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United States Nuclear Regulatory Commission
Protecting People and the Environment

NUREG-1437
Supplement 17
Second Renewal

Generic Environmental Impact Statement for License Renewal of Nuclear Plants

Supplement 17, Second Renewal

Regarding Subsequent License Renewal for Dresden Nuclear Power Station, Units 2 and 3

Draft Report for Comment

Office of Nuclear Material Safety and Safeguards

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NUREG-1437
Supplement 17
Second Renewal

Generic Environmental Impact Statement for License Renewal of Nuclear Plants

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Regarding Subsequent License Renewal for Dresden Nuclear Power Station, Units 2 and 3

Draft Report for Comment

Manuscript Completed: May 2025
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Office of Nuclear Material Safety and Safeguards

COMMENTS ON DRAFT REPORT

Proposed Action	Issuance of subsequent renewed Facility Operating License Nos. DPR-19 and DPR-25 for Dresden Nuclear Power Station, Units 2 and 3, in Morris, Illinois
Type of Statement	Draft Supplemental Environmental Impact Statement
Agency Contact	Angela Sabet U.S. Nuclear Regulatory Commission (NRC) Office of Nuclear Material Safety and Safeguards Email: Angela.Sabet@nrc.gov

Comments:

Any interested party may submit comments on this draft supplemental environmental impact statement (SEIS). Please specify "NUREG-1437, Supplement 17, Second Renewal, draft," in the subject or title line for your comments. Comments on this draft SEIS should be filed no later than 45 days after the date on which the U.S. Environmental Protection Agency (EPA) notice, stating that this draft SEIS has been filed with the EPA, 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. You may submit comments electronically by searching for Docket ID NRC-2024-0080 at the website: http://www.regulations.gov.

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COVER SHEET

Responsible Agency: U.S. Nuclear Regulatory Commission, Office of Nuclear Material Safety and Safeguards. There are no cooperating agencies involved in the preparation of this document.

Title: *Generic Environmental Impact Statement for License Renewal of Nuclear Plants, Supplement 17, Second Renewal, Regarding Subsequent License Renewal for Dresden Nuclear Power Station, Units 2 and 3, Draft Report for Comment* (NUREG-1437).

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ABSTRACT

The U.S. Nuclear Regulatory Commission (NRC, the Commission) staff prepared this supplemental environmental impact statement (SEIS) as part of its environmental review of Constellation Energy Generation, LLC's application to renew the operating licenses for Dresden Nuclear Power Station, Units 2 and 3, for an additional 20 years. This SEIS evaluates the environmental impacts of the license renewal and alternatives to license renewal. The alternatives evaluated in detail were the replacement power alternatives of natural gas, a combination of renewable and natural gas, and the no-action alternative. The NRC staff's preliminary recommendation is that the adverse environmental impacts of license renewal for Dresden Nuclear Power Station, Units 2 and 3 are not so great that preserving the option of license renewal for energy-planning decisionmakers would be unreasonable. The NRC staff based its recommendation on the following:

- the analysis and findings in NUREG-1437, *Generic Environmental Impact Statement for License Renewal of Nuclear Plants* (LR GEIS)
- the environmental report submitted by Constellation Energy Generation, LLC
- the NRC staff's consultation with Federal, State, Tribal, and local agencies
- the NRC staff's independent environmental review
- the NRC staff's consideration of public comments received during the scoping process

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

EXECUTIVE SUMMARY

Background

By letter dated April 17, 2024, Constellation Energy Generation, LLC (CEG) submitted to the U.S. Nuclear Regulatory Commission (NRC, the Commission) an application requesting renewal of the operating license for Dresden Nuclear Power Station, Unit 2 and 3 (DNPS), for an additional 20-year period (CEG 2024-TN11348).

Pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) 51.20(b)(2) (TN10253), the renewal of a power reactor operating license requires preparation of an environmental impact statement (EIS) or a supplement to an EIS. In addition, 10 CFR 51.95(c) (TN10253), “Operating License Renewal Stage,” states that, in connection with the renewal of a power reactor operating license, the NRC staff shall prepare an EIS, which is a supplement to the Commission’s NUREG-1437, Revision 2, *Generic Environmental Impact Statement for License Renewal of Nuclear Plants, Final Report*, dated August 2024 (LR GEIS) (NRC 2024-TN10161).

The current facility operating license for DNPS, Unit 2, expires at midnight on December 22, 2029, and the current facility operating license for DNPS, Unit 3 expires at midnight on January 12, 2031. The subsequent license renewal (SLR) application was submitted pursuant to 10 CFR Part 54 (TN4878), “Requirements for Renewal of Operating Licenses for Nuclear Power Plants,” and seeks to extend the facility operating license for Unit 2 to midnight on December 22, 2049, and Unit 3 to midnight on January 12, 2051. A notice of receipt and availability of the application was published in the *Federal Register* (FR) on May 7, 2024 (89 FR 38197-TN10781).

NRC staff found CEG’s application acceptable for docketing as announced in the FR on June 24, 2024 (89 FR 52514-TN10782). The NRC staff began the environmental review process described in 10 CFR Part 51, “Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions” (TN10253), by publishing a notice of intent to prepare a supplemental environmental impact statement (SEIS) and to conduct scoping for DNPS SLR on August 5, 2024 (89 FR 63450-TN10783). Thereafter, the NRC staff:

- conducted two public scoping meetings as virtual webinars on August 20, 2024
- conducted a severe accident mitigation alternatives (SAMA) virtual audit on September 30, 2024
- conducted a virtual environmental site audit during the week of October 21, 2024
- conducted an onsite environmental site audit on December 12, 2024
- reviewed CEG’s environmental report (ER) (CEG 2024-TN11347) and compared it to the LR GEIS
- consulted with Federal, State, Tribal, and local agencies
- conducted a review of CEG’s application for SLR (CEG 2024-TN11348) following the guidance set forth in NUREG-1555, Supplement 1, Revision 2, *Standard Review Plans for Environmental Reviews for Nuclear Power Plants, Supplement 1: Operating License Renewal, Final Report*, dated August 2024 (NRC 2024-TN10251)
- considered public comments received during the scoping process

Proposed Federal Action

CEG initiated the proposed Federal action by submitting an application (CEG 2024-TN11348) for SLR for DNPS, for which the existing facility operating licenses (DPR-19, DPR 25) include the expiration dates of Unit 2 on December 22, 2029 and Unit 3 on January 12, 2031. The NRC's Federal action is to decide whether to renew the licenses for an additional 20 years of operation. If the NRC renews the licenses, DNPS Unit 2 and 3 would be authorized to operate until December 22, 2049, and January 12, 2051, respectively.

Purpose and Need for the Proposed Agency Action

The purpose and need for the proposed agency action (renewal of operating licenses) is to provide an option that allows for power generation capability beyond the term of the current nuclear power plant operating licenses to meet future system generating needs, as such needs may be determined by State, utility, system, and, where authorized, Federal (other than the NRC) decision-makers. This definition of purpose and need reflects the Commission's recognition that, absent findings in the safety review required by the Atomic Energy Act of 1954, as amended (TN663), or in the environmental review required by the National Environmental Policy Act of 1969, as amended (TN661), that would lead the NRC to reject a license renewal application, the NRC has no role in the energy-planning decision of power plant owners, State regulators, system operators, and, in some cases, other Federal agencies, as to whether a particular nuclear power plant should continue to operate (61 FR 28467-TN4491; NRC 2024-TN10161).

Environmental Impacts of License Renewal

This SEIS evaluates the potential environmental impacts of the proposed action and reasonable alternatives to that action. The NRC designates the environmental impacts from the proposed action and reasonable alternatives as SMALL, MODERATE, or LARGE.

> **SMALL**: Environmental effects are not detectable or are so minor that they will neither destabilize nor noticeably alter any important attribute of the resource.
>
> **MODERATE**: Environmental effects are sufficient to alter noticeably, but not to destabilize, important attributes of the resource.
>
> **LARGE**: Environmental effects are clearly noticeable and are sufficient to destabilize important attributes of the resource.

Resource-specific effects or impact definitions from applicable environmental laws and executive orders, other than SMALL, MODERATE, and LARGE, are used where appropriate. The LR GEIS evaluates 80 environmental issues related to plant operation and classifies each issue as either a Category 1 issue (generic to all or a distinct subset of nuclear power plants as described below) or a Category 2 issue (specific to individual power plants). Category 1 issues are those that meet all the following criteria:

- The environmental impacts associated with the issue apply either to all plants or, for some issues, to plants having a specific type of cooling system or other specified plant or site characteristics.
- A single significance level (i.e., SMALL, MODERATE, or LARGE) has been assigned to the impacts (except for offsite radiological impacts of spent nuclear fuel and high-level waste disposal and offsite radiological impacts—collective impacts from other than the disposal of spent fuel and high-level waste).

- Mitigation of adverse impacts associated with the issue has been considered in the analysis, and it has been determined that additional nuclear plant-specific (hereafter, plant-specific) mitigation measures are not likely to be sufficiently beneficial to warrant implementation.

For Category 1 issues, no additional plant-specific analysis is required in this SEIS unless new and significant information is identified. Table 3-1 in Chapter 3 lists the Category 1 issues that are applicable to DNPS, and the significance levels of their impacts. Section 3.14 in Chapter 3 presents the process for identifying new and significant information. CEG and the NRC staff have identified no information that is both new and significant related to Category 1 issues that would call into question the conclusions in the LR GEIS. This conclusion is supported by the NRC staff's review of CEG's ER and other documentation relevant to CEG's activities, the public scoping process, and the findings from the NRC staff's site audits. Therefore, the NRC staff relied upon the conclusions of the LR GEIS for all Category 1 issues applicable to DNPS SLR.

Category 2 issues are plant-specific issues that do not meet one or more of the criteria for Category 1 issues; therefore, this SEIS documents the results of additional plant-specific review for applicable Category 2 issues. Table ES-1 summarizes the Category 2 issues relevant to DNPS SLR and the NRC staff's findings related to those issues. If the NRC staff determined that there were no Category 2 issues applicable for a particular resource area, the findings in the LR GEIS, as documented in Table B-1 in Appendix B to Subpart A of 10 CFR Part 51 (TN10253), are incorporated for that resource area.

