment and burnup levels (i.e., 10 wt% U-235 and 80 GWd/MTU, respectively) than the levels applicable to DAEC (NRC 2024-TN10333).

Section 7 of the 2010 SEIS (NRC 2010-TN13201), which is incorporated here by reference, evaluated the impacts of decommissioning with the license renewal term ending in 2034. If the resumption of power operations at DAEC occurs as a result of the proposed actions, then the term of that operation would still end in 2034. Based on the above information, the NRC staff determined that the proposed actions would not alter the previously determined SMALL impacts from decommissioning. Therefore, the NRC staff concludes that the environmental impacts from the proposed actions on eventual reactor shutdown and decommissioning of DAEC would be NOT SIGNIFICANT.

4 CONCLUSIONS

This EA describes the environmental review conducted by the NRC and DOE EDF staff for evaluating the environmental effects of granting the licensing and regulatory requests necessary to reauthorize power operations at DAEC through February 21, 2034, which is the end of the current operating license term under the DAEC RFL. DOE EDF acted as a cooperating agency on this review. Procedurally, this document follows 10 CFR 51.30, "Environmental assessment," and 10 CFR 51.31, "Determinations based on environmental assessment," which are the NRC's regulations for preparing EAs in accordance with NEPA (TN661). Within this section of the EA, the NRC staff presents conclusions and recommendations based on its environmental review.

4.1 Environmental Impacts of the Proposed Actions

The proposed set of actions for the reauthorization of power operations at DAEC consists of an exemption request and several LARs (see Section 1.1.1, Table 1-1). The purpose and need for these proposed actions is to provide an option for 610 MWe of baseload power generation through the current licensing term of February 21, 2034 (see Section 1.2). Chapter 3 evaluates the reasonably foreseeable environmental effects (impacts) of the proposed actions, which would be from preparations for the resumption of power operations and from the resumption of power operations at DAEC. The NRC staff also evaluated environmental effects associated with GHGs and climate change in Appendix D and with activities related to the eventual return to decommissioning in Section 3.16. As indicated in Section 3, the NRC staff concludes that the reasonably foreseeable environmental effects (impacts) of the proposed actions would be NOT SIGNIFICANT for each potentially affected environmental resource area. The NRC staff based this conclusion on an independent review of information provided in NEDA's licensing submittals, including the 2025 DAEC ER (NextEra 2025-TN13199), as well as other relevant information and sources. Section 1.3.4 provides a summary of the most important sources for the NRC staff's environmental review.

4.2 Comparison of Alternatives

In Section 2.2, the NRC staff considered possible alternatives to the proposed actions of reauthorizing power operations at DAEC. Only one alternative was considered—the no-action alternative. As noted in Section 2.2.1.1, taking the no-action would not meet the purpose and need for the proposed actions and could lead to a need to build new nuclear or non-nuclear power generation facilities. If the no-action alternative was selected and NEDA would not build new power generation facilities, any avoidance of environmental impacts resulting from not implementing the proposed actions would be minimal, as indicated by the analysis of the environmental impacts of the proposed actions presented in Chapter 3. However, building new power generation facilities would result in additional environmental impacts related to land disturbance and use of construction equipment. These impacts would be greater than those needed to put the already built DAEC facility back into operation. Depending on the location or locations ultimately selected for the new power generation facilities, the environmental impacts could potentially be SIGNIFICANT. In contrast, the potential environmental impacts from the proposed actions of reauthorizing power operations at DAEC would be NOT SIGNIFICANT for each potentially affected environmental resource area. Therefore, the NRC staff has determined that there are no environmentally preferrable alternatives to the proposed actions.

5 FINDING OF NO SIGNIFICANT IMPACT

The proposed actions before the NRC are whether to grant requests for an exemption and license amendments that are necessary to reauthorize power operations at DAEC through the remainder of its current license term (February 21, 2034). The NRC staff conducted an environmental review of these actions and prepared an EA. This FONSI incorporates by reference the EA in Chapters 1 through 4 of this document. On the basis of the EA and its determination that the environmental impacts of the proposed actions would be NOT SIGNIFICANT for each potentially affected resource area, the NRC staff concludes that the proposed actions will not have a significant effect on the quality of the human environment. Accordingly, the NRC staff has determined not to prepare an EIS for the proposed actions and that a FONSI is warranted.

This FONSI and the related environmental documents referenced throughout the EA are available for public review as discussed in the EA.

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7 LIST OF PREPARERS

Members of the NRC staff prepared this environmental assessment with assistance from DOE EDF and Pacific Northwest National Laboratory (PNNL). Table 7-1 identifies each preparer's name, affiliation, and summary of education and experience

Table 7-1 List of Preparers

Name	Education and Experience
Briana Arlene, NRC	Master's Certification, National Environmental Policy Act BS Conservation Biology 20 years of experience in ecological impact analysis, Endangered Species Act Section 7 consultations, and Essential Fish Habitat consultations
Kim Conway, NRC	BS Mechanical Engineering 20 years of experience in NRC project management including decommissioning licensing and environmental reviews
Jennifer Davis, NRC	BA Historic Preservation and Classical Civilization (Archaeology) 5 years of archaeological fieldwork; 23 years of experience in NEPA compliance, project management, cultural resources impact analysis, and National Historic Preservation Act Section 106 consultations
Lloyd Desotell, NRC	MS Civil Engineering MS Water Resources Management BA Environmental Studies Over 20 years of experience conducting surface and subsurface hydrologic analyses
Kevin Folk, NRC	MS Environmental Biology BA Geoenvironmental Studies 35+ years in NEPA compliance; project management; geologic, hydrologic, and water quality impacts analysis; utility infrastructure analysis, health and environmental regulatory compliance; and water supply and wastewater discharge permitting
Shannon Healy, NRC	MS Environmental Science BS Biology 10 years combined academic and professional experience
Stephen Koenick, NRC	MS Environmental Engineering BS Mechanical Engineering 30+ years of government and supervisory experience
Nancy Martinez, NRC	MA Earth and Planetary Science BS Earth and Environmental Science 14 years of experience in environmental impact analysis
John Parillo, NRC	MS Environmental Engineering BS Mechanical Engineering 50 years of experience in nuclear power, primarily in design-basis and severe accident dose consequence analysis
William Rautzen, NRC	MS Health Physics BS Health Physics BS Industrial Hygiene 22 years of government experience including 15 years of environmental impact analysis
Jeffrey Rikhoff, NRC	MRP Regional Environmental Planning MS Development Economics BA English

Name	Education and Experience
	45 years of combined industry and government experience in NEPA compliance for DOE Defense Programs/NNSA and Nuclear Energy, DoD, and DOI; project management; socioeconomics, and historic and cultural resource impact assessments, consultation with American Indian Tribes, and comprehensive land use and development planning studies
Gerry Stirewalt, NRC	PhD Structural Geology Registered Professional Geologist (PG) Certified Engineering Geologist (CEG) 50+ years of experience including geologic site characterization for nuclear energy facilities and high-level nuclear waste disposal facilities; 3-D geospatial modeling of subsurface geology, tectonic faults, hydrogeology, and contaminated groundwater plumes; and environmental assessments related to geologic environment, hydrogeology, and groundwater resources
Rao Tammara, NRC	MS Chemical/Nuclear Engineering MS Environmental Engineering 50 years of relevant experience working for consulting firms and for NRC
Bradley Werling, NRC	MS Environmental Science BA Engineering Physics BS Chemistry Duke NEPA Certificate 25+ years of experience as an analytical chemist including air monitoring analyses and radionuclide transport studies with 20 years of experience preparing and reviewing NEPA documents
Molly Rooney, DOE	MA Natural Resources BA Geographic Science 7 years of relevant experience in environmental compliance and environmental impact analysis
Alicia Williamson, DOE	MS Environmental Science BS Biology and Chemistry 24 years of relevant experience including nuclear facility licensing and siting, environmental impact analysis and environmental monitoring and compliance
Teresa Carlon, PNNL	BS Information Technology 30 years of experience as SharePoint administrator, project coordinator, and databases
Cyler Conrad, PNNL	PhD Anthropology (Archaeology) MA Anthropology (Archaeology) BA Anthropology 13 years of relevant experience Over 10 years of experience in archaeology, cultural resource management, National Historic Preservation Act Section 106, NEPA, and project management
Kim Leigh, PNNL	BS Environmental Science 25 years of experience in NEPA compliance and project management
Mike Parker, PNNL	BA English Literature 25 years of experience copyediting, document design, and formatting and 20 years of experience in technical editing
Lindsey Renaud, PNNL	MA Anthropology BA Anthropology 15 years in cultural resource management, Section 106 and 110 compliance, and NEPA environmental impact assessments
Kacoli Sen, PNNL	PhD Cancer Biology

Name	Education and Experience
	MS Zoology (Specialization Ecology) BS Zoology Diploma in Environmental Law Over 7 years of document editing and production experience
Dana Vesty, PNNL	BS Environmental Scientist Professional Wetland Scientist 9 years of experience in environmental assessments, permitting, environmental resource monitoring, and data analysis.
Caitlin Wessel, PNNL	PhD Marine Science MS Coastal, Marine, and Wetland Science 13 years of relevant experience in ecology, habitat modeling, chemical analysis, physical processes, and environmental assessments

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AM or MA = Master of Arts; BA = Bachelor of Arts; BS = Bachelor of Science; DoD = U.S. Department of Defense; DOE = U.S. Department of Energy; DOI = U.S. Department of Interior; CEG = Certified Engineering Geologist; EA = environmental assessment; GIS = Geographic Information System; MBA = Master of Business Administration; MRP = Master of Regional Planning; MS = Master of Science; NEPA = National Environmental Policy Act of 1969; NNSA = National Nuclear Security Administration; NRC = U.S. Nuclear Regulatory Commission; PG = Professional Geologist; PhD = Doctor of Philosophy; PNNL = Pacific Northwest National Laboratory.

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APPENDIX A

APPLICABLE LAWS, REGULATIONS, AND OTHER REQUIREMENTS

A.1 Federal and State Requirements

Several Federal laws and regulations affect environmental protection, health, safety, compliance, and consultation at every U.S. Nuclear Regulatory Commission (NRC or Commission) licensed nuclear power plant. Some require permits by, or consultation with, other Federal agencies or State, Tribal, or local governments. Certain Federal environmental requirements have been delegated to State authorities for enforcement and implementation. Furthermore, States have also enacted laws to protect public health and safety and the environment. It is the NRC's policy to make sure that nuclear power plants are operated in a manner that provides adequate protection of public health and safety and protection of the environment through compliance with applicable Federal and State laws, regulations, and other requirements, as appropriate.

Appendix F to Revision 2 of NUREG-1437, *Generic Environmental Impact Statement for License Renewal of Nuclear Plants* (the 2024 LR GEIS) (NRC 2024-TN10161) discusses Federal laws, regulations, and other requirements that may be applicable to the continued operation of nuclear power plants licensed by the NRC. These include Federal laws, regulations, and other requirements designed to protect the environment. The NRC staff relies upon and incorporates by reference herein the regulatory discussions and information presented in Appendix F, Sections F.2–F.7 of the 2024 LR GEIS (NRC 2024-TN10161: pp. F-1–F-24). Therefore, these Federal laws, regulations, and other requirements are not duplicated in this appendix, which instead focuses on facility-specific information.

In addition to carrying out some Federal programs, State legislatures develop their own laws. State statutes can supplement, as well as implement, Federal laws for the protection of their air, surface water, and groundwater resources. State legislation may address solid waste management programs, locally rare or endangered species, and historic and cultural resources. Additionally, the Atomic Energy Act of 1954, as amended (42 *United States Code* [U.S.C.] 2011 et seq.-TN663), authorizes the NRC to enter into an agreement with any State that allows the State to assume regulatory authority for certain activities (see 42 U.S.C. 2021-TN10029). Iowa is an NRC Agreement State. The Iowa Department of Health and Human Services has regulatory responsibility over the radioactive materials program under the Atomic Energy Act of 1954, as amended, Section 274b Agreement between the NRC and the State of Iowa.

The U.S. Environmental Protection Agency (EPA) has the primary responsibility to administer the Federal Water Pollution Control Act of 1972, as amended (33 U.S.C. 1251 et seq., herein referred to as the Clean Water Act [CWA]-TN662). The National Pollutant Discharge Elimination System (NPDES) Program addresses water pollution by regulating the discharge of potential pollutants to waters of the United States. The CWA allows for primary enforcement and administration through State agencies if the State program is at least as stringent as the Federal program. The EPA has delegated the authority to issue NPDES permits to the Iowa Department of Natural Resources.

A.2 Operating Permits and Other Requirements

The Duane Arnold Energy Center (DAEC) is subject to various Federal and State requirements. As a convenient source of references of environmental requirements, Table A-1 below lists principal Federal and State approvals necessary for the restart and resumption of power operations at DAEC through the end of the current renewed facility license. This list includes permits and licenses issued by Federal, State, and local authorities for activities at DAEC. Listed information is principally derived from the DAEC environmental report submitted by NextEra Energy Duane Arnold, LLC (NEDA) with updates provided in response to an NRC request for additional information (NextEra 2025-TN13199, NextEra 2026-TN13298). Where applicable, the status of the permit or approval is indicated.