Table ES-1 Summary of NRC Impact Findings Relating to Nuclear Plant-Specific Impacts of License Renewal at the Dresden Nuclear Power Station

Environmental Category – Relevant Category 2 Issue	Impact Finding
Surface Water Resources – Surface water use conflicts (plants with cooling ponds or cooling towers using makeup water from a river)	SMALL
Groundwater Resources – Groundwater use conflicts (plants with closed-cycle cooling systems that withdraw makeup water from a river)	SMALL
Groundwater Resources – Groundwater quality degradation (plants with cooling ponds)	SMALL
Groundwater Resources – Radionuclides released to groundwater	SMALL
Terrestrial Resources – Non-cooling system impacts on terrestrial resources	SMALL
Terrestrial Resources – Water use conflicts with terrestrial resources (plants with cooling ponds or cooling towers using makeup water from a river)	SMALL
Aquatic Resources – Impingement mortality and entrainment of aquatic organisms (plants with once-through cooling systems or cooling ponds)	SMALL
Aquatic Resources – Effects of thermal effluents on aquatic organisms (plants with once-through cooling systems or cooling ponds)	SMALL
Aquatic Resources – Water use conflicts with aquatic resources (plants with cooling ponds or colling towers using makeup water from a river)	SMALL to MODERATE
Federally Protected Ecological Resources – Endangered Species Act: Federally listed species and critical habitats under U.S. Fish and Wildlife Service jurisdiction	See Section 3.8.
Historic and Cultural Resources – Historic and cultural resources	See Section 3.9.
Human Health – Microbiological hazards to the public	SMALL

Table ES-1 Summary of NRC Impact Findings Relating to Nuclear Plant-Specific Impacts of License Renewal at the Dresden Nuclear Power Station (Continued)

Environmental Category – Relevant Category 2 Issue	Impact Finding
Human Health – Electromagnetic fields (EMFs)[(a)]	Uncategorized (Uncertain Impact)
Human Health – Electric shock hazards	SMALL
Greenhouse Gas Emissions and Climate Change – Climate change impacts on environmental resources	See Section 3.15.3.3.2.
Cumulative Effects – Cumulative effects	See Section 3.16.

(a) This issue was not designated as Category 1 or Category 2 and is discussed in Section 3.11.6.2.
Sources: Table B-1 in Appendix B to Subpart A of 10 CFR Part 51-TN10253; NRC 2024-TN10161.

Alternatives to the Proposed Action

As part of its environmental review, the NRC is required to consider alternatives to license renewal and evaluate the environmental impacts associated with each alternative. These alternatives can include other methods of power generation (replacement power alternatives), as well as not renewing the DNPS operating licenses (the no-action alternative).

The NRC staff considered 15 replacement energy alternatives and dismissed 13 from detailed study due to technical, resource availability, or commercial limitations that currently exist and that are likely to still exist when the DNPS operating licenses expire. Two replacement energy alternatives were determined to be reasonable and commercially viable:

- natural gas
- renewable and natural gas combination

As a consequence of not implementing the proposed agency action, in the case of a no-action alternative, the environmental impacts of these two alternatives, along with the no-action alternative, are evaluated in detail in this SEIS.

Recommendation

The NRC staff's preliminary recommendation is that the adverse environmental impacts of SLR for DNPS are not so great that preserving the option of SLR for energy-planning decisionmakers would be unreasonable. The NRC staff based its preliminary recommendation on the following:

- the analysis and findings in the LR GEIS
- the ER submitted by CEG
- the NRC staff's consultation with Federal, State, Tribal, and local agencies
- the NRC staff's independent environmental review
- the NRC staff's consideration of public scoping comments

ABBREVIATIONS AND ACRONYMS

µm	micrometer(s)
°C	degrees Celsius
°F	degrees Fahrenheit
ac	acre(s)
ACHP	Advisory Council on Historic Preservation
ADAMS	Agencywide Documents Access and Management System
AD	Anno Domini (Common Era)
AEA	Atomic Energy Act of 1954, as amended
ALARA	as low as reasonably achievable
APE	area of potential effects
AQCR	air quality control region
ATL	alternate thermal limits
BMP	best management practice
BP	before present
BTA	best technology available
Btu	British thermal unit
CAA	Clean Air Act
CEG	Constellation Energy Generation, LLC
CEJA	Illinois Climate and Equitable Jobs Act
CFR	*Code of Federal Regulations*
cfs	cubic feet per second
CO	carbon monoxide
CO_2	carbon dioxide
CO_2e or CO_2eq	carbon dioxide equivalent
CST	condensate storage tank
CWA	Clean Water Act of 1972, as amended
dB	decibel(s)
dBA	A-weighted decibel(s)
DNPS	Dresden Nuclear Power Station
DO	dissolved oxygen

DOE	U.S. Department of Energy
DOT	U.S. Department of Transportation
ECOS	Environmental Conservation Online System
EFH	essential fish habitat
EGU	electric generating unit
EIA	U.S. Energy Information Administration
EIS	environmental impact statement
EMF	electromagnetic field
EPA	U.S. Environmental Protection Agency
ER	environmental report
ESA	Endangered Species Act
EXPN	experimental population, non-essential
FE	federally endangered
FESOP	Federally Enforceable State Operating Permit
fps	feet per second
FPD	federally proposed designated (critical habitat)
FPE	proposed for Federal listing as endangered
FPT	proposed for Federal listing as threatened
FR	*Federal Register*
ft	feet/foot
ft^3	cubic feet
FT	federally threatened
FWS	U.S. Fish and Wildlife Service
g	acceleration due to gravity on the surface of the Earth
GEIS	generic environmental impact statement
GHG	greenhouse gas
gpm	gallons per minute
GTCC	Greater-than-Class-C Waste
GWP	global warming potential
ha	hectare(s)
hr	hour(s)
Hz	hertz

I&M	Illinois and Michigan
IAC	Illinois Administrative Code
IDNR	Illinois Department of Natural Resources
IDPH	Illinois Department of Public Health
IEPA	Illinois Environmental Protection Agency
in.	inch(es)
IPaC	Information for Planning and Consultation Report
IPCB	Illinois Pollution Control Board
ISFSI	independent spent fuel storage installation
kg	kilogram(s)
km	kilometer(s)
kV	kilovolt
kW	kilowatt
Leq	equivalent sound intensity level
LGU	large greenhouse gas emitting unit
LLRW	low-level radioactive waste
Lpm	liter(s) per minute
Lps	liter(s) per second
LR	license renewal
LR GEIS	Generic Environmental Impact Statement for License Renewal of Nuclear Plants (NUREG-1437)
m	meter(s)
m^3	cubic meters
MBTA	Migratory Bird Treaty Act of 1918, as amended
MDCT	mechanical draft cooling tower
mg/L	milligram(s) per liter
mgd	million gallons per day
mgm	million gallons per month
mgy	million gallons per year
mi	mile(s)
MLd	million liters per day
mph	miles per hour
mrad	millirad
mrem	millirem

MSA	Magnuson–Stevens Fishery Conservation and Management Act of 1976, as amended
mSv	millisievert
MT	metric tons
MW	megawatt
MWe	megawatts electric
MWt	megawatts thermal
NAAQS	National Ambient Air Quality Standards
NE	no effect
NEI	Nuclear Energy Institute
NEPA	National Environmental Policy Act of 1969
NETL	National Energy Technology Laboratory
NGCC	natural gas combined cycle
NHPA	National Historic Preservation Act of 1966
NLAA	not likely to adversely affect
NMFS	National Marine Fisheries Service
NMSA	National Marine Sanctuaries Act
NOAA	National Oceanic and Atmospheric Administration
NO_x	nitrogen oxides
NPDES	National Pollutant Discharge Elimination System
NRC	U.S. Nuclear Regulatory Commission, the Commission
NRHP	National Register of Historic Places
NUREG	NRC technical report designation
O_3	ozone
OCA	owner-controlled area
ODCM	offsite dose calculation manual
OSHA	Occupational Safety and Health Administration
PBF	physical and biological feature
PCB	polychlorinated biphenyl
pCi/L	picocuries per liter
PM	particulate matter
$PM_{2.5}$	particulate matter with a mean aerodynamic diameter of 2.5 μm or less
PM_{10}	particulate matter with a mean aerodynamic diameter of 10 μm or less
PNNL	Pacific Northwest National Laboratory

PPE	personal protective equipment
ppm	parts per million
PV	photovoltaic
QHEI	Qualitative Evaluation Index
rad/d	rad per day
RCP	Representative Concentration Pathway
RCRA	Resource Conservation and Recovery Act
REMP	Radiological Environmental Monitoring Program
RGPP	radiological groundwater protection program
RIS	representative important species
ROI	region of influence
ROW	right-of-way
SAMA	severe accident mitigation alternative
SDWA	Safe Drinking Water Act
SEIS	supplemental environmental impact statement
SHPO	State Historic Preservation Officer
SLR	subsequent license renewal
SLRA	subsequent license renewal application
SO_2	sulfur dioxide
SPCC	spill prevention, control, and countermeasure
SU	standard units
SWPPP	stormwater pollution prevention plan
TCP	traditional cultural properties
TDEC	Tennessee Department of Environment and Conservation
USACE	U.S. Army Corps of Engineers
U.S.C.	U.S. Code
USCB	U.S. Census Bureau
USGCRP	U.S. Global Change Research Program
USGS	U.S. Geological Survey
VOCs	volatile organic compounds
VOM	volatile organic matter

WHC	Wildlife Habitat Council

1 INTRODUCTION

The U.S. Nuclear Regulatory Commission's (NRC, the Commission) environmental protection regulations in Title 10 of the *Code of Federal Regulations* (10 CFR) Part 51 (TN10253), "Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions," implement the National Environmental Policy Act of 1969, as amended (TN661). This Act is commonly referred to as National Environmental Policy Act of 1969 (NEPA). The regulations at 10 CFR Part 51 (TN10253) require, in part, that the NRC staff prepare an environmental impact statement (EIS) before deciding whether to issue an operating license or a renewed operating license for a nuclear power plant. The regulations further direct the NRC staff to prepare EISs for renewal of nuclear power plant operating licenses as supplements to the Commission's NUREG-1437, Revision 2, *Generic Environmental Impact Statement for License Renewal of Nuclear Plants, Final Report*, dated August 2024 (LR GEIS) (NRC 2024-TN10161).

The Atomic Energy Act of 1954, as amended (AEA) (TN663), specifies that licenses for commercial power reactors can be granted for up to 40 years. The initial 40-year licensing period was based on economic and antitrust considerations rather than on technical limitations of the nuclear facility. The NRC regulations specified in 10 CFR 54 (TN4878), "Requirements for Renewal of Operating Licenses for Nuclear Power Plants," allow for an option to renew such licenses beyond the initial 40-year term for an additional period of time, limited to 20-year increments per renewal. There are no limitations in the AEA or NRC regulations restricting the number of times a license may be renewed.

The decision to seek subsequent license renewal (SLR) rests entirely with nuclear power facility owners and typically is based on the facility's economic viability and the investment necessary to continue to meet all safety and environmental requirements. The NRC makes the decision to grant or deny an SLR application (SLRA) based on whether the applicant has demonstrated that the safety and environmental requirements in the agency's regulations can be met during the period of extended operation.

1.1 Proposed Federal Action

Constellation Energy Generation, LLC (CEG) initiated the proposed Federal action by submitting an application (CEG 2024-TN11348) for SLR for Dresden Nuclear Power Station, Unit 2 and 3 (DNPS). The existing facility operating licenses (DPR-19, DPR-25) have expiration dates of December 22, 2029, for Unit 2, and January 12, 2031, for Unit 3. If the NRC renews the licenses, DNPS Units 2 and 3 would be authorized to operate until December 22, 2049, and January 12, 2051, respectively.

The NRC's Federal action is to decide whether to renew the licenses for an additional 20 years of operation.

1.2 Purpose and Need for the Proposed Federal Action

The purpose and need for the proposed agency action (renewal of operating licenses) is to provide an option that allows for power generation capability beyond the term of the current nuclear power plant operating license to meet future system generating needs, as such needs may be determined by State, utility, system, and, where authorized, Federal (other than NRC) decision-makers. This definition of purpose and need reflects the Commission's recognition that, absent findings in the safety review required by the AEA or findings in the environmental review required by NEPA that would lead the NRC to reject an SLRA, the NRC has no role in energy-planning decisions of power plant owners, State regulators, system operators, and, in some cases, other Federal agencies as to whether a particular nuclear power plant should continue to operate (61 FR 28467-TN4491; NRC 2024-TN10161).

1.3 Major Environmental Review Milestones

The NRC has established an SLR process that can be completed in a reasonable period of time with clear requirements to ensure safe plant operation for up to an additional 20 years of the nuclear power plant's life. The NRC staff conduct a safety review simultaneously with an environmental review and documents the findings of the safety review in a safety evaluation report and the findings of the environmental review in a supplemental environmental impact statement (SEIS). The safety evaluation report and the SEIS are both factors in the NRC's decision to either grant or deny the issuance of a renewed license. Schedules for the safety evaluation report and the SEIS for the DNPS SLRA are provided on the NRC's project website: https://www.nrc.gov/reactors/operating/licensing/renewal/applications/dresden-subsequent.html.

By a letter dated February 14, 2024, CEG submitted an SLRA to the NRC for DNPS (CEG 2024-TN11348), which included an environmental report (ER) (CEG 2024-TN11347). Notice of the receipt of the SLRA was published in the *Federal Register* (FR) on May 7, 2024 (Volume 89 of the FR, p. 38197 [89 FR 38197-TN10781]). After reviewing the SLRA and ER, the NRC staff accepted the application for a detailed technical review and published an FR notice of acceptability for docketing and opportunity for hearing on June 24, 2024 (89 FR 52514-TN10782). On August 5, 2024, the NRC published a notice in the FR (89 FR 63450-TN10783) informing the public of the NRC staff's intent to conduct an environmental scoping process, thereby beginning a 30-day scoping comment period.

The NRC staff held two public scoping meetings as virtual webinars on August 20, 2024. In February 2025, the NRC issued a scoping summary report for the DNPS SLRA environmental review (NRC 2025-TN11463), which includes the comments received during the scoping process and the NRC staff's responses to those comments (Appendix A).

To independently verify information in CEG's ER, the NRC staff conducted a virtual environmental site audit during the week of October 21, 2024, an onsite environmental site audit at DNPS on December 12, 2024, and a severe accident mitigation alternatives (SAMA) virtual audit during the week of September 30, 2024. During these audits, the NRC staff held meetings with plant personnel and reviewed site-specific documentation and photos. In an email dated December 26, 2024, the NRC staff summarized information requests resulting from the environmental site audits and SAMA audit (NRC 2024-TN11650). The Dresden Environmental Audit Report (NRC 2025-TN11651) was issued on April 3, 2025.

Upon completion of the scoping process, environmental site audits, and review of CEG's ER and related documents, the NRC staff compiled its findings into this draft SEIS. The NRC staff will make this draft SEIS available for a public comment period of 45 days. Based on the information gathered and received during the public comment period, the NRC staff will revise the draft SEIS and will then publish the final SEIS. Figure 1-1 shows the major milestones of the NRC's environmental review process for SLRAs.

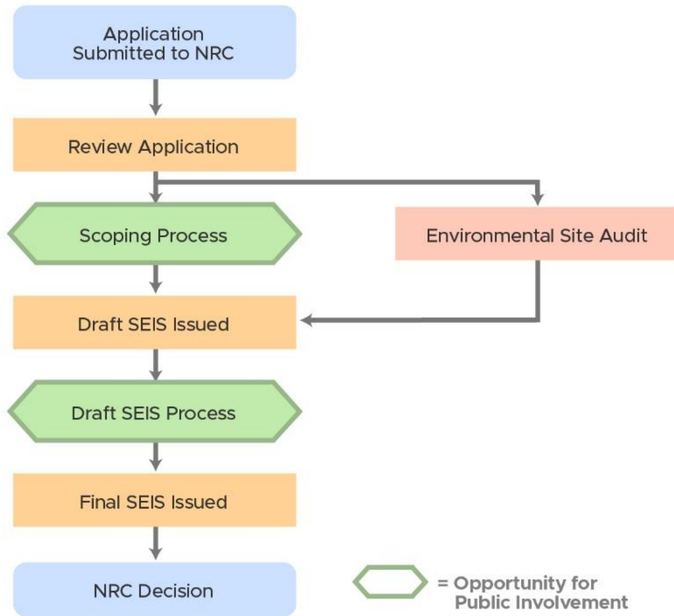

Figure 1-1 Environmental Review Process of the U.S. Nuclear Regulatory Commission for Nuclear Power Plants

1.4 Generic Environmental Impact Statement

To improve the efficiency of its license renewal (LR) environmental review process, the NRC staff assessed the overall environmental effects of LR. The LR GEIS (NRC 2024-TN10161) documents the results of the NRC's systematic approach to evaluating the environmental consequences of renewing the licenses of individual nuclear power plants and operating them for an additional 20 years. In the LR GEIS, the NRC staff analyzed in detail and determined the impact of those environmental issues that could be resolved generically.

The LR GEIS establishes separate environmental impact issues for the NRC staff to independently evaluate in LR environmental reviews. Of these issues, the NRC staff determined that some issues are generic to all plants or a specific subset of plants (Category 1). Other issues do not lend themselves to generic consideration and are nuclear plant site-specific (Category 2 or uncategorized). For each LR application, the NRC staff evaluate these issues in a SEIS to the LR GEIS. Table B-1 in Appendix B to Subpart A of 10 CFR Part 51 (TN10253), "Environmental Effect of Renewing the Operating License of a Nuclear Power Plant," (TN10253) provides a summary of the staff's findings for environmental issues as evaluated in the LR GEIS.

On August 6, 2024, the NRC published a final rule (89 FR 64166-TN10321) revising its environmental protection regulations in 10 CFR Part 51 (TN10253). Specifically, the final rule updated the potential environmental impacts associated with the renewal of an operating license for a nuclear power plant for up to an additional 20 years, which could either be an initial or SLR. The LR GEIS was also revised (NRC 2024-TN10161) as an update to the 2013 LR GEIS (NRC 2013-TN2654) and provided the technical basis for the final rule. The 2024 LR GEIS specifically supported the revised list of environmental issues and associated environmental impact findings for LR contained in Table B-1 in Appendix B to Subpart A of the revised 10 CFR

Part 51 (TN10253). The LR GEIS and final rule reflect lessons learned, knowledge gained, and experience from LR environmental reviews performed since the development of the 2013 LR GEIS; consider changes to applicable laws and regulations; and factor in new scientific data and methodology with respect to the assessment of potential environmental impacts of a nuclear power plant LR. The LR GEIS and final rule identify 80 environmental issues (i.e., 59 Category 1, 20 Category 2, and 1 issue that remains uncategorized) that may be associated with nuclear power plant operation and refurbishment during the renewal term.

For the NRC staff, the final rule became effective 30 days after its publication in the FR and thereafter the staff considers the new and modified issues, as applicable, in its LR SEISs. Compliance with the final rule by LR applicants is not required for up to 1 year following the publication in the FR (i.e., LR ERs submitted later than 1 year after publication must be compliant with the new rule).

For each environmental issue addressed in the LR GEIS, the NRC staff:

- describe the activity or aspect of plant operations or refurbishment that affects the environment
- identify the population or resource that is affected
- assess the nature and magnitude of the impact on the affected population or resource
- characterize the significance of both beneficial and adverse effects
- determine whether the results of the analysis apply to all or a specific subset of plants
- consider whether additional mitigation measures would be warranted for impacts that would have the same significance level for all plants

In considering whether the incremental environmental effects (impacts) of the NRC's proposed action (i.e., SLR) are significant, the NRC analyzes the geographic area and intensity of the effects. The geographic area consists of the characteristics of the area and its resources, such as proximity to unique or sensitive resources. For nuclear power plant-specific (hereafter, plant-specific) environmental issues, significance depends on the effects in the relevant geographic area, including, but not limited to, consideration of short- and long-term effects, as well as beneficial and adverse effects. The NRC's analysis of the intensity of effects includes consideration of the degree to which the action may (1) adversely affect public health and safety; (2) adversely affect unique characteristics of historic or cultural resources, parks, Tribal sacred sites, prime farmlands, wetlands, wild and scenic rivers, or ecologically critical areas; (3) violate relevant Federal, State, Tribal, or local laws or other requirements protecting the environment or be inconsistent with Federal, State, Tribal, or local policies designed for the protection of the environment; (4) have potential effects on the human environment that are highly uncertain; (5) adversely affect resources listed or eligible for listing in the National Register of Historic Places (NRHP); (6) adversely affect an endangered or threatened species or its habitat, including habitat that has been determined to be critical under the Endangered Species Act of 1973, as amended (TN1010); and (7) adversely affect rights of Tribal Nations that have been reserved through treaties, statutes, or executive orders. Based on this, the NRC established three levels of significance for potential impacts—SMALL, MODERATE, and LARGE—as defined below.

> **SMALL**: Environmental effects are not detectable or are so minor that they will neither destabilize nor noticeably alter any important attribute of the resource.

MODERATE: Environmental effects are sufficient to alter noticeably, but not to destabilize, important attributes of the resource.

LARGE: Environmental effects are clearly noticeable and are sufficient to destabilize important attributes of the resource.

These levels are used for describing the environmental impacts of the proposed action as well as for the impacts of a range of reasonable alternatives to the proposed action. Resource-specific effects or impact definitions from applicable environmental laws and executive orders, other than SMALL, MODERATE, and LARGE, are used where appropriate.

The LR GEIS determines whether the analysis of the environmental issue could be applied to all plants and whether additional mitigation measures would be warranted. Issues are assigned a Category 1 (generic to all or a distinct subset of plants) or Category 2 (plant-specific to certain plants only) designation. As established in the LR GEIS, Category 1 issues are those that meet the following three criteria:

- The environmental impacts associated with the issue have been determined to apply either to all plants or, for some issues, to plants that have a specific type of cooling system or other specified plant or site characteristics.
- A single significance level (i.e., SMALL, MODERATE, or LARGE) has been assigned to the impacts (except for offsite radiological impacts of spent nuclear fuel and high-level waste disposal and offsite radiological impacts—collective impacts from other than the disposal of spent fuel and high-level waste).
- Mitigation of adverse impacts associated with the issue has been considered in the analysis, and it has been determined that additional plant-specific mitigation measures are likely not to be sufficiently beneficial to warrant implementation.