Table A-1 Operating Permits and Other Requirements for the Reauthorization of Power Operations at Duane Arnold Energy Center

Permit/ Authorization	Agency	Authority	Number	Status/ Expiration Date	Authorized Activity
Renewed Facility License	NRC	AEA (42 U.S.C. 2011, et. seq.); 10 CFR 50.10	DPR-49	Active Expires 02/21/2034	Operation of DAEC
NPDES Individual Permit	Iowa DNR	CWA (33 U.S.C. § 1251 et seq.); 40 CFR Part 122; Iowa Code 455B 174, IAC 567-64.3	Iowa NPDES Permit No. 5700104; EPA No. IA0003727	Active Expires 02/28/2027	Authorizes discharge of wastewater to the Cedar River during the current shutdown status
NPDES permit modification/ renewal application	Iowa DNR	Iowa Code 455B 261-274	-	Current NPDES permit reflects shutdown conditions; NEDA plans to submit NPDES modification/ renewal application by the third quarter of CY 2026.	Authorize cooling tower blowdown and low-volume wastewater discharges
Water Use Permit	Iowa DNR	Iowa Code 455B 261-274, IAC 567 50-51	3046-R7	Active Expires 06/30/2032	Withdrawal of surface water and groundwater
Hazardous waste generation	Iowa DNR; EPA	IAC 567:120-123; 40 CFR Parts 260-	IAD984566133	N/A	Registers DAEC as a very small quantity generator of

Permit/ Authorization	Agency	Authority	Number	Status/ Expiration Date	Authorized Activity
		273 (RCRA Subtitle C)			hazardous waste in accordance with State regulations and Federal requirements under RCRA Subtitle C
Radioactive Material License	IDPH Bureau of Radiological Health	IAC Chapter 136C; IAC 641 Chapter 39	03011809-02	Active Expires 03/31/2029	Authorizes possession, use, and storage of byproduct, source, and special nuclear material in accordance with NRC Agreement State Regulations
Sewage treatment construction permit	Iowa DNR	Iowa Code 455B	TBD	Sewage treatment system currently out of service. NEDA plans to apply for a construction permit for UV treatment system in the fourth quarter of CY 2026.	Construction permit to add UV treatment to the sewage treatment system
Public water supply operation permit	Iowa DNR	Iowa Code 455B; IAC 567:50-51	TBD	Inactive. NEDA plans to reactivate the PWS operation permit before the system starts serving more than 25 staff for 60 or more days per year. NEDA plans to use a temporary potable water system to serve individual buildings until the former potable water system is restored.	Permits the potable water system and its operation

Permit/ Authorization	Agency	Authority	Number	Status/ Expiration Date	Authorized Activity
Industrial stormwater discharges	Iowa DNR	Iowa General Permit No. 1	-	NEDA will apply for NPDES General Permit No. 1 once industrial operations begin at the plant.	Stormwater discharges associated with industrial activity
Hazardous materials certification of registration	U.S. Department of Transportation	49 U.S.C. 5108	093025550007H	Valid with expiration date of 06/30/2026. NEDA plans to renew the registration prior to the resumption of power operations.	Hazardous materials shipments
Radioactive waste license; Radioactive waste transportation service license	IDPH Bureau of Radiological Health	Iowa Code 136C; IAC 641 Chapter 39	-	Expired. NEDA expects to renew this permit in 2026 before transporting any radioactive waste.	State-issued licenses to store and transport low-level radioactive waste
Water quality certification	Iowa DNR	CWA Section 401	-	NEDA has reached out to Iowa DNR and is awaiting confirmation that the facility's existing certification remains valid.	Required for an applicant for a Federal license or permit to conduct any activity which may result in any discharge into navigable waters
Air quality construction permit	Linn County Health Department	Iowa Code 455B IAC 567 Chapter 22; Linn County Code Chapter 10, Article III	-	One air quality construction permit has been received and activities under this permit have been completed (Permit No. 8230, expired	Authorize installation and operation of air emission sources, including an auxiliary boiler, emergency diesel generators, fire pump, and minor support sources

Permit/ Authorization	Agency	Authority	Number	Status/ Expiration Date	Authorized Activity
				02/06/2026). NEDA will apply for additional permits as information on unit specifications and construction timelines is established.	
Air operation permits	Linn County Health Department	Clean Air Act (CAA); Iowa Code 455B:567, IAC 20-31, LCCO 10.5; Linn County Code Chapter 10, Article III	7709	Previous permits were forfeited after shutdown. Air Quality Permit to Operate issued 01/26/2026.	Authorize operation of the auxiliary boiler, two standby diesel generators, and diesel fire pump

AEA = Atomic Energy Act of 1954, as amended; CFR = *Code of Federal Regulations*; CWA = Clean Water Act; CY = calendar year; DAEC = Duane Arnold Energy Center; DNR = Department of Natural Resources; EPA = U.S. Environmental Protection Agency; IDPH = Iowa Department of Public Health; LCCO = Linn County Code of Ordinances; NEDA = NextEra Energy Duane Arnold, LLC; NPDES = National Pollutant Discharge Elimination System; NRC = U.S. Nuclear Regulatory Commission; PWS = public water supply; RCRA = Resource Conservation and Recovery Act; TBD = to be determined; U.S.C. = *United States Code*; UV = ultraviolet. "-" denotes no data in table cell.

A.3 References

Cited references are included in Chapter 6.

APPENDIX B

AGENCIES, ORGANIZATIONS, INDIAN TRIBES, AND INDIVIDUALS CONTACTED

The U.S. Nuclear Regulatory Commission (NRC or Commission) contacted appropriate Federal, State, local, or regional agencies and Indian Tribes listed in Table B-1 below during the NRC staff's environmental review. This list excludes the U.S. Department of Energy Office of Energy Dominance Financing because it is a cooperating agency. The NRC is providing electronic copies of this environmental assessment to the listed agencies and entities. The NRC is also distributing the document to members of the public and other entities who requested that they be notified and who provided contact information.

Table B-1 List of Agencies, Organizations, Indian Tribes, and Persons Contacted by NRC during the Environmental Review for the Reauthorization of Power Operations at Duane Arnold Energy Center

Name	Affiliation
Jaime Loichinger	Advisory Council on Historic Preservation
Amy Bhesania	U.S. Environmental Protection Agency
-	U.S. Fish and Wildlife Service Illinois-Iowa Ecological Services Field Office
Heather Gibb	Iowa Department of Cultural Affairs
Durrell Cooper	Apache Tribe of Oklahoma
Floyd Azure	Assiniboine and Sioux Tribes of the Fort Peck Indian Reservation
Ryman LeBeau	Cheyenne River Sioux Tribe of the Cheyenne River Reservation
Anthony Reider	Flandreau Santee Sioux Tribe
Jon Greendeer	Ho-Chunk Nation
Missty Slater	Iowa Tribe of Kansas & Nebraska
Jake Keyes	Iowa Tribe of Oklahoma
Gail DuPuis-Cheatham	Kickapoo Tribe in Kansas
Joseph O'Brien	Lower Sioux Indian Community of Minnesota
Joey Awonohopay	Menominee Indian Tribe of Wisconsin
Douglas Lankford	Miami Tribe of Oklahoma
Gene Small	Northern Cheyenne Tribe of the Northern Cheyenne Indian Reservation
Jeffrey Gilpin	Omaha Tribe of Nebraska
John R. Shotton	Otoe-Missouria Tribe of Indians
Joseph (Zeke) Rupnick	Prairie Band Potawatomi Nation
Grant Johnson	Prairie Island Indian Community
Kathleen Wooden Knife	Rosebud Sioux Tribe of the Rosebud Indian
Audrey Rose Lee	Sac & Fox Nation of Oklahoma
Lucie Roberts	Sac & Fox Tribe of the Mississippi in Iowa
Tiauna Carnes	Sac & Fox Tribe of Missouri in Kansas and Nebraska
Alonzo Denney	Santee Sioux Nation

Name	Affiliation
Cole W. Miller	Shakopee Mdewakanton Sioux Community of Minnesota
J. Garret Renville	Sisseton-Wahpeton Oyate of the Lake Traverse Reservation SD
Lonna Jackson-Street	Spirit Lake Tribe, North Dakota
Steve Sitting Bear	Standing Rock Sioux Tribe of North and South Dakota
Jamie Azure	Turtle Mountain Band of Chippewa Indians of North Dakota
Kevin Jensvold	Upper Sioux Community of Minnesota
Chelaine Knudesen	Yankton Sioux Tribe of South Dakota
Coly Brown	Winnebago Tribe of Nebraska

"-" denotes no entry in table cell.

APPENDIX C

CHRONOLOGY OF ENVIRONMENTAL REVIEW CORRESPONDENCE

This appendix contains a chronological listing of correspondence between the U.S. Nuclear Regulatory Commission (NRC or Commission) and NextEra Energy Duane Arnold, LLC (NEDA) and other correspondence related to the NRC staff's environmental review for the reauthorization of power operations at Duane Arnold Energy Center (DAEC). All publicly available documents are electronically available via the NRC's Agencywide Documents Access and Management System (ADAMS) at https://www.nrc.gov/reading-rm/adams. The NRC docket number for DAEC is 05000331. Table C-1 below lists the environmental review correspondence, by date, along with the ADAMS accession number for each document.

Table C-1 Environmental Review Correspondence for the Reauthorization of Power Operations at Duane Arnold Energy Center

Date	Originator	Correspondence	ADAMS Accession Number
01/23/2025	NextEra Energy Duane Arnold, LLC	Duane Arnold Energy Center Regulatory Path to Potential Reauthorization of Power Operations	ML25023A265
01/23/2025	NextEra Energy Duane Arnold, LLC	Request for Exemption from Certain Termination of License Requirements of 10 CFR 50.82	ML25023A270
04/15/2025	U.S. Nuclear Regulatory Commission	Duane Arnold Energy Center, Restart Panel Charter	ML25069A731
11/10/2025	NextEra Energy Duane Arnold, LLC	Submittal of Environmental Report in Support of Restart of Duane Arnold Energy Center	ML25315A003
11/20/2025	NextEra Energy Duane Arnold, LLC	Request to Revise Operating License and Technical Specifications to Support Resumption of Power Operations	ML25324A300
12/17/2025	NextEra Energy Duane Arnold, LLC	Request to Update the Security Plan to Support Resumption of Power Operations	ML25363A083
01/30/2026	NextEra Energy Duane Arnold, LLC	Request to Reinstate the Emergency Plan to Support Resumption of Power Operations	ML26033A048
02/09/2026	U.S. Nuclear Regulatory Commission	Environmental Regulatory Audit Regarding the Proposed Reauthorization of Power Operations for the Duane Arnold Energy Center Under Renewed Facility Operating License No. DPR-49	ML26030A013
03/26/2026	U.S. Nuclear Regulatory Commission	Duane Arnold Energy Center - Estimated Hours and Review Schedule for Licensing Actions	ML26082A006

Date	Originator	Correspondence	ADAMS Accession Number
		Submitted to Support Resumption of Power Operations	
04/06/2026	U.S. Department of Energy	Request to Become a Cooperating Agency on the Duane Arnold Energy Center Restart Project	ML26125A413
04/13/2026	U.S. Nuclear Regulatory Commission	Duane Arnold Energy Center – Summary of Environmental Audit for the Proposed Reauthorization of Power Operations Under Renewed Facility Operating License No. DPR-49	ML26085A711
04/22/2026	U.S. Nuclear Regulatory Commission	*Federal Register;* NextEra Energy Duane Arnold, LLC; Duane Arnold Energy Center; Applications for Amendments to Renewed Facility License Involving Proposed No Significant Hazards Consideration Determination and Containing Safeguards Information and Order Imposing Procedures for Access to Safeguards Information	ML26091A203; 91 FR 21514
05/14/2026	U.S Nuclear Regulatory Commission	Section 106 Initiation Letter to the Iowa Department of Cultural Affairs	ML26126A045
05/14/2026	U.S Nuclear Regulatory Commission	Section 106 Initiation Letter to the Advisory Council on Historic Preservation	ML26126A044
05/14/2026	U.S. Nuclear Regulatory Commission	Section 106 Initiation Letter to the Assiniboine and Sioux Tribes of the Fort Peck Indian Reservation	ML26133A110
05/14/2026	U.S. Nuclear Regulatory Commission	Section 106 Initiation Letter to the Cheyenne River Sioux Tribe of the Cheyenne River Reservation	ML26133A111
05/14/2026	U.S. Nuclear Regulatory Commission	Section 106 Initiation Letter to the Flandreau Santee Sioux Tribe	ML26133A112
05/14/2026	U.S. Nuclear Regulatory Commission	Section 106 Initiation Letter to the Ho-Chunk Nation	ML26133A113
05/14/2026	U.S. Nuclear Regulatory Commission	Section 106 Initiation Letter to the Iowa Tribe of Oklahoma	ML26133A114
05/14/2026	U.S. Nuclear Regulatory Commission	Section 106 Initiation Letter to the Kickapoo Tribe in Kansas	ML26133A115
05/14/2026	U.S. Nuclear Regulatory Commission	Section 106 Initiation Letter to the Lower Sioux Indian Community of Minnesota	ML26133A116
05/14/2026	U.S. Nuclear Regulatory Commission	Section 106 Initiation Letter to the Menominee Indian Tribe of Wisconsin	ML26133A117

Date	Originator	Correspondence	ADAMS Accession Number
05/14/2026	U.S. Nuclear Regulatory Commission	Section 106 Initiation Letter to the Miami Tribe of Oklahoma	ML26133A118
05/14/2026	U.S. Nuclear Regulatory Commission	Section 106 Initiation Letter to the Northern Cheyenne Tribe of the Northern Cheyenne Indian Reservation	ML26133A119
05/14/2026	U.S. Nuclear Regulatory Commission	Section 106 Initiation Letter to the Omaha Tribe of Nebraska	ML26133A120
05/14/2026	U.S. Nuclear Regulatory Commission	Section 106 Initiation Letter to the Otoe-Missouria Tribe of Indians	ML26133A122
05/14/2026	U.S. Nuclear Regulatory Commission	Section 106 Initiation Letter to the Prairie Island Indian Community	ML26133A123
05/14/2026	U.S. Nuclear Regulatory Commission	Section 106 Initiation Letter to the Rosebud Sioux Tribe of the Rosebud Indian	ML26133A124
05/14/2026	U.S. Nuclear Regulatory Commission	Section 106 Initiation Letter to the Sac & Fox Nation of Missouri in Kansas and Nebraska	ML26133A125
05/14/2026	U.S. Nuclear Regulatory Commission	Section 106 Initiation Letter to the Sac & Fox Nation of Oklahoma	ML26133A126
05/14/2026	U.S. Nuclear Regulatory Commission	Section 106 Initiation Letter to the Sac & Fox Tribe of the Mississippi in Iowa	ML26133A127
05/14/2026	U.S. Nuclear Regulatory Commission	Section 106 Initiation Letter to the Santee Sioux Nation	ML26133A128
05/14/2026	U.S. Nuclear Regulatory Commission	Section 106 Initiation Letter to the Shakopee Mdewakanton Sioux Community of Minnesota	ML26133A129
05/14/2026	U.S. Nuclear Regulatory Commission	Section 106 Initiation Letter to the Sisseton-Wahpeton Oyate of the Lake Traverse Reservation SD	ML26133A130
05/14/2026	U.S. Nuclear Regulatory Commission	Section 106 Initiation Letter to the Spirit Lake Tribe, North Dakota	ML26133A131
05/14/2026	U.S. Nuclear Regulatory Commission	Section 106 Initiation Letter to the Standing Rock Sioux Tribe of North and South Dakota	ML26133A132
05/14/2026	U.S. Nuclear Regulatory Commission	Section 106 Initiation Letter to the Turtle Mountain Band of Chippewa Indians of North Dakota	ML26133A133
05/14/2026	U.S. Nuclear Regulatory Commission	Section 106 Initiation Letter to the Upper Sioux Community of Minnesota	ML26133A134
05/14/2026	U.S. Nuclear Regulatory Commission	Section 106 Initiation Letter to the Winnebago Tribe of Nebraska	ML26133A135
05/14/2026	U.S. Nuclear Regulatory Commission	Section 106 Initiation Letter to the Yankton Sioux Tribe of South Dakota	ML26133A136

Date	Originator	Correspondence	ADAMS Accession Number
05/14/2026	U.S. Nuclear Regulatory Commission	Section 106 Initiation Letter to the Iowa Tribe of Kansas & Nebraska	ML26126A070
05/14/2026	U.S. Nuclear Regulatory Commission	Section 106 Initiation Letter to the Apache Tribe of Oklahoma	ML26133A109
05/14/2026	U.S. Nuclear Regulatory Commission	Section 106 Initiation Letter to the Prairie Band Potawatomi Nation	ML26133A160
05/15/2026	NextEra Energy Duane Arnold, LLC	Duane Arnold Energy Center, Responses to NRC Requests for Confirmation of Information and Requests for Additional Information	ML26135A218
06/01/2026	Advisory Council on Historic Preservation	Letter response to notification of Section 106 Initiation	ML26153A025

ADAMS = Agencywide Documents Access and Management System; CFR = *Code of Federal Regulations*; LLC = Limited Liability Company; NRC = U.S. Nuclear Regulatory Commission.

APPENDIX D

GREENHOUSE GAS EMISSIONS AND CLIMATE CHANGE

D.1 Greenhouse Gas Emissions

As described in Revision 2 of NUREG-1437, *Generic Environmental Impact Statement for License Renewal of Nuclear Plants* (the 2024 LR GEIS) (NRC 2024-TN10161), gases found in the Earth's atmosphere that trap heat and play a role in the Earth's climate are collectively termed greenhouse gases (GHGs). These GHGs include carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), water (H_2O) vapor, and fluorinated gases, such as hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride (SF_6). Operations at nuclear power plants release GHGs from stationary combustion sources (e.g., diesel generators, pumps, diesel engines, boilers), refrigeration systems, electrical transmission and distribution systems, and mobile sources (worker vehicles). However, the GHG emissions from nuclear power plants are typically very minor because such plants do not normally combust fossil fuels to generate electricity.

GHG emissions associated with the proposed actions are related to preparations for the resumption of power operations, the resumption of power operations, and the return to decommissioning at Duane Arnold Energy Center (DAEC). Sources of GHG emissions associated with preparations for the resumption of power operations include worker vehicles, onsite stationary combustion sources (diesel generators, auxiliary boilers, pumps), onsite electricity consumption, and construction equipment to support activities identified in Table 3-1.

During the resumption of power operations at DAEC, sources of GHG emissions would include onsite stationary combustion equipment (auxiliary boilers, diesel generators, diesel pumps) and worker vehicles. Additionally, indirect GHG emissions from the resumption of power operations include the uranium fuel cycle and fuel and waste transportation. The U.S. Nuclear Regulatory Commission (NRC or Commission) staff has compiled updated estimates of GHG emissions from various activities associated with operating nuclear power plants. Appendix H in NUREG-2249, *Generic Environmental Impact Statement for Licensing of New Nuclear Reactors* (the 2026 NR GEIS) (NRC 2026-TN12155), discusses GHG emission estimates from fuel and waste transportation and the uranium fuel cycle. These estimates are based on a single installation of 1,000 megawatts electric (MWe) gross output with an 80 percent capacity factor (the reference 1,000 MWe reactor) and may be roughly linearly scaled from the reference 1,000 MWe reactor for other reactor outputs. DAEC provides a net electrical power output of 601 MWe. Therefore, the total GHG emissions would be 0.75 times (601 MWe divided by 800 MWe yields 0.75) the values provided in Table H-4 of the 2026 NR GEIS.

Sources of GHG emissions associated with decommissioning activities include workforce for a period of 40 years and demolition activities for 10 years that include emissions from fossil fuel fired equipment and workforce. The NRC staff included an estimate of GHG emissions from decommissioning because the potential approval of the proposed actions would delay the impacts of DAEC decommissioning.

Table D-1 provides the GHG emissions estimates for each of the activities described above.

Table D-1 Nuclear Power Plant Life-Cycle Greenhouse Gas Emissions Estimates for Preparation Activities, Power Operations (6 Years), and Decommissioning at Duane Arnold Energy Center

Phase	Activities	GHG Emissions (CO_2[eq]) T
Preparation Activities	Workforce[(a)]	21,210
Preparation Activities	Construction Equipment[(b)]	6,430
Preparation Activities	Onsite Equipment[(c)]	24,300
Power Operations	Plant Operations[(d)]	1,750
Power Operations	Uranium Fuel Cycle[(e)]	66,830
Power Operations	Operations Workforce[(a)]	15,760
Power Operations	Fuel and Waste Transportation[(e)]	1,740
Decommissioning	SAFSTOR Workforce[(a)]	11,020
Decommissioning	Decommissioning Equipment[(f)]	20,940
Decommissioning	Decommissioning Workforce[(a)]	8,820
Total	-	**179,370**

CO_2eq = carbon dioxide equivalent; DAEC = Duane Arnold Energy Center; ER = environmental report; GHG = greenhouse gas; T = ton(s).
"-" denotes no data in table cell.

(a) Workforce GHG emissions based on Table H-2 of NUREG-2249 (NRC 2026-TN12155) and a total peak workforce of 1,039 at DAEC during preparation activities, an operations workforce of 386, a decommissioning workforce of 200, and a SAFSTOR workforce of 40.

(b) The NRC staff calculated GHG emissions from construction equipment based on the following assumptions: construction equipment would consist of common equipment needed for earthwork (excavator, front end loader, or backhoe); equipment conservatively assumed to be used 8 hours a day for the entire duration of activity identified in Table A to Enclosure 1 in NextEra 2026-TN13298; most conservative 2007 composite CO_2 emission factor (in lb/hr) from AQMD Undated-TN13007 was used; and a 0.997 equivalency factor was applied to obtain CO_2eq.

(c) Emissions account for onsite equipment and electricity usage over a 3-year period. Equipment includes auxiliary boiler, diesel generators, and diesel pump. Emissions from electricity usage based on historical data presented in Table 3.7-2 and Table 3.7-3 of the 2025 DAEC ER (NextEra 2025-TN13199). Highest value from Table 3.7-2 and Table 3.7-3 of the 2025 DAEC ER presented here, converted to tons, and rounded.

(d) Emissions account for onsite equipment, are based on historical data from operations of DAEC, and presented in Table 4.7-2 of the 2025 DAEC ER (NextEra 2025-TN13199). Highest value from Table 4.7-2 of the 2025 DAEC ER presented here, converted to tons, and rounded. Equipment includes an auxiliary boiler, diesel generators, and diesel pump and 6 years of operation is accounted for.

(e) Uranium fuel cycle and fuel and waste transportation based on Appendix H of NUREG-2249 (NRC 2026-TN12155), scaled to 6 years of operation, and applying a scaling factor of 0.75 given that DAEC provides a net electrical power output 601 MWe.

(f) GHG emissions based on Appendix H, Table H-2 of NUREG-2249 (NRC 2026-TN12155) presented here in tons.

D.2 Affected Environment for Climate Change

The NRC staff has determined that climate change may alter the affected environment described in Chapter 3 of this environmental assessment during the period of preparation for the resumption of power operations and following the actual resumption of power operations at DAEC (the renewed facility license issued in 2010 expires in 2034). Climate change is a global phenomenon, and the activities associated with the continued operation of DAEC are not expected to appreciably alter these trends. However, climate change may create a new environment that could result in changed impacts from preparation activities and power operations at DAEC or impose operational restrictions on the DAEC site's safety and performance. This section documents the NRC staff's assessment of the potential effects of climate change on its evaluation of the environmental impacts of the proposed actions.

The NRC staff references the fourth (NCA4) and fifth (NCA5) National Climate Assessment report (USGCRP 2017-TN5848, USGCRP 2023-TN9762) and other supporting documents to provide the basis for assessing the likely climate change impacts around the DAEC site.

The climate change projections in the U.S. Global Change Research Program (USGCRP) reports are generally expressed as a change expected for the mid-21st century (e.g., 2036–2065) or late 21st century (e.g., 2071−2099) relative to average conditions existing in the near present (1991−2020). The NRC staff identified that the mid-21st century projections are relevant to the evaluation of the resumption of power operations at DAEC through February 21, 2034, the end of the current operating license term under the DAEC renewed facility license.

The USGCRP's climate change impact reports include projections for various scenarios based on future emissions of heat-trapping gases. The NCA4 and NCA5 use shared socioeconomic pathways (SSPs), representative concentration pathways (RCPs), and/or global warming levels (GWLs) when presenting projected climate change. RCPs are based on the predicted changes in radiative forcing (a measure of the influence that a factor, such as GHG emissions, has in changing the global balance of incoming and outgoing energy) in the year 2100, relative to preindustrial conditions. The four RCP scenarios are numbered in accordance with the change in radiative forcing measured in watts per square meter (i.e., +2.6 [very low], +4.5 [lower], +6.0 [mid-high], and +8.5 [higher]) (USGCRP 2018-TN5847). For example, RCP 2.6 is representative of a mitigation scenario aimed at limiting the increase of global mean temperature to 1.1°F (IPCC 2014-TN7651). RCP 8.5 reflects a continued increase in global emissions resulting in increased warming by 2100. GWLs are used to describe the level of global temperature increase (e.g., 3.6°F or 5.4°F) relative to preindustrial temperature conditions (USGCRP 2023-TN9762). Five SSP (SSP1-1.9, SSP1-2.6, SSP2-4.5, SSP3-7.0, and SSP5-8.5) scenarios cover a range of GHG pathways and climate change mitigation. GWLs are used to describe the level of global temperature increase (e.g., 23.6°F or 5.4°F) relative to preindustrial temperature conditions. For example, under a very high emission scenario (SSP5-8.5) models project reaching 3.6°F of global warming between 2033 and 2054; under an intermediate scenario (SSP2-4.5), models project reaching a 3.6°F GWL between 2038 and 2085. The International Panel on Climate Change projects that a global warming of 3.6°F will be exceeded during the 21st century unless substantial reductions in GHG emissions occur in the coming decades (IPCC 2021-TN7435). By the end of the century, a global warming of 5.4°F can be exceeded under a high and very high scenario (SSP3-7.0 and SSP5-8.5) (USGCRP 2023-TN9762).

D.3 Observed and Expected Climatological Changes

The Intergovernmental Panel on Climate Change determined that the global surface temperature has increased faster since 1970 than in any other 50-year period over at least the last 2,000 years (IPCC 2023-TN8557). From 2011 through 2020, the global surface temperature was 2°F warmer than that in the preindustrial period (1850–1900) (IPCC 2023-TN8557). From 1901 to 2023, global precipitation has increased at an average rate of 0.03 in. per decade (EPA 2024-TN10205). From 1901 to 2023, average surface temperature across the contiguous United States has increased by 0.17°F per decade (EPA 2024-TN10205). From 1901 to 2023, total annual precipitation in the contiguous United States has increased at a rate of 0.18 in. per decade (EPA 2024-TN10205).

The annual average temperature data across Iowa exhibited an increase of 0.5–2°F between 2002–2021 relative to 1901–1960 (USGCRP 2023-TN9762: Figure 2.4). The number of hot days (days at or above 95°F) in the Midwest has decreased by 5.6 days, the number of cold days (days at or below 32°F) has decreased by 4.9 days, and the number of warm nights

(nights at or above 70°F) have increased by 0.6 nights in the period from 2002–2021 relative to 1901–1960 (USGCRP 2023-TN9762: Figure 2.7). Average annual precipitation in the period between 2002–2021 (relative to the 1901–1960 average) for the Midwest exhibits an increase, with Iowa exhibiting an increase of up to 15 percent (USGCRP 2023-TN9762: Figure 2.4). The Midwest has experienced a 45 percent increase in the number of extreme precipitation days (defined as the top 1 percent of heaviest precipitation events) in the period between 1958–2021 (USGCRP 2023-TN9762: Figure 2.8).

The NRC staff used climate change projections for the mid-21st century (i.e., 2036–2065) and a GWL of 3.6°F under a very high emission scenario as the bounding climate scenario for the time period covering the resumption of power operations at DAEC. This assessment ensures that the potential environmental impacts for all resource areas under a changing climatic regime are conservatively considered in the context of the NRC's evaluation of the environmental impacts of the reauthorization of power operations at DAEC. Table D-2 summarizes the projected changes for various climate variables.

Table D-2 Climate Variables and Projected Changes for Linn County, Iowa

Climate Variable	Projected Change Under a Global Warming Level of 3.6°F relative to the Period Between 1991–2020 or Under an Intermediate Emissions Scenario (RCP4.5) by Midcentury (2036–2065 relative to 1991–2020)
Average surface air temperature	Increase of 4°F
Hottest day of the year	Increase by 4°F
Annual number of days with temperatures above 95°F	Increase of 12 days
Annual number of days with temperatures below 32°F	A decrease of 20 days
Projected changes in precipitation	Annual total precipitation is projected to increase by 1 percent and the annual number of days with extreme precipitation (top 1 percent of historical rainfall events) is projected to increase by 13 percent
General/Other	Medium confidence that climate change is projected to worsen air quality in many regions of the United States. Increase in annual actual evapotranspiration of 1 in. for Iowa Increase of annual runoff up to 0.5 in. for Iowa Both an increase (up to 0.1 in.) and a decrease (0.1 in.) of average summer soil moisture for Iowa Annual climatic water deficit of up to 0.2 in. in Iowa

Source: USGCRP 2023-TN9762.

D.4 Environmental Consequences of Preparations for the Resumption of Power Operations and the Resumption of Power Operations

Changes in climate could have broad implications for environmental resources. Climate change impacts can occur across resource areas that are affected by the proposed actions. The climate change analysis focuses on assessing the potential effects of climate on the resource area impact determinations (NOT SIGNIFICANT) assigned in Chapter 3. Below, the NRC staff considers the overlapping effects of climate change on the environmental resource areas that may also be directly affected by proposed actions. In other words, the proposed actions must have an incremental new, additive, or increased physical effect or impact on the resource area and climate change is expected to have a reasonably foreseeable effect on that resource area. If both criteria are not present, then the NRC did not consider the overlapping impacts of the proposed actions and climate change. For example, climatological changes are not expected to affect noise levels or impact radiological exposure levels or doses and, therefore, they are not discussed below. Alternatively, as discussed in Chapter 3, the proposed actions would not alter the industrial land use and visual appearance of DAEC as there is no new, additive, or increased physical effect on these resource areas. Therefore, the climate change impacts on land use and visual resource areas are not discussed below. This does not mean that climate change will not have a reasonably foreseeable effect on the land use resource area, but both criteria discussed above are not present and, therefore, overlapping impacts are not anticipated. For this reason, based on this framework and the NRC staff's analysis of the proposed actions in Chapter 3, climate change impacts to land use and visual resources, noise, historic and cultural resources, socioeconomics conditions, radiological and nonradiological human health, waste management, uranium fuel cycle and transportation, postulated accidents, and decommissioning are not discussed further.