For generic issues (Category 1), the SEIS requires no additional plant-specific evaluation unless new and significant information has been identified.

- **New information** can be identified from many sources, including the applicant, the NRC, other agencies, or public comments. If a new issue is revealed, the NRC staff will first analyze the issue to determine whether it is within the scope of the LR environmental evaluation. If the NRC staff determine that the new issue bears on the proposed action, the staff will then determine the significance of the issue for the plant and analyze the issue in the SEIS.
- **New and significant information**. To merit additional review, information must be both new and significant, and it must bear on the proposed action or its impacts.

Section 3.14 further describes the process for identifying new and significant information for plant-specific analysis. Plant-specific issues (Category 2) are those that do not meet one or more of the three criteria of Category 1 issues; therefore, the SEIS requires additional plant-specific review for these issues.

The LR GEIS, Revision 2, evaluates 80 environmental issues, provides generically applicable findings for numerous issues (subject to the consideration of any new and significant information on a plant-specific basis), and concludes that a plant-specific analysis is required for 20 of the 80 issues. Figure 1-2 illustrates the LR environmental review process. The results of that plant-specific review are documented in the SEIS.

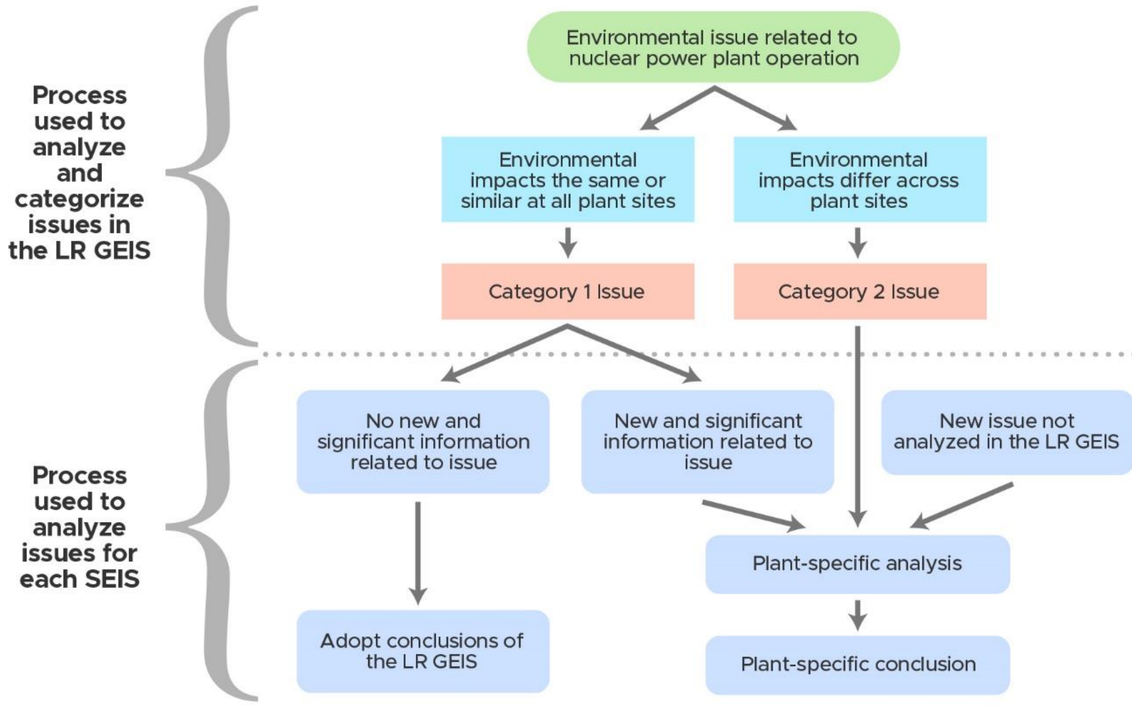

Figure 1-2 Environmental Issues Evaluated for License Renewal of Nuclear Power Plants

1.5 Supplemental Environmental Impact Statement

This SEIS presents the NRC staff's analysis of the environmental effects of the continued operation of DNPS through the SLR term, alternatives to SLR, and mitigation measures for minimizing adverse environmental impacts. Chapter 2 describes the proposed action and alternatives to the proposed action. Chapter 3 contains an analysis and comparison of the potential environmental impacts from SLR and alternatives to SLR. Chapter 4 presents the NRC's preliminary recommendation on whether the adverse environmental impacts of SLR for DNPS are so great that preserving the option of SLR for energy-planning decision-makers would be unreasonable.

The NRC staff will make its recommendation to the Commission regarding the environmental impacts of DNPS' SLR in the final SEIS, after considering comments received on the draft SEIS during the public comment period.

The NRC staff based its preliminary recommendation on:

- the analysis and findings in the LR GEIS
- the ER submitted by CEG
- the NRC staff's consultation with Federal, State, Tribal, and local agencies
- the NRC staff's independent environmental review
- the NRC staff's consideration of public scoping comments

1.6 Decisions To Be Supported by the SEIS

The decision to be supported by this SEIS is whether to renew the DNPS operating licenses for an additional 20 years. The regulation in 10 CFR 51.103(a)(5) (TN10253) that specifies the NRC's environmental review decision standard states:

> In making a final decision on a license renewal action pursuant to [10 CFR] Part 54 of this chapter, the Commission shall determine whether or not the adverse environmental impacts of license renewal are so great that preserving the option of license renewal for energy planning decisionmakers would be unreasonable.

There are many factors that the NRC takes into consideration when deciding whether to renew the operating license of a nuclear power plant. The analysis of environmental impacts in the LR GEIS, as supplemented by this SEIS, will provide the NRC's decision-maker (the Commission) with important environmental information for consideration in deciding whether to renew the DNPS licenses.

1.7 Cooperating Agencies

During the scoping process, the NRC staff did not identify any Federal, State, Tribal, or local agencies as cooperating agencies for this SEIS.

1.8 Consultations

SLR environmental reviews may require consultation with other Federal, State, regional, and local agencies and Indian Tribes. For SLR, the NRC staff must consider the effects of its actions on ecological resources protected under Federal statutes, including the Endangered Species Act of 1973, as amended (ESA) (TN1010). Section 106 of National Historic Preservation Act of 1966, as amended (NHPA) (TN4157) requires Federal agencies to take into account the effects of their undertakings on historic properties. See Appendix C for a list of the agencies and groups with which the NRC staff consulted and a description of the consultations and related correspondence.

1.9 Correspondence

Appendix D chronologically lists docketed correspondence the NRC staff sent and received with external parties as part of the agency's environmental review of the DNPS SLRA, excluding the consultation correspondence listed in Appendix C and public comments referenced in Appendix A.

1.10 Status of Compliance

CEG is responsible for complying with all NRC regulations and other applicable Federal, State, and local requirements. Appendix F to the LR GEIS describes some of the major applicable Federal statutes (NRC 2024-TN10161). Numerous permits and licenses are issued by Federal, State, and local authorities for activities at DNPS. Appendix B contains further information about CEG's status of compliance.

1.11 Related Federal and State Activities

The NRC staff reviewed the possibility that activities (projects) of other Federal agencies might impact the renewal of the operating licenses for DNPS. Any such activities could result in cumulative environmental impacts and the potential need for the Federal agency to become a cooperating agency for preparing this SEIS. The NRC staff has determined that there are no Federal projects that would make it necessary for another Federal agency to be a cooperating agency in the preparation of this SEIS in accordance with 10 CFR 51.10(b)(2) (TN10253). Section 3.16 identifies past, present, and reasonably foreseeable future actions considered in the cumulative effects analysis for this SLRA.

The NRC is required under Section 102(2)(C) of NEPA (TN661) to consult with and obtain comments from any Federal agency or designated authority that has jurisdiction by law or special expertise with respect to any environmental impact involved in the subject matter of the NRC's EIS. As explained in Section 1.8, Appendix C provides a complete list of consultation correspondence.

2 ALTERNATIVES INCLUDING THE PROPOSED ACTION

Although the NRC's decision-making authority is limited to deciding whether to renew a nuclear power plant's operating license, the agency's implementation of NEPA (TN661) requires consideration of the environmental impacts of that action as well as the environmental impacts of reasonable alternatives to that action. Although the ultimate decision about which alternative (or the proposed action) to implement falls to the power plant owners and State, utility, system, and, where authorized, Federal (other than NRC) energy-planning decision-makers, comparing the environmental impacts of renewing the operating license to the environmental impacts of alternatives allows the NRC to determine whether the environmental impacts of LR are so great that preserving the option of LR for energy-planning decision-makers would be unreasonable (10 CFR 51.95(c)(4) [TN10253]).

Energy-planning decision-makers and power plant owners ultimately decide whether the nuclear power plant will continue to operate, and economic and environmental considerations play important roles in this decision. In general, the NRC's responsibility is to ensure the safe operation of nuclear power plants, not to formulate energy policy, promote nuclear power, or encourage or discourage the development of alternative power generation. The NRC does not engage in energy-planning decisions, and it makes no judgment as to which replacement power alternatives would be the most likely alternative selected in any given case.

This chapter describes (1) the DNPS site and its operation, (2) the proposed action (subsequent renewal of the DNPS operating licenses), (3) reasonable alternatives to the proposed action (including the no-action alternative), and (4) alternatives eliminated from detailed study.

2.1 Description of Nuclear Power Plant Facility and Operation

DNPS includes three boiling water reactors located in Morris, Illinois. Unit 1 operated commercially from 1960 through 1978 and was retired in 1984. Unit 2 began operation in June 1970, followed by Unit 3 in November 1971. The NRC staff drew information about DNPS' facilities and operation from CEG's ER (CEG 2024-TN11347).

2.1.1 External Appearance and Setting

DNPS is located approximately 23 miles (mi) (37 kilometers [km]) southwest of Joliet, Illinois. The DNPS site consists of approximately 2,459 acres (ac) (995 hectares [ha]) along the Illinois, Des Plaines, and Kankakee Rivers. The station, associated infrastructure, cooling lake, and most of the site boundary are in Grundy County, with a small portion of the cooling lake and site boundary extending into western Will County. DNPS also leases a total of approximately 17 ac (7 ha) from the State of Illinois under two lease agreements. This acreage is comprised of two narrow strips of river frontage located near the site's northeast corner.

Figure 2-1 shows the structures within the DNPS site boundary. The principal structures at DNPS are the following: turbine building, Unit 2 and 3 common reactor building, Unit 1 (retired), wastewater treatment facility, administration building, training building, cooling towers, 345 kilovolt (kV) switchyard, discharge structure radwaste building, independent spent fuel storage installation (ISFSI), 138 kV switchyard, crib house, sewage treatment plant, discharge canal, intake canal, and meteorological tower. Figure 2-2 and Figure 2-3 depict the location of DNPS relative to other features within the 6 mi (10 km) and 10 mi (16 km) radii of the facility, respectively.