Based on its review, the NRC staff has determined that the impact determinations (NOT SIGNIFICANT) assigned in Chapter 3 would not be altered by the projected effects of climate change. The NRC staff provides the following resource-specific justifications for this determination.

D.4.1 Meteorology and Air Quality

Climate change can impact air quality as a result of changes in meteorological conditions during the period of the resumption of power operations at DAEC. Air pollutant concentrations are sensitive to winds, temperature, humidity, and precipitation. Ozone levels and particulate matter have been found to be particularly sensitive to climate change influences. Ozone is formed by the chemical reaction of nitrogen oxides and volatile organic compounds in the presence of heat and sunlight. The emission of ozone precursors also depends on temperature, wind, and solar radiation (NRC 2020-TN7241). Warmer temperatures, air stagnation, droughts, and wildfires are favorable conditions for higher levels of ozone and particulate matter less than 2.5 microns ($PM_{2.5}$) (USGCRP 2023-TN9762). The USGCRP reports that there is medium confidence that climate change is projected to worsen air quality in many regions of the United States (USGCRP 2023-TN9762). This is due to the uncertainty in how meteorology will respond to climate change and how these meteorological conditions will in turn change air pollutant concentrations. For instance, a rise in temperature increases atmospheric humidity; chemical reactions that result in the destruction of ozone increase with increasing humidity thereby reducing ozone. However, greater humidity is expected to worsen $PM_{2.5}$ in certain regions. As discussed in Section 3.3.1, DAEC is in Linn County, which is designated in attainment. Climate change can worsen air quality by compromising the attainment status of counties. However, as discussed in Section 3.3.3, the NRC staff determined that the $PM_{2.5}$ emissions and its

precursors from the resumption of power operations at DAEC are projected to be well below 100 tons/year and represent less than 1 percent of Linn County's air pollutant emissions. Therefore, the NRC staff concludes that the air quality impacts from the resumption of power operations at DAEC would not be exacerbated if climate change were to worsen air quality in Linn County and that the air quality impact determinations (NOT SIGNIFICANT) assigned in Chapter 3 would not be altered by the projected effects of climate change.

D.4.2 Water Resources

Climatic changes, such as changes in air temperature and precipitation patterns, can affect the availability of water resources. The NRC staff determined that the climate model projections for Iowa and Linn County indicate potential future changes to precipitation, runoff, and air temperature that could influence water availability and water quality. As noted in Table D-2, increases in annual precipitation and extreme precipitation events are projected. Increases in annual precipitation and heavy precipitation can result in greater runoff and the potential for increased riverine flooding. In turn, these changes can result in the transport of a higher sediment load and other contaminants to surface waters, potentially degrading ambient water quality. During the resumption of power operations at DAEC, impacts to surface water quality from plant discharges would be regulated under DAEC's National Pollutant Discharge Elimination System (NPDES) permit. NEDA does not expect any changes to environmental interfaces, new sources, or significant differences in emissions or effluents, including their volumes or mass, from the resumed power operations at DAEC as compared to the power operations before the 2020 plant shutdown (NextEra 2025-TN13199).

Projected increases in ambient air temperature and the number of hot days (as identified in Table D-2) may elevate surface water temperature and increase evaporation. As intake water temperatures warm, the volume of surface water needed for nuclear power plant cooling may increase or plant efficiencies can decrease (USGCRP 2014-TN3472, USGCRP 2018-TN5847). As discussed in Section 3.4.3, consumptive water use for DAEC represents less than 3 percent of the daily 90-percent exceedance flow (i.e., 712 cfs) at the Cedar Rapids gaging station.

For the groundwater resources area, precipitation and evapotranspiration are key drivers in groundwater recharge. A reduction in soil moisture due to higher temperate and reduced groundwater recharge, especially if runoff rates increase with heavier rainfall events, reduces groundwater availability to wells, reduces baseflow to streams, and can negatively affect groundwater quality. However, increases in precipitation, which are projected in Linn County, could partially offset reductions in water availability and groundwater recharge due to projected temperature increases. As discussed in Section 3.5.2, groundwater will continue to be used to support DAEC operations. Groundwater will be used for industrial and potable purposes and groundwater use is estimated to be approximately half the maximum total rate of groundwater withdrawals allowed under Water Use Permit 3046-R7.

Based on the above information, the NRC staff concludes that surface water and groundwater impacts from the resumption of power operations at DAEC would not be exacerbated if climate change were to worsen water availability or quality and that surface water and groundwater effects determinations (NOT SIGNIFICANT) assigned in Chapter 3 would not be altered by the projected effects of climate change.

D.4.3 Ecological Resources

Changes in water temperature can alter the balance of aquatic ecosystems. Water temperature is an essential physical property of all aquatic environments on which aquatic ecological resources rely. The NRC staff determined that the ambient air temperature and the annual number of hot days in Linn County are projected to increase. Higher ambient air temperatures can increase surface water temperatures (USGCRP 2023-TN9762) and these temperatures directly affect water quality. Warming water temperatures may also influence the abundance and distribution of both native and invasive species, as well as result in earlier spawning times. Species may migrate or shift their ranges to cooler waters in response to habitat loss from warming waters (Phillips et al. 2018-TN10290). Simultaneously, increased water temperatures could lead to increased volumetric water withdrawal requirements and related increases in heated discharge. This in turn can lead to a proportional increase in the number of aquatic organisms impinged and entrained and may result in a larger area where aquatic organisms could experience elevated temperatures resulting from DAEC's thermal effluent discharge.

As discussed in Section 3.7.3, NEDA performed a CWA Section 316(b) compliance study that indicates that the configuration and operation of the closed cycle recirculating system at DAEC is the primary proposed mechanism for reducing impingement and entrainment mortality. NEDA proposes that this system represents the best technology available with no further impingement mortality or entrainment reduction measures being warranted. Furthermore, the area of influence of the intake structure is relatively small. The proposed mechanical draft cooling towers are expected to function similarly to those previously operating on site. A thermal analysis after the initiation of plant operations found that the maximum extent of the 1°F excess isotherm was measured to extend 500 ft downstream and 60 ft offshore from the discharge structure, encompassing approximately 0.35 ac. The maximum extent of the 5°F excess isotherm was measured to extend 250 ft downstream and 50 ft offshore, encompassing approximately 0.14 ac. NEDA will need to submit an NPDES permit renewal application to the Iowa DNR in order to operate DAEC. NEDA expects this permit to be updated to reincorporate cooling tower blowdown and process wastewater discharges into the permit that were previously removed when DAEC ceased operations. Based on the thermal plume that is expected based on previous power operations and compliance with the operational NPDES permit, once issued, the NRC staff concludes that the impacts to aquatic ecological resources from the resumption of power operations of DAEC would not be exacerbated by the projected effects of climate change.

Overall, the NRC staff concludes that the ecological resources impact determination (NOT SIGNIFICANT) assigned in Chapter 3 would not be altered by the projected effects of climate change.

D.5 Conclusions

The NRC staff concludes that the potential effects of climate change would not alter the significance determinations in this environmental assessment for the preparations for the resumption of power operations and for the resumption of power operations at DAEC.

D.6 References

Cited references are in Chapter 6.

APPENDIX E

HISTORIC AND CULTURAL RESOURCES HISTORIC PHOTOGRAPHS

This appendix provides historic photographs of the Duane Arnold Energy Center (DAEC) site, which visually depict the land disturbance that occurred between approximately 1970–1974. One historic aerial photograph shows the DAEC site immediately prior to construction (Figure E-1). The photograph is undated, but it was likely taken in either 1969 or 1970. The DAEC site was originally selected due to its proximity to the Cedar River, existing transmission line infrastructure, transmission facilities, and customer base. As identified in Section 3.9, the site was previously graded and disturbed through farming and agricultural activities during the 19th and 20th centuries. Agricultural fields are visible in Figure E-1 below. Figure E-2 through Figure E-5 show various stages of facility construction on the DAEC site.

Figure E-1 The Duane Arnold Energy Center Site Prior to Beginning Construction, Date Unknown. Source: NextEra 2020-TN13420.

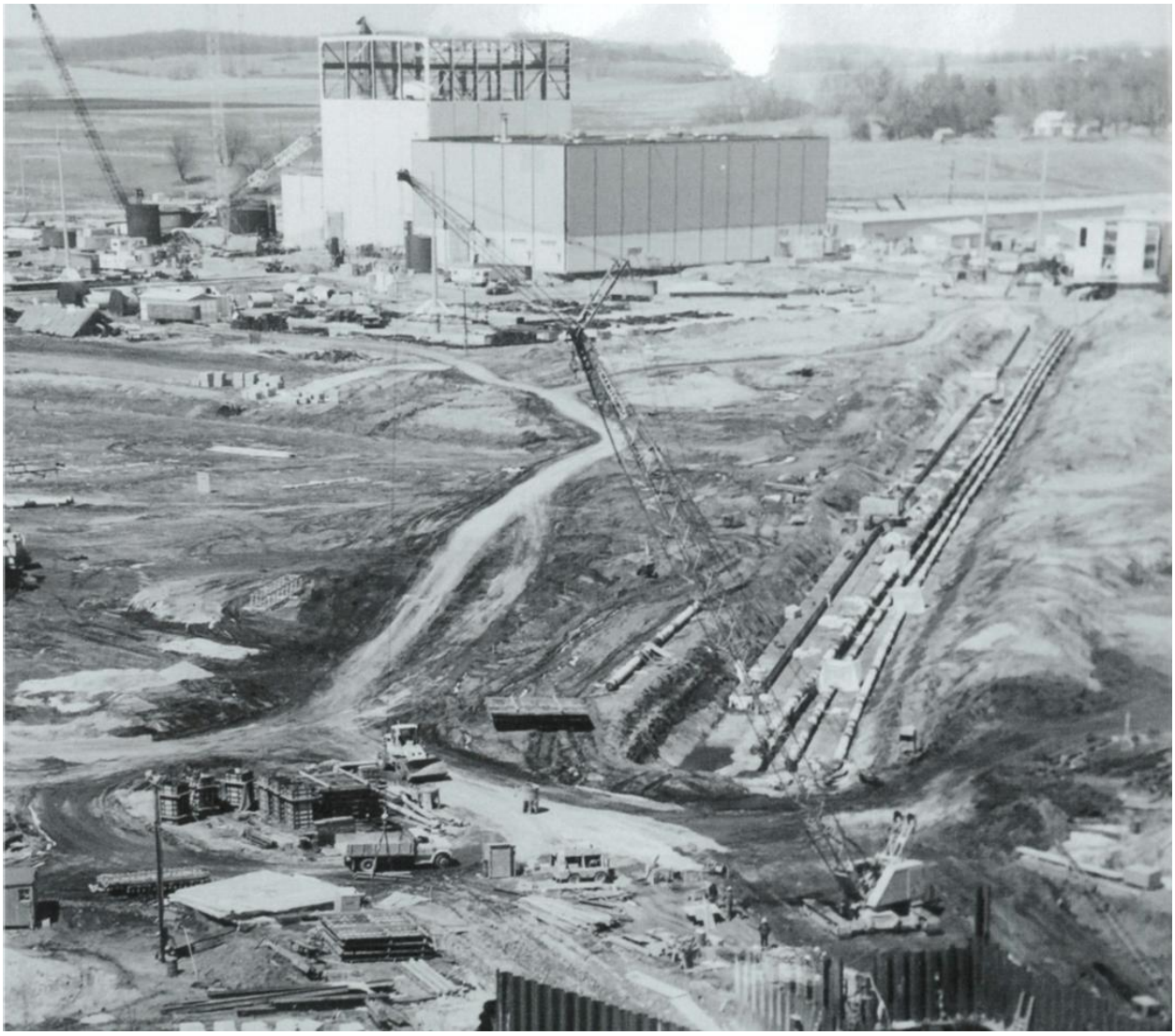

Figure E-2 The Duane Arnold Energy Center Site During Construction, 1970–1974. View Looking Approximately Northwest. Source: NextEra 2020-TN13420.

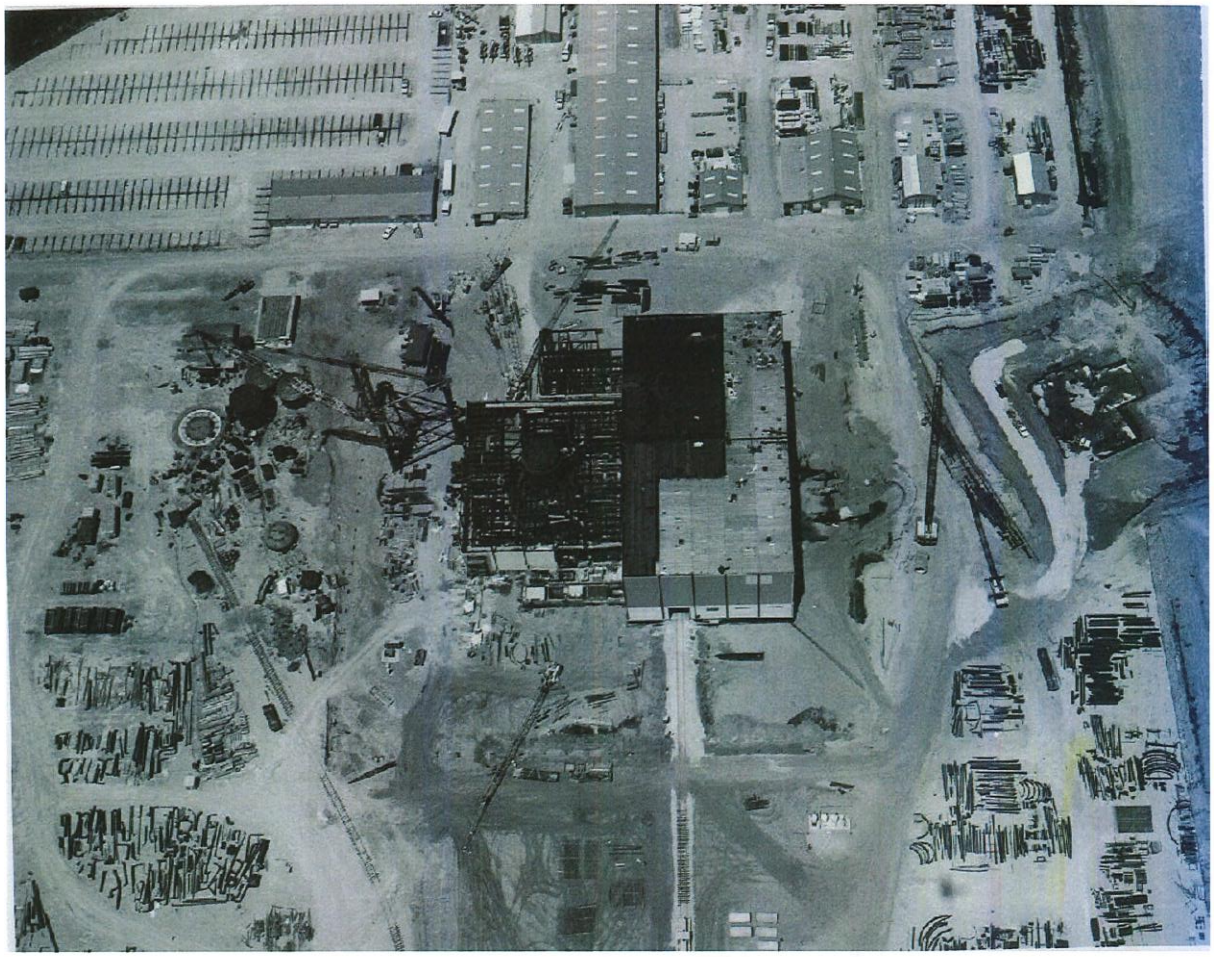

Figure E-3 An Aerial View of the Duane Arnold Energy Center Site Construction, 1970–1974. Source: NextEra 2026-TN13298.