Figure 2-1 Dresden Nuclear Power Station (DNPS) Site Layout. Source: CEG 2024-TN11347.

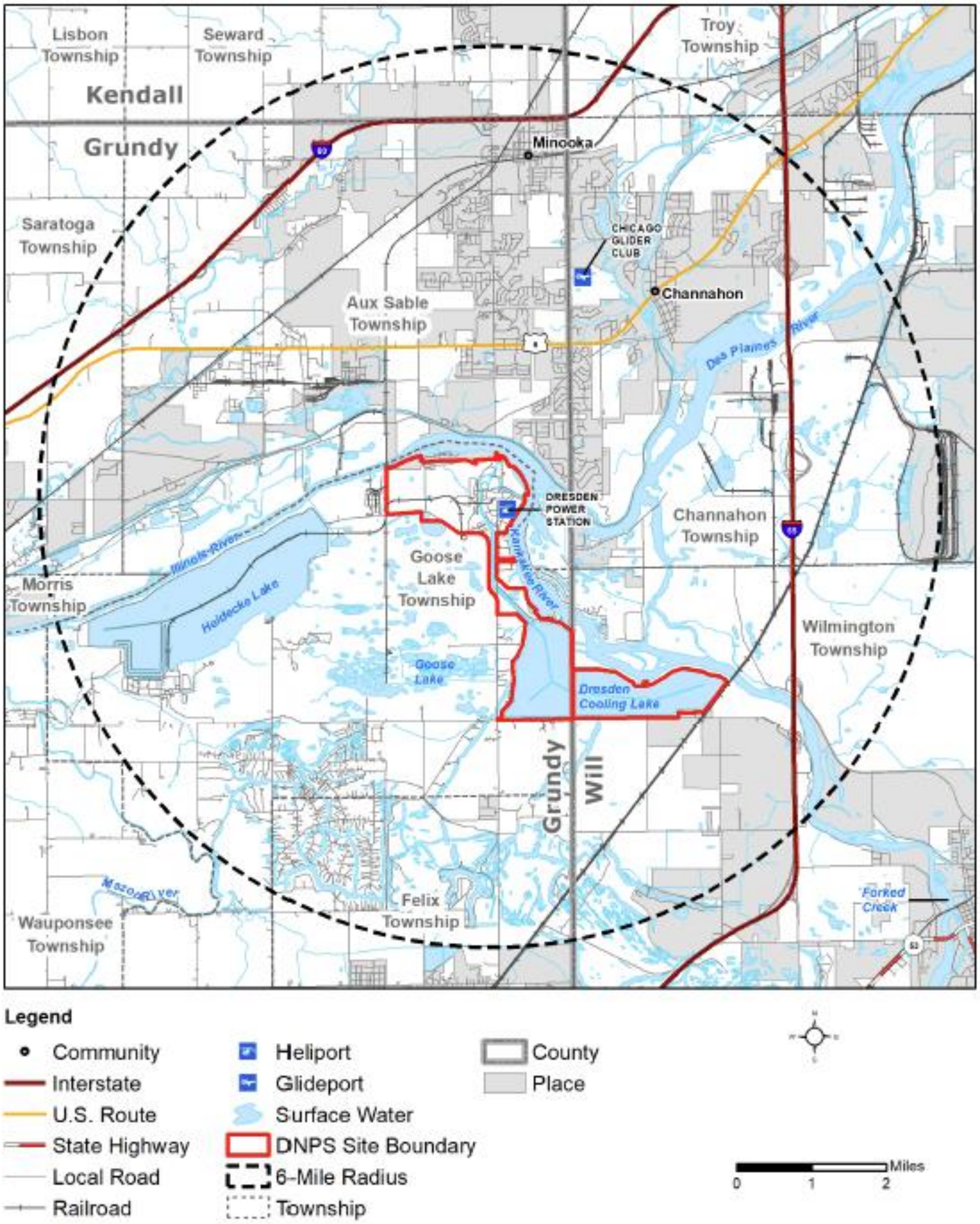

Figure 2-2 **Dresden Nuclear Power Station (DNPS) Site and 6 mi Radius. Source: CEG 2024-TN11347.**

Figure 2-3 Dresden Nuclear Power Station (DNPS) and 50 mi Radius. Source: CEG 2024-TN11347.

2.1.2 Nuclear Reactor Systems

DNPS includes three reactors. Unit 1, a boiling water reactor, operated from 1960 to 1978 and was retired in 1984; DNPS Units 2 and 3 are boiling water reactor steam driven turbine generators and were manufactured by General Electric. DNPS Units 2 and 3 produce an output of 2,957 megawatts thermal (MWt) each. Unit 2 began operating in June 1970, and Unit 3 began operating in November of 1971.

DNPS Units 2 and 3 were originally licensed with reactor core thermal power of each unit rated at 2,527 MWt; however, in 2001 the NRC approved an extended power update to increase the maximum reactor core power level of each unit to 2,957 MWt. For purposes of analysis in this SEIS, the 5,914 MWt total for Units 2 and 3 results in a net generation of approximately 1,845 megawatts electric (MWe) for DNPS. The containment system has separate primary containments and pressure suppression systems but shares a common secondary containment (reactor building) (CEG 2024-TN11347).

2.1.3 Cooling and Auxiliary Water Systems

Cooling and auxiliary water systems at DNPS include the circulating water system, containment cooling service water system, service water system, reactor building closed cooling water system, demineralized water makeup system, ultimate heat sink, condensate storage facilities, turbine building closed cooling water system, standby coolant supply system, potable and sanitary water system, and fire protection system. The NRC staff incorporate the descriptions of these systems from Section 2.2.3 of CEG's ER here by reference and summarizes key information in the following sections (CEG 2024-TN11347).

DNPS uses the Kankakee River as its source of cooling water. DNPS' circulating water intake structure provides a continuous supply of non-contact cooling water to Units 2 and 3. The intake canals are approximately 2,000 feet (ft) (610 meters [m]) long, 56 ft (17 m) wide vertical-sided canals that route water from the Kankakee River to DNPS (CEG 2024-TN11347). DNPS uses a cooling and auxiliary water system to dissipate heat from the turbine condensers. Figure 2-4 provides a basic schematic diagram of this system.

2.1.3.1 Cooling Water Intake and Discharge

Section 2.2.3 of CEG's ER provides detailed descriptions of CEG's cooling and auxiliary water systems, which include a circulating water system, containment cooling service water system, service water system, reactor building closed water system, demineralized water makeup system, ultimate heat sink, condensate storage facility, turbine building closed cooling water system, standby coolant supply system, potable and sanitary water system and fire protection water system. The NRC staff incorporate the descriptions of these systems in Section 2.2.3 of CEG's ER here by reference and summarizes key information in this section (CEG 2024-TN11347).

Cooling water for DNPS is withdrawn from the Kankakee River via the Units 2 and 3 intake canals. DNPS is authorized to withdraw water from the Kankakee River, and there is no explicit limit on water withdrawal amounts. During periods of low flow, however, water from the Des Plaines River represents a larger portion of the DNPS influent. Cooling water passes through the Units 2 and 3 crib house and into the condensers before the water exits the turbine building and is discharged to the hot canal and routes to the cooling lake. DNPS operates in closed-cycle mode from October 1 through June 14 each year (IEPA 2016-TN11652). DNPS generally operates in closed-cycle mode with the flow-regulating gates routing cooling water from the cooling lake back to the crib house intake structure. From June 15 through September 30 each year, the station's National Pollutant Discharge Elimination System (NPDES) permit allows it to operate in indirect open cycle mode. In this mode, the flow-regulating gates divert all the cooling water flow to the Illinois River through a permitted outfall. The canal cooling tower systems provide supplemental cooling capacity to the Dresden Cooling Lake. The system discharges to the DNPS discharge canal, which leads to the Illinois River.

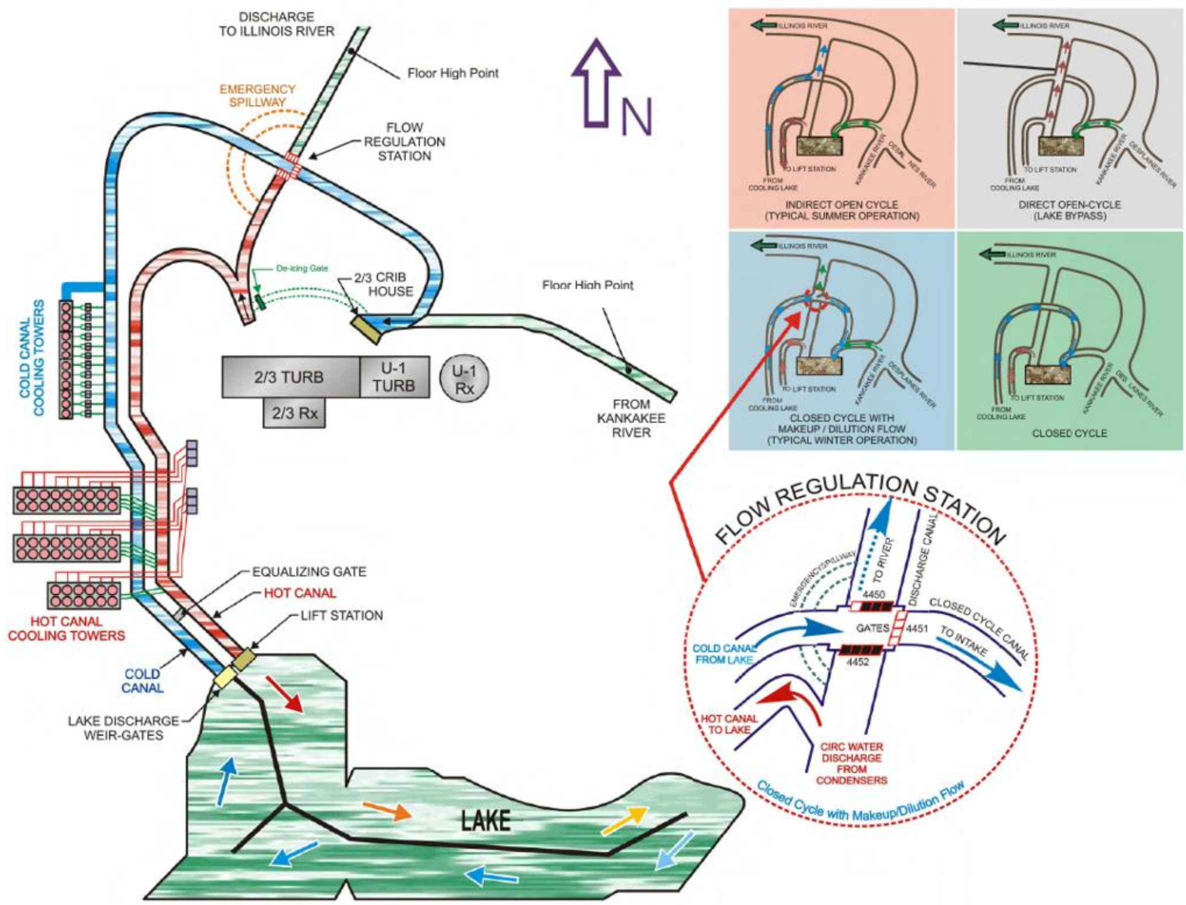

Figure 2-4 Dresden Nuclear Power Cooling and Auxiliary Water System Schematic. Source: CEG 2024-TN11347.