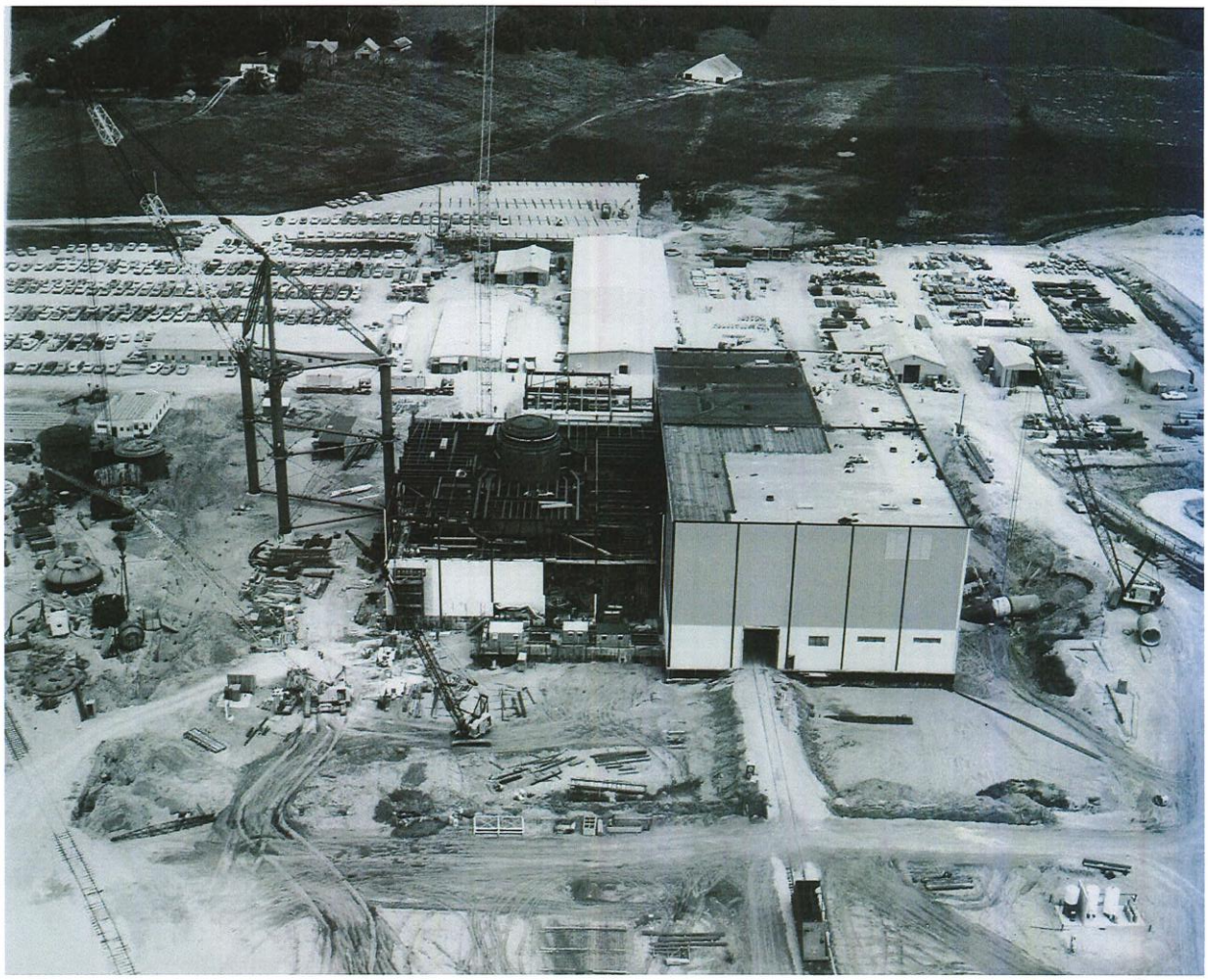

Figure E-4 An Aerial View of the Duane Arnold Energy Center Site Construction, 1970–1974. View Looking Approximately North. Source: NextEra 2026-TN13298.

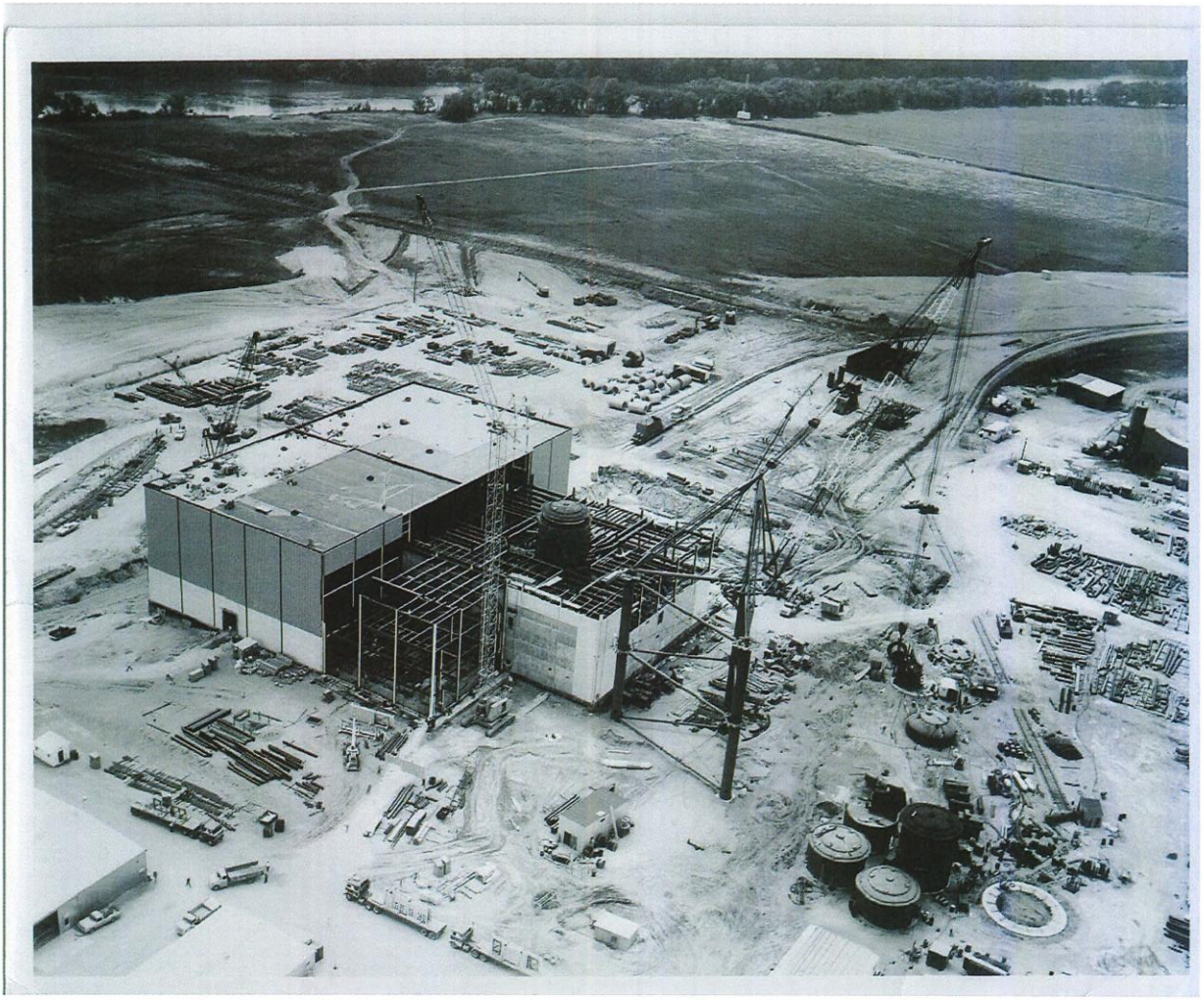

Figure E-5 An Aerial View of the Duane Arnold Energy Center Site Construction, 1970–1974. View Looking Approximately Southeast. Source: NextEra 2026-TN13298.

E.1 References

Cited references are in Chapter 6.

APPENDIX F

ECOLOGICAL CONSULTATIONS

This appendix of the environmental assessment outlines the ecological consultations conducted by the U.S. Nuclear Regulatory Commission (NRC or Commission) staff to inform its environmental review under the National Environmental Policy Act of 1969, as amended (NEPA) (TN661). It includes documentation of the NRC staff's compliance with applicable statutes, including the Endangered Species Act (ESA) (TN1010). These consultations assess the potential effects of the proposed actions on federally listed species and designated critical habitats.

To inform these consultations and the broader NEPA analysis, this appendix begins with information on terrestrial and aquatic ecological resources within the project area. This integrated ecological context provides the scientific basis for evaluating potential environmental impacts of the proposed actions, ensuring consistency with applicable Federal statues and supporting a comprehensive understanding of the affected environment.

F.1 Terrestrial Ecological Resources

This section describes the terrestrial environment at the Duane Arnold Energy Center (DAEC) site, as well as relevant ecological studies and surveys conducted at DAEC and within the surrounding area. This information supplements and supports the NRC staff's analyses of potential impacts that terrestrial ecological resources may experience as a result of the proposed DAEC restart, which are presented in Section 3.6.

F.1.1 Terrestrial Environment

The DAEC site and vicinity lie within the Iowan Surface (EPA Level IV Ecoregion 47c) and the Western Corn Belt Plains (EPA Level III Ecoregion 47) (EPA 2000-TN13203). The Iowa Department of Natural Resources (DNR) characterizes this region as irregular to smooth plains predominately used for cropland, with native vegetation consisting of bluestem prairies and oak-hickory forests (IADNR 2025-TN13204). The NRC's NUREG-1437, Supplement 42, *Generic Environmental Impact Statement for License Renewal of Nuclear Plants, Supplement 42, Regarding Duane Arnold Energy Center, Final Report* (the 2010 supplemental environmental impact statement [SEIS]) (NRC 2010-TN13201) and the NextEra Energy Duane Arnold, LLC (NEDA) environmental report (ER) (NextEra 2025-TN13199) provide descriptions of terrestrial habitats and species. The 500 ac DAEC site primarily consists of 195 ac of developed areas (open space and low to high intensity development), 109 ac of pasture/hay, 85 ac of cultivated crops, 52 ac of wetlands (woody and emergent wetlands), and 45 ac of deciduous forest. Other landcover includes 11 ac barren land, 2 ac open water, 1 ac grasslands, and minimal shrub/scrub habitat (NextEra 2026-TN13298; USGS 2023-TN11609). Since the 2010 SEIS (NRC 2010-TN13201), NEDA demolished the cooling towers and plans to replace them in-kind northeast of the DAEC protected area, within a previously disturbed area (NextEra 2026-TN13298).

The NRC staff accessed the online National Wetlands Inventory (NWI) mapper on January 28, 2026 (FWS 2024-TN11617) and downloaded Iowa NWI data for analysis. The NWI mapper showed 11 mapped wetlands onsite, totaling approximately 65.5 ac, which breaks down into three types: four freshwater emergent wetlands (4.22 ac), five freshwater forested/shrub

wetlands (56.88 ac), and two freshwater ponds (4.41 ac). Figure F-1 shows the location of NWI mapped wetlands within the DAEC site boundary.

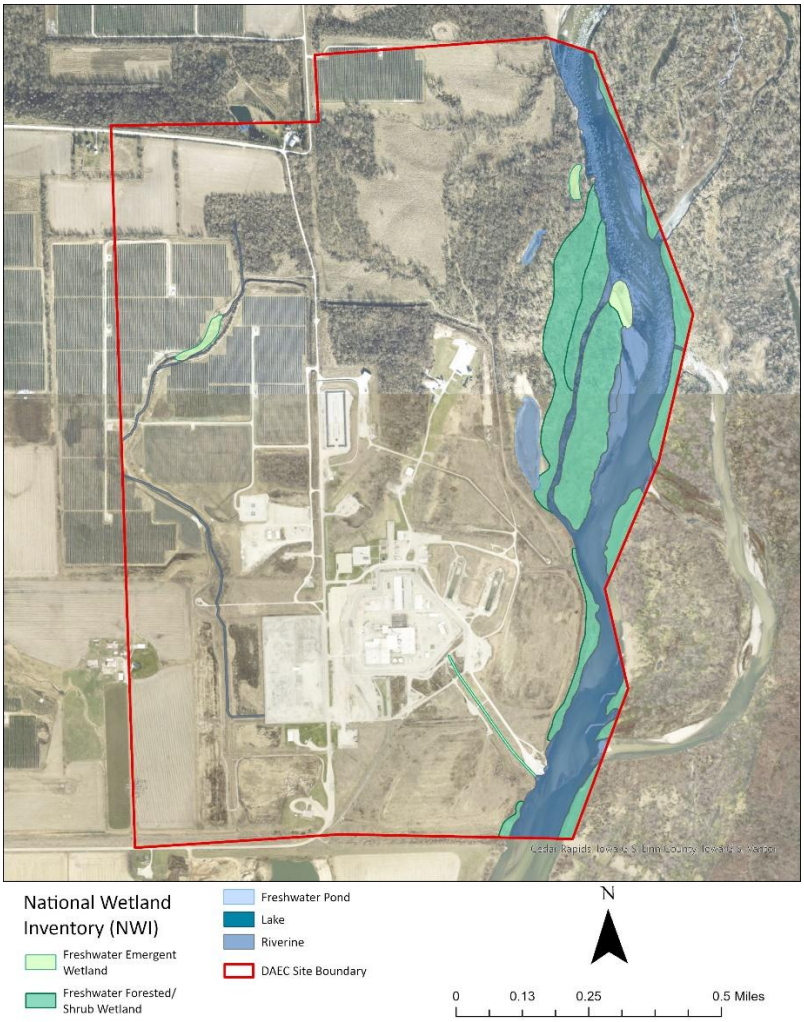

Figure F-1 National Wetlands Inventory Wetlands Within the Duane Arnold Energy Center Site Boundary. Data Source: FWS 2024-TN11617.

F.1.2 State-Listed Terrestrial Species

The Endangered Plants and Wildlife of the State of Iowa (IA Code 481B-TN13205) specifies the State's responsibility for conserving, protecting, restoring, and propagating endangered and threatened species. In the 2025 DAEC ER, NEDA presented a list of Federal and State-listed species that occur in Linn County (NextEra 2025-TN13199). The NRC staff independently downloaded and reviewed data for Linn and Benton Counties (IADNR 2026-TN13421, IADNR 2026-TN13422). Table F-1 and Table F-2 below present the 88 State-listed species that Iowa DNR recorded in these two counties and summarizes if potential habitat is present on the DAEC site. This table does not include federally listed species that may also be State-listed; those species are discussed below.

Table F-1 State-Listed Endangered and Threatened Terrestrial Species Observed in Benton and Linn Counties, Iowa

Group	Scientific Name	Common Name	State Status[(a)]	Potential Habitat Onsite (Y/N)
Amphibians	*Ambystoma laterale*	blue-spotted salamander	E	Y
Amphibians	*Notophthalmus viridescens*	central newt	T	Y
Birds	*Ammodramus henslowii*	Henslow's sparrow	T	N
Birds	*Buteo lineatus*	red-shouldered hawk	E	N
Birds	*Haliaeetus leucocephalus*	bald eagle	S	Y
Birds	*Tyto alba*	barn owl	E	Y
Insects	*Battus philenor*	pipevine swallowtail	S	N
Insects	*Calephelis mutica*	swamp metalmark	S	N
Insects	*Erynnis baptisiae*	wild indigo dusky wing	S	Y
Insects	*Euphydryas phaeton*	Baltimore checkerspot	T	N
Insects	*Eurytides marcellus*	zebra swallowtail	S	Y
Insects	*Poanes zabulon*	Zabulon skipper	S	Y
Insects	*Problema byssus*	byssus skipper	T	N
Insects	*Satyrium caryaevorum*	hickory hairstreak	S	Y
Mammals	*Glaucomys volans*	southern flying squirrel	S	Y
Mammals	*Perognathus flavescens*	plains pocket mouse	E	Y
Plants	*Acalypha gracilens*	slender copperleaf	S	Y
Plants	*Adoxa moschatellina*	muskroot	S	N
Plants	*Anaphalis margaritacea*	pearly everlasting	S	N
Plants	*Aster pubentior*	flat top white aster	S	Y
Plants	*Astragalus distortus*	bent milk-vetch	S	N
Plants	*Besseya bullii*	kitten tails	T	N
Plants	*Botrychium campestre*	prairie moonwort	S	Y
Plants	*Botrychium multifidum*	leathery grape fern	T	Y
Plants	*Botrychium simplex*	little grape fern	T	Y
Plants	*Brasenia schreberi*	water shield	S	N
Plants	*Cacalia suaveolens*	sweet Indian plantain	T	Y
Plants	*Callitriche heterophylla*	water starwort	S	N
Plants	*Calopogon tuberosus*	grass pink	S	N
Plants	*Cardamine douglassii*	purple cress	S	Y
Plants	*Carex aggregata*	glomerate sedge	S	Y
Plants	*Carex cephalantha*	sedge	S	N
Plants	*Carex conoidea*	field sedge	S	N
Plants	*Carex crinita*	fringed sedge	S	Y
Plants	*Carex leptalea*	slender sedge	S	N
Plants	*Carex richardsonii*	Richardson sedge	S	N
Plants	*Carex tenera*	slender sedge	S	Y
Plants	*Carex tonsa*	deep green sedge	S	N

Group	Scientific Name	Common Name	State Status[a]	Potential Habitat Onsite (Y/N)
Plants	*Carex umbellata*	hidden sedge	S	Y
Plants	*Chimaphila umbellata*	Prince's pine	T	Y
Plants	*Cirsium hillii*	Hill's thistle	S	Y
Plants	*Cirsium muticum*	swamp thistle	S	Y
Plants	*Crataegus coccinea*	scarlet hawthorn	S	Y
Plants	*Cuscuta indecora*	pretty dodder	S	N
Plants	*Cypripedium candidum*	small white lady's slipper	S	N
Plants	*Cypripedium reginae*	showy lady's slipper	T	Y
Plants	*Dichanthelium boreale*	northern panic-grass	E	Y
Plants	*Equisetum sylvaticum*	woodland horsetail	T	Y
Plants	*Eriophorum angustifolium*	tall cotton grass	S	Y
Plants	*Gaylussacia baccata*	black huckleberry	T	Y
Plants	*Geum vernum*	spring avens	S	Y
Plants	*Hypericum boreale*	northern St. John's-wort	E	N
Plants	*Ilex verticillata*	winterberry	E	N
Plants	*Juncus effusus*	soft rush	S	Y
Plants	*Juncus greenei*	Green's rush	S	N
Plants	*Lechea intermedia*	narrowleaf pinweed	T	Y
Plants	*Lycopodium digitatum*	crowfoot clubmoss	S	N
Plants	*Menyanthes trifoliata*	buckbean	T	N
Plants	*Mimulus glabratus*	yellow monkey flower	T	N
Plants	*Oenothera perennis*	small sundrops	T	Y
Plants	*Ophioglossum pusillum*	northern adder's-tongue	S	Y
Plants	*Penstemon tubiflorus*	tunnel-formed penstemon	S	Y
Plants	*Phlox bifida*	cleft phlox	S	N
Plants	*Platanthera clavellata*	small green woodland orchid	S	Y
Plants	*Platanthera flava*	pale green orchid	E	Y
Plants	*Platanthera psycodes*	purple fringed orchid	T	Y
Plants	*Polygala incarnata*	pink milkwort	T	Y
Plants	*Polygala polygama*	racemed milkwort	E	N
Plants	*Potamogeton amplifolius*	large-leaf pondweed	S	N
Plants	*Potamogeton vaseyi*	vasey pondweed	S	Y
Plants	*Potentilla fruticosa*	shrubby cinquefoil	T	N
Plants	*Salix candida*	sage willow	S	N
Plants	*Salix pedicellaris*	bog willow	T	N
Plants	*Scutellaria nervosa*	veined skullcap	S	Y
Plants	*Selaginella rupestris*	ledge spikemoss	S	N
Plants	*Spiranthes magnicamporum*	great plains ladies'-tresses	S	N
Plants	*Spiranthes ovalis*	oval ladies'-tresses	T	Y

Group	Scientific Name	Common Name	State Status[(a)]	Potential Habitat Onsite (Y/N)
Plants	*Viburnum prunifolium*	smooth black-haw	S	Y
Plants	*Viola incognita*	large-leaf white violet	E	Y
Plants	*Viola lanceolata*	lance-leaved violet	S	Y
Plants	*Viola macloskeyi*	violet	S	Y
Plants	*Xyris torta*	yellow-eyed grass	E	N
Reptiles	*Clemmys insculpta*	wood turtle	E	Y
Reptiles	*Emydoidea blandingii*	Blanding's turtle	T	Y
Reptiles	*Liochlorophis vernalis*	smooth green snake	S	Y
Reptiles	*Pituophis catenifer sayi*	bullsnake	S	N
Reptiles	*Terrapene ornata*	ornate box turtle	T	N
Snails	*Vertigo meramecensis*	bluff vertigo	E	N

Y = Yes; N = No.

(a) State Status (IADNR 2026-TN13421, IADNR 2026-TN13422): E = State Endangered, T = State Threatened; S = Special Concern. Special Concern are species suspected to have population or distribution problems and may become threatened in the near future.

F.1.3 Eagles and Migratory Birds

The DAEC site is in the Mississippi flyway, an important bird migration route which extends from the Gulf Coast to the Arctic Circle. Migrant birds often fly at night, landing to rest early in the morning. Suitable habitats that allow migratory birds to feed, rest, and avoid predators are called stopovers. Large natural barriers may create crowded stopover locations because flights over the barriers mean long stretches without opportunities to rest or feed. Along the Mississippi flyway, the Great Lakes are major barriers. Many species of migratory birds likely use the DAEC site and vicinity during the spring and fall migrations.

Two statutes govern management of eagles and other migratory birds. The Bald and Golden Eagle Protection Act (TN1447) extends protections to the bald eagle (*Haliaeetus leucocephalus*) and golden eagle (*Aquila chrysaetos*). The Act prohibits anyone without a permit from the Secretary of the Interior from "taking" bald eagles or golden eagles, including their parts, nests, or eggs. The Migratory Bird Treaty Act of 1918 (TN3331) makes it illegal for anyone to take, possess, import, export, transport, sell, purchase, barter, or offer for sale any migratory bird or the parts, nests, or eggs of such a bird except under the terms of a valid permit issued under Federal regulations.

The 2010 SEIS (Section 2.2.6, incorporated here by reference) states that commonly observed birds in the DAEC site's wooded areas include meadowlarks (*Sturnella* spp.), barn swallows (*Hirundo rustica*), red-winged blackbirds (*Agelaius phoeniceus*), blue jays (*Cyanocitta cristata*), wood duck (*Aix sponsa*), doves and crows (*Corvus* spp.), pheasants (*Phasianus* spp.), and quail (*Coturnix* spp.). According to the U.S. Fish and Wildlife Service's (FWS's) Information for Planning and Consultation (IPaC) report (FWS 2026-TN13423), six Birds of Conservation Concern have the potential to occur on the DAEC site. Birds of Conservation Concern are bird species that are the highest conservation priority for the FWS that are not already designated as federally threatened or endangered. In addition, breeding bald eagles have the potential to occur on site (breeding period October 15–August 31) (FWS 2026-TN13423). During the 2021 raptor nest survey conducted for the Duane Arnold solar project, three bald eagle nests were

identified, with the nearest active nest located approximately 60 ft north of the site along the Cedar River (NextEra 2025-TN13199). Though golden eagles occasionally overwinter in bluffs located in northeastern Iowa from November through March (IADNR 2026-TN13425), they are not likely to appear on the DAEC site due to the lack of their preferred habitat of hills, cliffs, and bluffs (FWS 2026-TN13424).

While the U.S. osprey (*Pandion haliaeetus*) is not listed as endangered or threatened at the Federal or State level, State agencies are working together to expand the bird's breeding range and to monitor its nesting activity (IADNR 2026-TN13426). NEDA constructed an artificial nest platform onsite near the river, approximately 492 ft east of the meteorological tower. Historically, observations of ospreys occurred on both the meteorological tower and artificial nest platform; however, there have been no onsite observations since 2008 (NextEra 2026-TN13298). In 2002, Iowa's Peregrine Falcon Restoration project released eight falcons at the hacking station on the off-gas site (NextEra 2025-TN13199). NEDA has not observed peregrine falcons within the site boundaries (NextEra 2026-TN13298). In 2010, Iowa delisted peregrine falcons as a state endangered species.

F.1.4 Terrestrial Invasive Species

Invasive species are defined as a non-native organisms whose introduction causes or is likely to cause economic or environmental harm, or harm to human, animal, or plant health (81 Federal Register [FR] 88609-TN8375). Executive Order 13112 (64 FR 6183-TN4477), as amended by Executive Order 13751 (81 FR 88609-TN8375), directs Federal agencies to not authorize, fund, or carry out actions likely to cause or promote the introduction or spread of invasive species unless they determine that the benefits of the action clearly outweigh the harm from invasive species and that all feasible and prudent measures to minimize risk of harm will be taken in conjunction with these actions (64 FR 6183-TN4477: Section 2).

The Iowa DNR Forest Invasive Species Guide lists 37 plant invasive species (IADNR Undated-TN13456) as specific targets for detecting and controlling if found: autumn olive (*Elaeagnus umbellata*), bull thistle (*Cirsium vulgare*), Canada thistle (*Cirsium arvense*), cheatgrass (*Bromus tectorum*), Chinese elm (*Ulmus parvifolia*), common buckthorn (*Rhamnus cathartica*), common burdock (*Arctium* L.), common teasel (*Dipsacus* L.), crown vetch (*Coronilla* L.), Dame's rocket (*Hesperis matronalis*), bush honeysuckle (Diervilla Mill.), garlic mustard (*Alliaria petiolata*), giant hogweed (*Heracleum mantegazzianum*), honeysuckle (*Lonicera* L.), Japanese barberry (*Berberis thunbergii*), Japanese knotweed (*Polygonum cuspidatum*), knapweed (*Centaurea* L.), kudzu (*Pueraria*), leafy spurge (*Euphorbia esula*), multiflora rose (*Rosa multiflora*), musk thistle (*Carduus nutans*), oriental bittersweet (*Celastrus orbiculatus*), privet (*Ligustrum* L.), purple loosestrife (*Lythrum salicaria*), Queen Anne's lace (*Daucus carota*), reed canary grass (*Phalaris arundinacea*), Russian olive (*Elaeagnus angustifolia*), salt cedar (*Tamarix ramosissima*), sericea lespedeza (*Lespedeza cuneata*), Siberian elm (*Ulmus pumila*), spotted knapweed (*Centaurea stoebe*), tree of heaven (*Ailanthus altissima*), velvet leaf (*Senna lindheimeriana*), white mulberry (*Morus alba*), wild parsnip (*Pastinaca sativa*), winged burning bush (*Euonymus occidentalis*), and yellow star thistle (*Centaurea solstitialis*).

Iowa administrative code (IA Admin Code 21.58-TN13457) classifies Palmer amaranth (*Amaranthus palmeri*) as a Class A noxious weed for eradication and Canada thistle (*Cirsium arvense*), teasel (*Dipsacus* spp.), leafy spurge (*Euphorbia esula*), bull thistle (*Cirsium vulgare*), multiflora rose (*Rosa multiflora*), European morning glory or field bindweed

(*Convolvulus arvensis*), and all other species of thistles belonging in the genus of *Carduus* as Class B noxious weeds for control.

Onsite, NEDA will continue to manage the site with select use of herbicides and mowing for security and safety reasons. Targeted pesticide applications will control stinging pests and species that impact human safety, as needed. NEDA will apply broadcast herbicide within developed areas (NextEra 2026-TN13298).