A separate service water system also draws from the Kankakee River and discharges to the Illinois River (NRC 2004-TN7247). Water from the Kankakee River provides water for several closed-cycle cooling water systems, including the recirculation motor generator set oil coolers, the generator station coolers, the turbine oil coolers, the generator hydrogen coolers, and other systems. Water from the Kankakee River is also used to wash the circulating water traveling screens and to pressurize the fire header.

2.1.3.2 Well Water Supply System

There are three onsite production wells to supply water to various DNPS systems. CEG submits annual reports documenting its groundwater withdrawals with the Illinois State Water Survey (Exelon 2021-TN11654). The two primary water supply wells are approximately 1,500 ft deep (457 m) (Exelon 2021-TN11654). The two wells tap the Cambrian-Ordovician aquifer (AEC 1973-TN11661). These wells were constructed in 1968, and each has a pumping capacity of 200 gallons per minute (gpm) (757 liters per minute [Lpm]). These wells provide processing, washing, cooling, condensing, boiler feed, and sanitary water for employees (NRC 2004-TN7247). DNPS is not connected to a municipal water system and pumps groundwater for use as potable water and for process water (NRC 2004-TN7247). Section 3.6.3.2 of CEG’s ER provides a more detailed description of the groundwater well supply system (CEG 2024-TN11347).

2.1.4 Radioactive Waste Management Systems

The NRC licenses nuclear power plants with the expectation that they will release a limited amount of radioactive material to both the air and water during normal operations. DNPS Units 2 and 3 use liquid, gaseous, and solid waste processing systems to collect and treat, as needed, radioactive materials produced as a byproduct of nuclear power plant operations. Section 2.2.6 of CEG's ER provides an expanded description of DNPS' radioactive waste management systems (CEG 2024-TN11347). The NRC staff discuss the radioactive waste management systems in Section 3.13.1.

2.1.5 Nonradioactive Waste Management Systems

DNPS generates nonradioactive waste as a result of nuclear power plant maintenance, cleaning, and operational processes. DNPS manages nonradioactive wastes in accordance with applicable Federal and State regulations, as implemented through its corporate procedures. Section 2.2.7 of CEG's ER provides an expanded description of the nonradioactive waste management systems at DNPS (CEG 2024-TN11347). The NRC staff discuss the nonradioactive waste management systems in Section 3.13.2.

2.1.6 Utility and Transportation Infrastructure

The utility and transportation infrastructure at nuclear power plants typically interfaces with public infrastructure systems available in the region. Such infrastructure includes utilities, such as suppliers of electricity, fuel, and water, as well as roads and railroads that provide access to the site. The following sections briefly describe the existing utility and transportation infrastructure at DNPS. Plant-specific information in this section is primarily derived from CEG's ER (CEG 2024-TN11347), unless otherwise cited.

2.1.6.1 Electricity

Nuclear power plants generate electricity for other users; however, they also use electricity to operate. Offsite power sources provide power to engineered safety features and emergency equipment in the event of a malfunction or interruption of power generation at the nuclear power plant. Planned independent backup power sources provide power, if power from both the nuclear power plant itself and offsite power sources is interrupted.

The in-scope transmission lines for DNPS extend between the nuclear power block and the 345 kV switchyard that connects the generating units to the regional grid. Two independent sources of offsite power (normal and auxiliary) are available for each Units 2 and 3. Section 2.2.5 of CEG's ER provides an expanded description of DNPS power transmission lines (CEG 2024-TN11347).

2.1.6.2 Fuel

DNPS utilizes low-enriched uranium dioxide fuel with enrichments of 5 percent or less by weight of uranium-235, with peak fuel-rod burn-up levels less than 62,000 megawatt (MW)-days per metric ton of uranium. The reactor is refueled on a 24-month cycle with outages lasting for approximately 16 to 18 days. DNPS currently stores spent fuel in the spent fuel pool and in dry cask storage containers at the onsite ISFSI. Units 2 and 3 have their own spent fuel pool measuring 33 ft (10 m) by 41 ft (12 m). Dry cask storage at the ISFSI provides the means for long-term onsite storage of DNPS' Units 2 or 3 spent nuclear fuel. Section 2.2.6.4 of CEG's ER provides an expanded description of CEG's spent nuclear fuel (CEG 2024-TN11347).

2.1.6.3 Water

DNPS is not connected to a municipal water supply and sources its potable and sanitary water entirely from groundwater (CEG 2024-TN11347). There are currently three operating wells providing water to various systems on the DNPS property. The two primary wells are approximately 1,500 feet (457 m) deep and provide processing, washing, cooling, condensing, boiler feed, and sanitary water for employees. The third well is 160 feet (48 m) deep and supplies water for the sewage treatment plant operation.

The surface water features within the DNPS area include the Illinois River to the north, the Des Plaines River to the east, and the Kankakee River to the southeast. Constructed surface water features include two intake canals (located at Unit 1, and Units 2 and 3) leading from the Kankakee River, two discharge canals (located at Unit 1, and Units 2 and 3) leading to the Illinois River, a cooling lake, and two canals leading to and from the cooling lake (i.e., the hot and cold canals), respectively. Section 3.6.3.1 of CEG's ER (CEG 2024-TN11347) provides an expanded description of DNPS' surface water use, and Section 2.1.3 of this SEIS describes the DNPS' cooling and auxiliary water systems.

2.1.6.4 Transportation Systems

Nuclear power plants are served by controlled access roads that are connected to U.S. highways and interstate highways. In addition to roads, many nuclear power plants also have railroad connections for moving heavy equipment and other materials. Nuclear power plants located on navigable waters may have facilities to receive and ship loads on barges. Section 3.10.6 describes the DNPS transportation systems.

2.1.6.5 Power Transmission Systems

For SLRs, the NRC staff evaluate, as part of the proposed action, the continued operation of (1) those power transmission lines that connect to the substation where it feeds electricity into regional power distribution system and (2) those transmission lines that supply outside power to the nuclear plant from the grid (NRC 2024-TN10161). The transmission lines that are in scope for the DNPS SLR environmental review are located on site between the nuclear power block and the 345 kV switchyard that connects the generating units to the regional grid. The in-scope transmission lines are not accessible to the public. Section 3.11.5 further describes the in-scope transmission lines.

2.1.7 Nuclear Power Plant Operations and Maintenance

Maintenance activities conducted at DNPS include inspection, testing, and surveillance to maintain the current licensing basis of the facility and to ensure compliance with environmental and safety requirements. These activities include in-service inspections of safety-related structures, systems, and components; quality assurance and fire protection programs; and radioactive and nonradioactive water chemistry monitoring.

Additional programs include those implemented to meet technical specification surveillance requirements and those implemented in response to NRC generic communications. Such additional programs include various periodic maintenance, testing, and inspection procedures necessary to manage the effects of aging on structures and components. Certain program activities are performed during the operation of the power plant, whereas others are performed during scheduled refueling outages on a staggered 24-month cycle, as described in Section 2.2.2 of CEG's ER (CEG 2024-TN11347).

2.2 Proposed Action

As stated in Section 1.1, the NRC's proposed Federal action is to decide whether to issue subsequent renewed operating licenses to DNPS for an additional 20 years. Section 2.2.1 provides a description of normal power plant operations during the SLR term.

2.2.1 Nuclear Power Plant Operations during the Subsequent License Renewal Term

Plant operation activities during the SLR term would be the same as, or similar to, those occurring during the current license term. CEG's ER states that DNPS will continue to operate during the SLR term in the same manner as during the current license term except for additional aging management programs, as necessary. Such programs would address structure and component aging in accordance with 10 CFR Part 54 (TN4878), "Requirements for Renewal of Operating Licenses for Nuclear Power Plants." Section 2.1 further describes the activities specific to the operation of DNPS.

2.2.2 Refurbishment and Other Activities Associated with License Renewal

Refurbishment activities include replacement and repair of major structures, systems, and components. As described in the LR GEIS, most major refurbishment activities are actions that would typically take place only once in the life of a nuclear plant, if at all (NRC 2024-TN10161). For example, replacement of pressurized-water reactor steam generator systems is a refurbishment activity. Refurbishment activities may have an impact on the environment beyond those that occur during normal operations and may require evaluation, depending on the type of action and the plant-specific design.

As part of its SLRA, CEG evaluated major structures, systems, and components in accordance with 10 CFR 54.21 (TN4878), "Contents of Application—Technical Information," to identify major refurbishment activities necessary for the continued operation of DNPS during the proposed 20-year period of extended operation. As stated in Section 2.3 of CEG's ER, CEG has identified no SLR-related refurbishment or replacement actions needed to maintain the functionality of systems, structures, and components, consistent with the current licensing basis, during the proposed SLR term (CEG 2024-TN11347).

2.2.3 Termination of Nuclear Power Plant Operations and Decommissioning after the License Renewal Term

NUREG-0586, Supplement 1, Volumes 1 and 2, "*Generic Environmental Impact Statement on Decommissioning of Nuclear Facilities: Regarding the Decommissioning of Nuclear Power Reactors*" (the decommissioning GEIS) (NRC 2002-TN7254), describes the environmental impacts of decommissioning. The majority of plant operations activities would cease with reactor shutdown. Some activities (e.g., security and oversight of spent nuclear fuel) would remain unchanged, whereas others (e.g., waste management, administrative work, laboratory analysis, surveillance, monitoring, and maintenance) would continue at reduced or altered levels. Systems dedicated to reactor operations would cease operations. However, if these systems are not removed from the site after reactor shutdown, their physical presence may continue to impact the environment. Impacts associated with dedicated systems that remain in place, or with shared systems that continue to operate at normal capacities, could remain unchanged.

Decommissioning will occur whether DNPS is shut down at the end of its current operating license or at the end of the period of extended operation 20 years later. There is no plant-specific issue related to decommissioning. The LR GEIS concludes that LR would have a negligible (SMALL) effect on the impacts of terminating operations and decommissioning on all resources (NRC 2024-TN10161).