F.2 Aquatic Ecological Resources

This section describes the aquatic environment at the DAEC site, as well as relevant ecological studies and surveys conducted at DAEC and within the surrounding area. This information supplements and supports the NRC staff's analyses of potential impacts that aquatic ecological resources may experience as a result of the proposed DAEC restart, which are presented in Section 3.7

F.2.1 Aquatic Environment

F.2.1.1 Plankton and Periphyton

Plankton are small and often microscopic organisms that drift or float in the water column. Phytoplankton are single-celled plant plankton and include diatoms (single-celled, yellow algae) and dinoflagellates (single-celled organism with two flagella). Phytoplankton live suspended in the water column and occur in the limnetic (open water) zone of a water body. Periphyton consist of single-celled or filamentous species of algae that attach to benthic or macrophytic surfaces. Periphyton occur in the littoral (nearshore and shallow) zone. They tend to be highly productive because they have more access to nutrients through their roots than do phytoplankton. Plankton and periphyton communities have not been routinely monitored in the Cedar River but are described in the 1973 final environmental statement (FES), which is incorporated here by reference (AEC 1973-TN13202). Operational monitoring conducted in 1976 found that plankton populations fluctuated throughout the year with the maximum population occurring in October and the minimum population occurring from January through March. The dominant organisms observed were diatoms, predominantly *Cyclotella* and *Nitzschia*, and unidentified flagellates. A wide variety of green algae and blue-green algae, chiefly *Oscillatoria*, were common from July through September (McDonald 1976-TN13416).

Zooplankton are tiny invertebrates that provide essential food for larval fish and other small aquatic organisms. The zooplankton community in the Cedar River was characterized in the 1982 Baseline Study and it was found that species composition and diversity were typical of those in mid-western rivers with rotifers accounting for the majority of all zooplankton (McDonald 1983-TN13411).

F.2.1.2 Benthic Invertebrates

Benthic invertebrates inhabit the bottom of the water column and its substrates. They include macroinvertebrates (clams, crabs, oysters, and other shellfish) as well as certain zooplankton. Benthic macroinvertebrate monitoring occurred at the DAEC site from 1971 through 1999 and additional mussel surveys were conducted in 2002 upstream of the DAEC intake, the results of these studies are described in Section 2.2.5 of the 2010 SEIS, which is incorporated here by reference (NRC 2010-TN13201). The studies found low diversity of macroinvertebrates in the

vicinity of DAEC; however, the researchers concluded that this is likely due to poor marginal mussel habitat within the area, not poor water quality (NRC 2010-TN13201).

More recently, the Iowa DNR has established monitoring sites along the Cedar River. Monitoring site Cedar River—Palo is located just downstream of DAEC and was last sampled for benthic macroinvertebrates in 2011. This sampling effort revealed a benthic macroinvertebrate index of biotic integrity (BMBI) score of 45, indicating a "fair" biological condition where total taxa richness is reduced (IADNR 2026-TN13410). The closest upstream monitoring site from DAEC is the Vinton (Lower) site. That site was last sampled for benthic macroinvertebrates in 2007. The sampling effort was qualitative only and a BMBI score was unable to be calculated (IADNR 2026-TN13464).

F.2.1.3 Juvenile and Adult Fish

The Iowa DNR is responsible for managing fisheries in the State and waters in the vicinity of DAEC are managed by the Lake Macbride Fisheries Management office. This office conducts a variety of management activities including surveying fish and mussel populations, installing fish habitat, investigating fish kills, and educating the public. The Iowa DNR also has a Fisheries Research Program that focuses on evaluating and improving fisheries management practices. The DNR consistently stocks the Cedar River in the vicinity of DAEC with walleye and occasionally with northern pike. Surveys of the Cedar River in the vicinity of DAEC conducted in 2025 indicate that river carpsucker and smallmouth bass make up the majority of the fish population in this stretch of the river. The survey effort also collected bigmouth buffalo (*Ictiobus cyprinellus*), bluegill (*Lepomis macrochirus*), channel catfish (*Ictalurus punctatus*), flathead catfish (*Pylodictis olivaris*), freshwater drum (*Aplodinotus grunniens*), highfin carpsucker (*Carpiodes velifer*), largemouth bass (*Micropterus salmoides*), quillback carpsucker (*Carpiodes cyprinus*), rock bass (*Ambloplites rupestris*), shorthead redhorse (*Moxostoma macrolepidotum*), shovelnose sturgeon (*Scaphirhynchus platorynchus*), smallmouth buffalo (*Ictiobus bubalus*), walleye (*Sander vitreus*), white bass (*Morone chrysops*), and white crappie (*Pomoxis annularis*) (IADNR 2026-TN13414).

F.2.1.4 Recreationally Important Fisheries

Recreational fisheries in the Cedar River are regulated by Iowa DNR. Popular fish species include bigmouth buffalo, black buffalo (*Ictiobus niger*), black bullhead (*Ameiurus melas*), black crappie (*Pomoxis nigromaculatus*), blue sucker (*Cycleptus elongatus*), bluegill, bowfin (*Amia calva*), channel catfish, common carp (*Cyprinus carpio*), flathead catfish, freshwater drum, golden redhorse (*Moxostoma erythrurum*), goldeye (*Hiodon alosoides*), green sunfish (*Lepomis cyanellus*), largemouth bass, longnose gar (*Lepisosteus osseus*), mooneye (*Hiodon tergisus*), northern hog sucker (*Hypentelium nigricans*), northern pike (*Esox lucius*), quillback, river carpsucker (*Carpiodes carpio*), sauger (*Sander canadensis*), shorthead redhorse, shortnose gar (*Lepisosteus platostomus*), smallmouth bass (*Micropterus dolomieu*), smallmouth buffalo, walleye, white bass, white crappie, and yellow bullhead (*Ameiurus natalis*). Commercial fishing is not allowed within the Cedar River in Iowa.

F.2.2 State-Protected and Other Special Status Aquatic Species

The Iowa DNR has regulatory authority for fish and wildlife in Iowa including endangered species protected under the law entitled Endangered Plants and Wildlife (IA Code 481B-TN13205). The Natural Resource Commission and the Director of the Department of Natural Resources are responsible for the administration of Chapter 481B. This law specifies the State's

responsibility for conserving, protecting, restoring, and propagating endangered and threatened species. Under this law, “endangered” indicates that the species is in danger of extinction throughout all or a significant portion of its range, “threatened” indicates that the species is likely to become endangered within the foreseeable future, and the designation of “special concern” indicates any species about which problems of status or distribution are suspected but not documented. While not protected by the Iowa Threatened and Endangered Species law, many species of special concern are protected under Federal or other State laws addressing hunting, fishing, collecting, and harvesting. State-listed aquatic species that could occur in Linn County, Iowa are listed in Table F-2 (IADNR 2026-TN13422).

Table F-2 State-listed Aquatic Species That May Occur in Linn County, Iowa

Scientific Name	Common Name	Class	State Status	Habitat
Ambystoma laterale	blue-spotted salamander	Amphibian	SE	Forests, freshwater pond
Notophthalmus viridescens	central newt	Amphibian	ST	Forests, freshwater pond, herbaceous
Lampetra appendix	American brook lamprey	Fish	ST	Riverine
Moxostoma duquesnei	black redhorse	Fish	ST	Riverine
Notropis heterolepis	blacknose shiner	Fish	ST	Riverine
Esox americanus	grass pickerel	Fish	ST	Freshwater pond, riverine
Acipenser fulvescens	lake sturgeon	Fish	SE	Riverine
Etheostoma spectabile	orangethroat darter	Fish	ST	Riverine
Notropis texanus	weed shiner	Fish	SE	Freshwater pond, riverine
Ammocrypta clara	western sand darter	Fish	ST	Riverine
Lasmigona compressa	creek heelsplitter	Freshwater Mussels	ST	Freshwater pond, riverine
Strophitus undulatus	creeper	Freshwater Mussels	ST	Freshwater pond, riverine
Anodontoides ferussacianus	cylindrical papershell	Freshwater Mussels	ST	Freshwater pond, riverine
Venustaconcha ellipsiformis	ellipse	Freshwater Mussels	ST	Freshwater pond, riverine
Lampsilis higginsii	Higgin’s-eye pearly mussel	Freshwater Mussels	SE	Riverine
Tritogonia verrucosa	pistolgrip	Freshwater Mussels	SE	Freshwater stream, riverine
Alasmidonta viridis	slippershell mussel	Freshwater Mussels	SE	Riverine
Lampsilis teres	yellow sandshell	Freshwater Mussels	SE	Riverine

SE = State endangered; ST = State threatened.

F.2.3 *Invasive and Nuisance Species*

Non-native species are those species that are present only because of introduction and that would not naturally occur either currently or historically in an ecosystem. Invasive species cause harm when they out-compete native species by reproducing and spreading rapidly in areas where they have no natural predators, thus changing the balance of the ecosystems. Three aquatic invasive species have been identified by the Iowa DNR within the 56 river-mile stretch of the Cedar River from La Porte City to Cedar Rapids, the bighead carp (*Hypophthalmichthys nobilis*), the rusty crayfish (*Faxonius rusticus*), and the silver carp (*Hypophthalmichthys molitrix*) (IADNR 2026-TN13414). Invasive mollusks are not known to occur at the DAEC site (NextEra 2026-TN13298).

F.3 Endangered Species Act Section 7 Consultation and Biological Evaluation

As a Federal agency, the NRC must comply with the ESA (TN1010) as part of any action authorized, funded, or carried out by the agency. In this case, the proposed actions are the decisions whether to grant or deny NEDA's interdependent, connected licensing and regulatory requests (see Table 1-1), including any revisions or supplements thereto or other regulatory or licensing requests submitted to the NRC that are necessary to reauthorize power operations, that if approved, would collectively support reauthorizing power operations and refueling of the DAEC reactor. Under Section 7 of the ESA, the NRC must consult with the FWS and the National Marine Fisheries Service (NMFS) ("the Services" [collectively] or "Service" [individually]), as appropriate, to ensure that the proposed actions are not likely to jeopardize the continued existence of any endangered or threatened species or result in the destruction or adverse modification of designated critical habitat.

Biological assessments are required for any agency action that is a "major construction activity" (Title 50 of the *Code of Federal Regulations* [50 CFR] 402.12(b)) (TN4312). A major construction activity is a construction project or other undertaking having construction-type impacts that is a major Federal action significantly affecting the quality of the human environment under NEPA (TN661) (51 FR 19926-TN7600). Federal agencies may fulfill their obligations to consult with the Services under ESA Section 7 and to prepare a biological assessment, if required, in conjunction with the interagency cooperation procedures required by other statutes, including NEPA (50 CFR 402.06(a)). In such cases, the Federal agency should include the results of ESA Section 7 consultation(s) in the NEPA document (50 CFR 402.06(b)).

Licensing and regulatory requests in support of reauthorizing power operations do not require the preparation of a biological assessment because they are not a major construction activity. Nonetheless, the NRC staff must consider the impacts of its actions on federally listed species and designated critical habitats. For cases in which the NRC staff finds that the proposed action "may affect" ESA-protected species or habitats, ESA Section 7 requires the NRC to consult with the relevant Service(s).

For federally listed species and critical habitats under the FWS's jurisdiction, the NRC staff has incorporated its biological evaluation below, which considers the effects of the proposed actions on ESA-listed species. Table F-3 summarizes the species and habitats potentially present in the action area, the ESA effect determinations made by the NRC staff, and the status of the FWS's concurrence.

There are no federally listed species or critical habitats under the NMFS's jurisdiction within the action area. Therefore, this issue is not addressed further in this biological evaluation.

Table F-3 Effect Determinations for Federally Listed Species and Critical Habitats Under U.S. Fish and Wildlife Service Jurisdiction Potentially Present in the Action Area of the Duane Arnold Energy Center Restart

Species	Federal Status[a]	Potentially Present in the Action Area?	Service	NRC Effect Determination[b]	FWS Concurrence Date[c]
northern long-eared bat (*Myotis septentrionalis*)	FE	Yes	FWS	NLAA	04/27/2026
rusty patched bumble bee (*Bombus affinis*)	FE	Yes	FWS	NLAA	04/27/2026
western regal fritillary (*Argynnis idalia occidentalis*)	FPT	No	FWS	NE	N/A
monarch butterfly (*Danaus plexippus*)	FPT	Yes	FWS	NLAA	N/A

FE = federally endangered; FPT = proposed for Federal listing as threatened; FWS = U.S. Fish and Wildlife Service; NLAA = may affect, not likely to adversely affect; NRC = U.S. Nuclear Regulatory Commission; NE = no effect; N/A = not applicable.

(a) Indicates protection status under the Endangered Species Act (ESA) (TN1010).

(b) The NRC staff makes its effect determinations for federally listed species in accordance with the language and definitions specified in the FWS and NMFS Endangered Species Consultation Handbook (FWS and NMFS 1998-TN1031).

(c) Indicates the date the FWS concurred with the NRC staff's effect determination (FWS 2026-TN13408, FWS 2026-TN13409). The ESA does not require Federal agencies to seek FWS concurrence for NLAA determinations for proposed species; therefore, the FWS concurrence date for these species is marked "N/A."

F.3.1 Action Area

The implementing regulations for ESA Section 7 define "action area" to mean all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action (50 CFR 402.02) (TN4312). The action area effectively bounds the analysis of federally listed species and critical habitats because only species and habitats that occur within the action area may be affected by the Federal action. The NRC staff recognizes that, although the described action area is stationary, federally listed species can move in and out of the action area. For instance, a migratory bird could occur in the action area seasonally as it forages or breeds within the action area. Thus, in its analysis, the NRC staff considers not only those species known to occur directly within the action area but also those species that may passively or actively move into the action area. The NRC staff then considers if the life history and habitat requirements of each species make it likely to occur in the action area where it could be affected by restart activities.

F.3.1.1 Terrestrial Action Area

The terrestrial portion of the action area includes the entirety of the DAEC site. This area encompasses the reactor and associated structures, intake and discharge facilities, parking areas, laydown yards, landscaped zones, and roads and other transportation infrastructure. Section F.1 describes the terrestrial environment in detail.

F.3.1.2 Aquatic Action Area

The aquatic portion of the action area includes portions of the Cedar River affected by the discharge structure thermal mixing zone, intake water withdrawals, and any potential effects from point-source discharge outfalls. Section F.2 describes the aquatic environment in detail.

F.3.2 Endangered Species Act—Federally Listed Species and Critical Habitats Under U.S. Fish and Wildlife Service Jurisdiction

The NRC staff identified four species under FWS jurisdiction that may occur in the action area. These include two species that are federally listed as endangered under the ESA and two species that are proposed for Federal listing as threatened. The NRC staff reviewed the 2025 DAEC ER, the FWS IPaC database, available ecological surveys, and other records to determine whether suitable habitat for each species occurs in the action area and whether the species itself may occur in the action area. The NRC staff determined that no critical habitats occur within or near the action area.

Table F-4 summarizes the results of the NRC staff's evaluation, including the habitat requirements and information on the occurrence of each species within the action area. The NRC staff's ESA effect determinations are discussed in detail below (see also Table F-5).

Table F-4 Biological Evaluation of Federally Listed Species under the Jurisdiction of the U.S. Fish and Wildlife Service with Potential to Occur within the Duane Arnold Energy Center Restart Action Area

Common Name	NRC Staff Evaluation[a,b]	NRC Effect Determination [c,d]
northern long-eared bat (*Myotis septentrionalis*)	**Baseline Information:** According to the final rule (80 FR 17974-TN4216), the northern long-eared bat (NLEB) is a flying, insectivorous mammal found across much of the eastern and north-central United States and all Canadian provinces. It predominantly overwinters in hibernacula including underground caves and mines. In spring, summer, and fall it uses forest habitats and roosts individually or in colonies underneath tree bark or in cavities or crevices of live trees and snags greater than three inches at diameter at breast height. Threats include white-nose syndrome, human disturbances of hibernacula and roosts, collision with wind turbines, chemical contaminants, and loss of summer habitat from forest management and conversion. **Site Occurrence:** The NLEB is not known to occur on the DAEC site (NextEra 2025-TN13199). According to the Determination Key (DKey) for the northern long-eared bat and tricolored bat, the action area is not located within 0.5 mi of a known bat hibernaculum or winter roost (FWS 2026-TN13409; NextEra 2026-TN13298). Individuals may be present in the area in spring, summer, and fall in very low numbers. Potential roosting and maternity habitat for the NLEB occurs within the undeveloped forested areas of the site (NextEra 2025-TN13199). **Preparation Impacts[[b]1–4]:** Proposed preparation activities would occur only within previously developed portions of the DAEC site, and no forested areas or potential roost trees would be affected or removed (NextEra 2026-TN13298). Since the NLEB relies on mature trees and snags for summer roosting and maternity	NLAA

Common Name	NRC Staff Evaluation[a,b]	NRC Effect Determination [c,d]
	colonies, the absence of tree clearing eliminates the primary pathway for significant effects. Temporary increases in noise, traffic, and human presence during preparation activities would be similar to routine disturbance levels already occurring at the site and would not measurably alter bat use of adjacent forested areas. Bat collisions with vehicles and manmade structures at nuclear power plants are not well documented but are likely rare based on available information (NRC 2024-TN10161: p. 3-63). Accordingly, any potential disturbance to NLEB from preparation activities would be too small to be meaningfully measured or detected and, therefore, insignificant. **Operations Impacts**[[b]1–3]**:** Operational activities are anticipated to be similar in magnitude and frequency to those that occurred prior to shutdown, which are characterized in the 2010 SEIS. No tree clearing or changes to the forest cover are proposed during the resumption of power operations (NextEra 2025-TN13199). If NLEB individuals occur in the action area during the active season, they would have already experienced routine noise, vibration, and general human disturbances associated with site maintenance, infrastructure repairs, and other long-standing site activities. While individuals may have to reacclimate to the resumption of power operations, the shutdown period has been relatively short, and any behavioral adjustments are expected to be minor and temporary. As a result, these impacts would be insignificant. Given the lack of tree removal, the location of work in previously disturbed areas, and the very low likelihood of adverse effects to roosting or foraging bats, the NRC staff concludes that the proposed actions **may affect but are not likely to adversely affect** the northern long-eared bat. **ESA Consultation Summary:** The ESA requires Federal agencies to consult with the FWS when a proposed action may affect a listed species. The NRC staff completed the FWS's northern long-eared bat and tricolored bat range-wide DKey. Based on the information provided and the NRC's NLAA determination, FWS issued written concurrence on April 27, 2026 (FWS 2026-TN13409). This concurrence fulfills the ESA Section 7 consultation requirements for the species.	
rusty patched bumble bee (*Bombus affinis*)	**Baseline Information:** Rusty patched bumble bees are highly social, forming large colonies consisting of a single queen, female workers, and males (FWS 2016-TN11192). While all rusty patched bumble bees have entirely black heads, only workers and males have a rusty reddish patch centrally located on the abdomen. The annual cycle begins in early spring with a solitary queen. Reproductive males and a new queen are produced mid- to late- summer and early fall. The new queen enters diapause over winter, and the cycle begins again in the spring. The rusty patched bumble bee inhabits a variety of places, including prairies, woodlands, marshes, agricultural landscapes, and residential parks and gardens, preferring those areas with diverse and abundant flowers with nearby undisturbed nesting sites, and overwintering habitat for the hibernating queen. Nests are typically located within abandoned rodent nests or similar cavities	NLAA

Common Name	NRC Staff Evaluation[a,b]	NRC Effect Determination [c,d]
	that are one to four feet below ground. Threats include pathogens, effects of climate change, pesticides, and reduction of habitat quality and quantity (FWS 2022-TN13465). **Site Occurrence:** Prior to the mid- to late 1990s, the rusty patched bumble bee was widely distributed across 31 States/provinces, including Iowa (FWS 2016-TN11192). Since 2000, the bumble bee was reported in 14 States/provinces, including Iowa. According to the rusty patched bumble bee range-wide DKey, the action area overlaps with the rusty patched bumble bee high potential zone (FWS 2026-TN13423; NextEra 2026-TN13298). Unmowed and periodically mowed areas onsite support a variety of grasses and wildflowers (NRC 2026-TN13330). Potential habitat exists onsite within the grasslands, agricultural landscapes, woodlands, and marshes. **Preparation Impacts**[([b]1,4,5)]**:** Ground disturbance as part of preparation activities could disturb scattered flowering plants; however, the rusty patched bumble bee is not associated with any single flower species and instead relies on areas with a diverse assemblage of blooms. None of the areas proposed for disturbance contain dense or extensive patches of flowers and all are previously disturbed areas that currently provide low-quality foraging habitat. Because only small numbers of widely scattered flowers may be affected, any effects on foraging resources would be too small to be meaningfully measurable to the species and would, therefore, be insignificant. Potential nest sites for the rusty patched bumble bee typically occur below ground near dense, diverse flower patches. The proposed activities are limited to previously disturbed areas and maintained areas that lack the floral density and habitat structure to support a nest. Therefore, the likelihood that a nest would be present and affected is extremely low, and any potential effects are discountable. NEDA will continue to manage the site with select herbicide application and mowing for security and safety, primarily within existing disturbed areas (NextEra 2026-TN13298). These activities would not reduce any existing high-value foraging or nesting habitat on the site. Based on the limited scale of disturbance, the low habitat value of the affected areas, and the very low probability of affecting a nest, the effects of the proposed activities on the rusty patched bumble bee would be insignificant or discountable. Accordingly, the NRC staff concludes that the proposed actions **may affect but are not likely to adversely affect** the rusty patched bumble bee. **Operations Impacts**[([b]1,4,5)]**:** Same as above. **ESA Consultation Summary:** The ESA requires Federal agencies to consult with the FWS when a proposed action may affect a listed species. The NRC staff completed the FWS's rusty patched bumble bee range-wide DKey. Based on the information provided and the NRC's NLAA determination, FWS issued written concurrence on April 27, 2026 (FWS 2026-TN13408). This concurrence fulfills the ESA Section 7 consultation requirements for the species.	

monarch butterfly (*Danaus plexippus*)	**Baseline Information:** According to the candidate review (87 FR 26152-TN8591), the monarch butterfly is a flying insect with bright orange wings and black veins and wing borders. It is dependent on milkweeds (primarily *Asclepias* spp.) for egg-laying and larval food. North American populations migrate to Mexico or California in the fall and return in early spring. Adult monarchs feed on nectar from milkweeds and from a variety of plant species. Threats include habitat loss and degradation of habitat from conversion of grasslands to agriculture, widespread use of herbicides, logging/thinning at overwintering sites in Mexico, senescence and incompatible management of overwintering sites in California, urban development, drought, insecticides, and climate change effects. **Site Occurrence:** During the March 2026 site visit, the NRC staff observed scattered milkweed throughout the site (NRC 2026-TN13330). Monarchs and milkweeds are known to occur in the Chain-O-Lakes Wildlife Management Area, Wickiup Hill Learning Center, and site vicinity based on a review of iNaturalist in 2026 (https://www.inaturalist.org/). Larvae are potentially present wherever milkweed is present. **Preparation Impacts:**([b]1–5) Although ground disturbance during site preparation could affect scattered milkweed stems, the scale and ecological context of these impacts indicate that effects on the monarch butterfly would be minimal. Milkweed in the project area occurs only as isolated plants within common, disturbed, non-forested habitats, and none of the affected areas contain dense or high-value milkweed patches (NRC 2026-TN13330). Because milkweed is a widespread, fast-growing species that naturally colonizes open and disturbed settings throughout the region, the loss of a small number of scattered stems would not meaningfully reduce the availability of larval host plants within the project footprint or surrounding landscape. Further, any insecticide applications associated with facility operations would occur in or immediately around buildings, paved surfaces, and other maintained areas where milkweed does not occur (NextEra 2026-TN13298). As a result, no indirect herbicidal or toxic effects on milkweed or monarch eggs and larvae are anticipated. Given the limited extent of disturbance, the absence of concentrated milkweed resources in the affected areas, the rapid natural recovery of milkweed within the landscape, and the lack of expected exposure to insecticides, the proposed actions are not expected to measurably affect monarch breeding habitat or monarch reproductive capacity. Accordingly, the NRC staff concludes that the proposed actions **may affect but are not likely to adversely affect** the monarch butterfly. **Operations Impacts:**([b]1,4,5) Same as above. **ESA Consultation Summary:** ESA regulations in 50 CFR 402.10(a) (TN4312) require Federal agencies to confer with the Services on any agency action that is likely to jeopardize the continued existence of any proposed species or result in the destruction or adverse modification of proposed critical habitat. Therefore, based on its NLAA determination, the NRC is not required to confer with the FWS on the monarch butterfly.	NLAA

Common Name	NRC Staff Evaluation[a,b]	NRC Effect Determination [c,d]
western regal fritillary (*Argynnis idalia occidentalis*)	**Baseline Information:** The regal fritillary is a large non-migratory butterfly with predominately orange forewings and black hindwings found in the native grasslands of the central and northern Great Plains, portions of the Midwest, and a single location in eastern Pennsylvania (FWS 2023-TN13466). The western subspecies currently occupies portions of 14 States, from Indiana to Colorado and from North Dakota to Oklahoma within a variety of grassland habitats. After emerging in early spring, larvae exclusively feed off the leaves of violets (*Viola* spp.). In late spring/summer the larvae pupate and emerge in June/July to feed on various nectar sources. Egg-laying occurs in late summer and fall when individual females may lay hundreds to thousands of eggs in native grassland habitats. The primary threats include climate change, drought, invasive species, grassland conversion, and periodic disturbance (FWS 2023-TN13466). **Site Occurrence**[([b]1,3,4)]**:** The regal fritillary is an indicator of the health of native prairies, as they cannot survive in altered grasslands such as row crops, non-native pastures, or developed areas (FWS 2023-TN13466). The western regal fritillary is not known to occur on the DAEC site, and the application reports no observations of violets onsite (NextEra 2025-TN13199). Violets were observed within the vicinity at Wickiup Hill County Park based on a review of iNaturalist in 2026 (https://www.inaturalist.org/). Potential habitat occurs within the vicinity of the action area; however, it is not likely that potential habitat exists onsite given the lack of violets and non-converted prairies. **Preparation and Operations Impacts**[([b]1,3,4)]**:** No preparation or operational activities would occur in or near suitable western regal fritillary habitat. As explained above, the species requires native prairie with abundant violets for larval development, neither of which occurs on the DAEC site. All areas that would be disturbed are previously developed or maintained and do not support any component of the species' habitat. Vegetation management (mowing and selective herbicide use) would continue only in these already unsuitable areas. Because no suitable habitat or host plants are present, no individuals are expected to occur onsite. Therefore, the NRC staff concludes that the proposed actions would have **no effect** on the western regal fritillary. **ESA Consultation Summary:** ESA regulations in 50 CFR 402.10(a) (TN4312) require Federal agencies to confer with the Services on any agency action that is likely to jeopardize the continued existence of any proposed species or result in the destruction or adverse modification of proposed critical habitat. Therefore, based on its NE determination, the NRC is not required to confer with the FWS on the western regal fritillary.	NE

CFR = *Code of Federal Regulations*; ESA = Endangered Species Act of 1973, as amended; FWS = U.S. Fish and Wildlife Service; IPaC = Information for Planning and Consultation; NE = no effect; NEDA = NextEra Energy Duane Arnold, LLC; NLAA = may affect, not likely to adversely affect; NRC = U.S. Nuclear Regulatory Commission; SEIS = supplemental environmental impact statement.

(a) All species in this table were identified as potentially occurring within the action area via an FWS IPaC report (FWS 2026-TN13423).

(b) Applicable generic impacts considered, along with species specific factors: (1) habitat loss, degradation, disturbance, or fragmentation; and associated effects; (2) behavioral changes resulting from preparation, refurbishment, or other site activities; (3) mortality or injury from collisions with nuclear power plant structures and vehicles; (4) vegetation management and pesticide application; and (5) other landscape maintenance activities, stormwater management, and other ongoing operations and maintenance activities.
(c) The NRC staff makes its effect determinations for federally listed species in accordance with the language and definitions specified in the FWS and National Marine Fisheries Service Endangered Species Consultation Handbook (FWS and NMFS 1998-TN1031).
(d) Conclusions address both the preparations for the resumption of power operations and the resumption of power operations.

F.3.3 Chronology of Endangered Species Act Section 7 Consultation

The NRC, the action agency, will seek concurrence from the Services for the listed species for which the proposed actions may affect but are not likely to adversely affect (see Table F-3) in accordance with 50 CFR 402.13(c) (TN4312). Table F-5 lists the correspondence relevant to the ESA Section 7 consultation.

Table F-5 Endangered Species Act Section 7 Consultation Correspondence with the U.S. Fish and Wildlife Service for the Duane Arnold Energy Center Restart

Date	Description	ADAMS Accession No.[(a)]
January 21, 2026	FWS to NRC, Official Species List for the DAEC Restart	ML26117A122
April 27, 2026	FWS to NRC, NLAA Concurrence under the Range-wide Northern Long-eared Bat and Tricolored Bat Determination Key	ML26117A121
April 27, 2026	FWS to NRC, NLAA Concurrence under the Rusty Patched Bumble Bee Determination Key	ML26117A120

ADAMS = Agencywide Documents Access and Management System; DAEC = Duane Arnold Energy Center; FWS = U.S. Fish and Wildlife Service; NLAA = may affect, not likely to adversely affect; NRC = U.S. Nuclear Regulatory Commission
(a) Access these documents through the NRC's ADAMS at https://adams-search.nrc.gov/home.

F.4 References

Cited references are included in Chapter 6.