2.3 Alternatives

As stated above, NEPA requires the NRC to consider reasonable alternatives to the proposed action of renewing the DNPS operating licenses. For a replacement energy alternative to be reasonable, it must be either (1) commercially viable on a utility scale and operational before the reactor 's operating license expires or (2) expected to become commercially viable on a utility scale and operational before the reactor's operating license expires (NRC 2024-TN10161). The NRC published the most recent LR GEIS revision in 2024, and it incorporated the latest information on replacement energy alternatives available at that time; however, rapidly evolving technologies are likely to outpace the information in the LR GEIS. Thus, for each supplement to the LR GEIS, the NRC staff must perform a plant-specific analysis of replacement energy alternatives that accounts for changes in technology and science since the most recent LR GEIS revision.

In this SEIS, the NRC staff rely upon the description of alternative sources of replacement energy in Appendix D of the LR GEIS. The alternatives analysis in this SEIS are consistent with NEPA Section 102(2)(C)(iii) (TN661), which states "…a reasonable range of alternatives to the proposed agency action, including an analysis of any negative environmental impacts of not implementing the proposed agency action in the case of a no action alternative, that are technically and economically feasible, and meet the purpose and need of the proposal."

The alternative to the proposed agency action, renewing the DNPS operating licenses, is for the NRC to not renew the operating licenses. This is called the no-action alternative and is described in Section 2.3.1. In addition, as a consequence of not implementing the proposed agency action in the case of a no-action alternative, two replacement power alternatives were identified for detailed study. As described in Section 2.3.2, these replacement energy alternatives could replace DNPS' generating capacity by meeting the region's energy needs through other means or sources of energy.

In addition, the Illinois Climate and Equitable Jobs Act (CEJA) requires electric generating units (EGUs) and large greenhouse-gas emitting units (LGUs) to "permanently reduce all CO_2e and copollutant emissions to zero" (Climate and Equitable Jobs Act of 2021-TN11284). This will require a phase-out of coal- and petroleum-fired power plants by January 1, 2030, and of natural gas-fired power plants by January 1, 2045, with the exception that EGUs and LGUs may temporarily continue emitting greenhouse gases (GHGs) if it has been determined "that ongoing operation of the EGU is necessary to maintain power grid supply and reliability or ongoing operation of the LGU that is not an EGU is necessary to serve as an emergency backup to operations" (Climate and Equitable Jobs Act of 2021-TN11284).

2.3.1 No-Action Alternative

Under the no-action alternative, the NRC would not renew the DNPS operating licenses, and the reactor units would shut down on or before the expiration of the current licenses for Unit 2 on December 22, 2029 and Unit 3 on January 12, 2031.

After permanent shutdown of the reactors, nuclear power plant operators would initiate decommissioning in accordance with NRC regulations in 10 CFR 50.82 (TN249). The decommissioning GEIS (NRC 2002-TN7254) describes the environmental impacts from decommissioning a nuclear power plant and related activities. The analysis in the decommissioning GEIS bounds the environmental impacts of decommissioning when CEG terminates reactor operations at DNPS. A licensee is required to assess the environmental effects of decommissioning activities in their post-shutdown decommissioning activities report and to inform the NRC whether planned activities could result in significant environmental impacts not previously reviewed. Section 2.2.3 describes the incremental environmental effects of SLR on future decommissioning activities.

Termination of reactor operations would result in the total cessation of electrical power production at DNPS. Because it does not provide a means of delivering baseload power to meet future electric system needs, assuming there is a need for the electrical power generated by DNPS, the no-action alternative (not renewing the operating licenses) would create a need for replacement power. In addition, Section 102(2)(C)(iii) of NEPA (TN661), amended by the Fiscal Responsibility Act of 2023, requires “an analysis of any negative environmental impacts of not implementing the proposed agency action in the case of a no action alternative.” The negative environmental impacts of not renewing the DNPS operating licenses (no-action alternative) and the need for replacement power are described in the replacement power alternatives impact sections for each of the analyzed resource areas in Chapter 3.

2.3.2 Replacement Power Alternatives

The following sections describe replacement energy alternatives that could be implemented as a consequence of not renewing the DNPS operating licenses in the case of a no-action alternative. The potential environmental impacts of these alternatives are described in Chapter 3. Although the NRC’s authority only extends to deciding whether to renew the DNPS operating licenses, replacement power alternatives represent possible options that energy planning decision-makers may need to consider if the DNPS operating licenses are not renewed. In evaluating replacement power alternatives, the NRC staff considered energy-generating technologies in commercial operation, as well as technologies likely to be commercially available by the time the current DNPS renewed operating licenses expire. Because energy generating technologies continually evolve in capability and cost, and because regulatory structures change to either promote or impede the development of certain technologies, this evaluation considered which replacement power alternatives may be available and commercially viable when the current DNPS operating licenses expire.

Chapter 7 of CEG’s ER discusses replacement power alternatives as proposed by CEG (CEG 2024-TN11347). In addition, the NRC staff considered information from the following sources in the replacement power analysis:

- Appendix D of the LR GEIS (NRC 2024-TN10161)
- U.S. Department of Energy (DOE) offices, including the U.S. Energy Information Administration (EIA)

- the U.S. Environmental Protection Agency (EPA)
- other Federal agency and national laboratory publications
- industry sources and publications

In total, the NRC staff considered 15 replacement power alternatives to the proposed action and eliminated 13 from detailed study because of technical, resource availability, or commercial limitations. These limitations are likely to continue when the current DNPS operating licenses expire, rendering these alternatives not feasible or commercially viable.

The alternatives the NRC staff considered but eliminated from detailed study were:

- new nuclear
- solar power
- wind power
- biomass power
- hydroelectric power
- geothermal power
- ocean wave, current, and tide energy
- petroleum-fired power
- coal-fired power
- fuel cells
- purchased power
- delayed retirement of other generating facilities
- demand-side management/energy conservation/energy efficiency

The two replacement power alternatives remaining for detailed study were:

- natural gas
- renewable and natural gas combination

Section 2.4 briefly describes the 13 alternatives eliminated from detailed study and provides the basis for each elimination. Table 2-1 summarizes the key characteristics of the two replacement energy alternatives studied in detail in this SEIS, which are further described in the sections that follow. The order in which this SEIS presents the different alternatives does not imply increasing or decreasing level of impact; nor does the order imply that an energy-planning decisionmaker would be more (or less) likely to select any given alternative.

Table 2-1 Overview of Replacement Power Alternatives for Dresden Nuclear Power Station, Studied in Detail

Alternative	Natural Gas	Renewable and Natural Gas Combination
Summary	Construction of an NGCC plant with a design capacity of 2,120 MWe to yield approximately 1,845 MWe (assuming an 87 percent capacity factor).	Construction of an NGCC plant with a design capacity of 1,484 MWe to yield approximately 1,291 MWe (assuming an 87 percent capacity factor). Construction of a 41 MW onsite solar energy installation and eighteen 125 MW offsite solar energy installations. The solar installations would be coupled with battery storage. Operation of the NGCC plant would be phased out by 2045 and replaced with additional offsite solar (eighteen 125 MW units) and wind (six 300 MW units) energy installations. The electrical power generated after 2045 would be 4,541 MWe of solar energy (25 percent capacity factor) and 1,800 MWe of wind energy (41.4 percent capacity factor).
Location	On the DNPS site	The NGCC plant would be constructed on the DNPS site; solar components would be constructed at both onsite and offsite locations; wind components would be constructed off site.
Cooling System	Closed-cycle with mechanical draft cooling towers	The NGCC plant would be closed-cycle with mechanical draft cooling towers. No cooling system would be required for solar or wind energy components.
Land Required[(a)]	The NGCC facility would be sited within an approximately 74 ac area. No additional land would be required for transmission infrastructure or natural gas pipelines.	NGCC component: Sited within the same 74 ac area as the standalone NGCC plant. No additional land would be required for transmission infrastructure or natural gas pipelines. Solar component: Initially, an estimated 308 ac would be required for onsite installations and 16,300 ac would be required for offsite installations. Once the NGCC unit is retired, an additional 16,300 ac would be needed. Wind component: Once the NGCC plant is phased out, offsite wind installations would require 154,200 ac for wind farms, with 4,500 ac disturbed for construction, and 1,300 ac occupied by permanent structures. Transmission: An estimated total of 19,100 ac would be required for construction of transmission infrastructure for the 36 offsite solar energy installations and 6 offsite wind energy installations.

Table 2-1 Overview of Replacement Power Alternatives for Dresden Nuclear Power Station, Studied in Detail (Continued)

Alternative	Natural Gas	Renewable and Natural Gas Combination
Work Force	Approximately 1,200 workers would be required for 2 to 3 years during peak construction and 150 workers would be required during operations.	NGCC component: Work force requirements would be similar to a standalone NGCC plant. Approximately 1,200 workers would be required during peak construction and 150 workers would be required during operations. Wind component: Construction would require fewer jobs than for the NGCC plant. Solar component: Construction would require fewer jobs than for the NGCC plant. An estimated 20 to 30 workers would be needed to maintain solar installations.

DNPS = Dresden Nuclear Power Station; NGCC = natural gas-fired combined-cycle.

(a) For the renewable components of the replacement energy combination alternative, 6.03 wind installations and 17.36 solar installations were used to calculate land requirements. For land required for transmission corridors, a total of 36 solar energy installations and 6 wind energy installations were used to calculate acreage. Land acreage was rounded to the nearest hundred for offsite renewable energy installations.

2.3.2.1 Natural Gas Alternative

The natural gas alternative would consist of a natural gas combined cycle (NGCC) plant constructed at the DNPS site with a design capacity of 2,120 MWe to replace the 1,845 MWe of power currently generated by DNPS based on a capacity factor of 87 percent (EIA 2022-TN10537). The NGCC plant would use mechanical draft cooling towers (MDCTs) (CEG 2024-TN11347).

CEG identified a 74 ac (30 ha) area immediately west of the cooling towers within the DNPS site for potential siting of an NGCC plant. Although this area is approximately 18 ac (7 ha) less than the 92 ac (37 ha) that the National Energy Technology Laboratory (NETL) estimates are required for siting an NGCC plant of the requisite design capacity, CEG estimates that the repurposing of existing access roads, cooling system infrastructure, transmission lines, and temporary construction use areas within the DNPS site to support the NGCC plant would sufficiently reduce the total additional land area needed for siting. Existing onsite transmission line infrastructure and corridors would be used, and natural gas transmission lines exist near the DNPS site to supply natural gas to the NGCC plant (CEG 2024-TN11347).

2.3.2.2 Renewable and Natural Gas Combination Alternative

The renewable and natural gas combination alternative would consist of:

- An NGCC plant constructed at the DNPS site, using MDCTs, providing 70 percent of the replacement power need. The NGCC plant would have a design capacity of 1,484 MWe to yield approximately 1,291 MWe (assuming an 87 percent capacity factor) (EIA 2022-TN10537).
- Onsite and offsite solar energy installations with battery storage, providing 30 percent of the replacement power need. The onsite solar energy installation would be approximately 41 MW (assuming a 25 percent capacity factor). Eighteen 125 MW (gross) solar energy installations would be located off site within Illinois.

- Phase out of the NGCC plant by January 1, 2045, in accordance with provisions of the CEJA requiring all EGUs and LGUs using gas as a fuel to "permanently reduce all CO_2e and copollutant emissions to zero," with exceptions for ongoing operation of LGUs and EGUs necessary to maintain power grid supply and reliability or as necessary to serve as an emergency backup to operations (Climate and Equitable Jobs Act of 2021-TN11284). If phased out consistent with the CEJA, the NGCC plant would be replaced with offsite solar and wind energy installations within Illinois that include battery storage. These would include another eighteen 125 MW (gross) offsite solar energy installations, for a total of 36 solar energy installations, and six 300 MW (gross) offsite wind energy installations (CEG 2024-TN11347).

The NGCC plant would be constructed on site at DNPS within the 74 ac (30 ha) area described in Section 2.3.2.1. No additional land would be required for transmission infrastructure or natural gas pipelines (CEG 2024-TN11347).

Onsite solar energy installations would be installed on approximately 308 ac (124 ha), and an estimated 16,300 ac (6,600 ha) of land would be required for initial offsite solar energy installations (assuming 7.5 ac [3.0 ha] per MW) (CEG 2024-TN11347).

Once the NGCC plant is retired, power generation would be replaced with solar and wind energy installations located off site in Illinois. An additional eighteen 125 MW solar installations would require 16,300 ac (6,600 ha) of land. Six 300 MW wind installations would require 154,200 ac (62,400 ha) for wind farms, with 4,500 ac (1,800 ha) disturbed for construction, and 1,300 ac (500 ha) occupied by permanent structures. Land within wind farms not occupied by permanent structures may be available for other compatible uses (CEG 2024-TN11347).

On average, approximately 25 mi (40 km) of new 345 kV transmission lines, each with a right-of-way width of approximately 150 ft (46 m), would need to be developed to support each offsite solar and wind installation. Based on these assumptions, the 36 offsite solar energy installations (18 initial installations plus an additional 18 installations by 2045) and the 6 offsite wind energy installations would disturb approximately 455 ac (184 ha) each or approximately 19,100 ac (7,700 ha) in total.

2.4 Alternatives Considered but Eliminated

2.4.1 New Nuclear

Construction and operation of a new nuclear facility was considered but eliminated from detailed study because the Illinois State Legislature passed legislation prohibiting the construction of nuclear power plants in Illinois (IL Stat. 220-TN11210), with exceptions for small modular reactors with nameplate capacity less than 300 MW. While legislation has been proposed that would fully repeal the moratorium on all sizes of new nuclear facilities (IL P.A 103-0569 2024-TN11817, IL SB1527 2025-TN11820), until this moratorium is lifted, construction and operation of a new nuclear facility that would generate an equivalent amount of energy to the 1,845 MWe of DNPS is not a reasonable alternative for detailed study.

2.4.2 Solar Power

Solar power, including solar photovoltaic and concentrating solar power technologies, generates power from sunlight. Solar photovoltaic components convert sunlight directly into electricity using solar cells made from silicon or cadmium telluride. Concentrating solar power uses heat from the sun to boil water and produce steam. The steam then drives a turbine connected to a generator to ultimately produce electricity (NREL Undated-TN7710).

Solar generators are considered an intermittent resource because their availability depends on ambient exposure to the sun, also known as solar insolation. Further, to be viable, a utility-scale solar power alternative must replace the amount of electrical power that DNPS currently provides. Assuming a capacity factor of 25 percent (DOE/EIA 2023-TN8821), approximately 7,380 MWe of additional solar energy capacity would need to be installed to replace the 1,845 MWe of electricity generated by DNPS. Based on CEG's estimate of 5 to 7.5 ac (2 to 3 ha) of land per MW, this would require between 36,900 and 55,350 ac (14,900 and 22,400 ha) of land.

If the DNPS operating licenses are not renewed, it is unlikely that DNPS' generating capacity would be replaced by a single type of intermittent electricity generation, including a non-baseload resource such as utility-scale solar (CEG 2024-TN11347). A combination of energy sources, including sources described in Section 2.3.2.2, could complement each other and reduce issues such as the intermittency of wind and utility-scale solar power.

Considering the above factors, the NRC staff conclude that solar power energy facilities alone do not provide a reasonable alternative to DNPS SLR. However, solar power generation, in combination with other energy generating technologies, could be a reasonable alternative to DNPS SLR, as explained in Section 2.3.2.2.

2.4.3 Wind Power

As is the case with other renewable energy sources, the feasibility of wind power serving as an alternative baseload power depends on the location (relative to expected electricity users), value, accessibility, and constancy of the resource. Wind energy must be converted to electricity at or near the point where it is extracted, and currently there are limited energy storage opportunities available to overcome the intermittency and variability of wind resources.

The American Clean Power Association reports a total of more than 122,000 MW of installed wind energy capacity nationwide as of December 31, 2020 (DOE Undated-TN8431). To be considered a reasonable replacement power alternative to DNPS' SLR, a wind power alternative would have to replace the amount of electrical power that DNPS provides. Assuming a capacity factor of 41.4 percent for onshore wind facilities (DOE 2021-TN9562), land-based wind energy facilities would need to generate approximately 4,460 MW of electricity to replace 1,845 MWe of DNPS' generating capacity.

Using DOE metrics of 0.74 ac (0.30 ha) per MW for permanent structures, 2.47 ac (1.00 ha) per MW for construction footprint, and 85.24 ac (34.50 ha) per MW for wind farm boundaries (DOE 2015-TN8757), onshore wind farms could require 380,000 ac (154,000 ha) for wind farm boundaries, 11,000 ac (4,500 ha) for construction, and 3,300 ac (1,300 ha) for structures using a 41.4 percent capacity factor. Additionally, because wind is an intermittent energy source, energy storage would be needed, increasing land requirements. To meet this capacity requirement, different installations would be required to meet the land requirements (CEG 2024-TN11347).

The types of impacts of a standalone wind energy alternative would be similar to the effects of offsite wind energy generation under the combination alternative, but the magnitude of such impacts may differ based on the amount of wind energy capacity to be constructed. Given the intermittency of wind power, a standalone wind alternative was considered but eliminated from detailed study. However, wind power generation, in combination with other energy generating technologies, could be a reasonable alternative to DNPS SLR, as explained in Section 2.3.2.2.

2.4.4 Biomass Power

Biomass resources used for biomass-fired power generation include agricultural residues, animal manure, wood wastes from forestry and industry, residues from food and paper industries, municipal green wastes, dedicated energy crops, and methane from landfills (IEA 2007-TN8436). Using biomass-fired generation for baseload power depends on the geographic distribution, available quantities, constancy of supply, and energy content of biomass resources. For this analysis, the NRC staff assume that biomass would be combusted for power generation in the electricity sector.

As of 2023, 12 biomass facilities in Illinois generated approximately 55 MW of electricity, mostly from waste and methane gas from municipal landfills (2024 EIA-TN10937). For utility-scale biomass electricity generation, the NRC staff assume that the technologies used for biomass conversion would be similar to the technology used in other fossil fuel plants, including the direct combustion of biomass in a boiler to produce steam (NRC 2024-TN10161). Accordingly, biomass generation is considered a carbon-emitting technology. Biomass energy generation is generally more cost effective when co-located with coal-fired power plants (IEA 2007-TN8436). However, most biomass fuel-fired power plants generally only reach capacities of 50 MWe, with large plants reaching 100–120 MWe. Replacing DNPS’ generating capacity using only biomass fuel would require the construction of 15 to 16 large facilities (CEG 2024-TN11347).

Increasing biomass fuel-fired generation capacity by expanding existing or constructing new units by the time DNPS’ current operating licenses expire is unlikely. Additionally, the ability to generate baseload power is limited by the need to site multiple smaller biomass facilities in close proximity to substantial fuel sources. For these reasons, biomass fuel-fired generation is not a reasonable alternative to DNPS SLR.

2.4.5 Hydroelectric Power

As of 2020, there were approximately 2,300 hydroelectric facilities operating in the United States (DOE Undated-TN7701). Hydroelectric technology captures flowing water and directs it to a turbine and generator to produce electricity (NRC 2024-TN10161). There are three variants of hydroelectric power: (1) run-of-the-river (diversion) facilities that redirect the natural flow of a river, stream, or canal through a hydroelectric facility, (2) store-and-release facilities that block the flow of the river by using dams that cause water to accumulate in an upstream reservoir, and (3) pumped-storage facilities that use electricity from other power sources to pump water to higher elevations during off peak load periods to be released during peak load periods through the turbines to generate additional electricity (EIA 2020-TN8352, EIA 2021-TN8353).

Although EIA projects that hydropower will remain a leading source of renewable power generation in the United States through 2040, there is little expected growth in large-scale hydropower capacity (DOE/EIA 2013-TN2590). The potential construction of large new hydropower facilities has diminished because of public concern over flooding, habitat alteration and loss, and the impact on natural rivers (NRC 2024-TN10161).

The dam with the greatest potential to produce hydropower electricity in Illinois (496 MW) is the Ohio River Locks and Dam at the Illinois/Kentucky border (ORNL 2012-TN8440), which alone would not be sufficient to replace DNPS' generation capacity.

Because of the lack of potential sites and the environmental constraints associated with the development of multiple new hydropower facilities in Illinois, a hydropower alternative was eliminated from detailed study.

2.4.6 Geothermal Power

Geothermal technologies extract the heat contained in geologic formations to produce steam to drive a conventional steam turbine generator. Facilities producing electricity from geothermal energy have demonstrated capacity factors of 95 percent or greater, making geothermal energy a potential source of baseload electric power. However, the feasibility of geothermal power generation to provide baseload power depends on the regional quality and accessibility of geothermal resources. Utility-scale geothermal energy generation requires geothermal reservoirs with a temperature above 200°F (93°C). Known utility-scale geothermal resources are concentrated in the Western United States, specifically Alaska, Arizona, California, Colorado, Hawaii, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, and Wyoming. In general, most assessments of geothermal resources have been concentrated on these Western States (DOE Undated-TN7698; USGS 2008-TN7697). Illinois has limited potential for geothermal energy (CEG 2024-TN11347). Given its low potential, geothermal power generation is not a reasonable alternative to DNPS SLR.

2.4.7 Ocean Wave, Current, and Tide Energy

Ocean waves, currents, and tides are generally predictable and reliable, making them attractive candidates for potential renewable energy generation. Four major technologies can be suitable to harness wave energy: (1) terminator devices that range from 500 kilowatts (kW) to 2 MW, (2) attenuators, (3) point absorbers, and (4) overtopping devices (BOEM Undated-TN7696). Point absorbers and attenuators use floating buoys to convert wave motion into mechanical energy, driving a generator to produce electricity. Overtopping devices trap a portion of a wave at a higher elevation than the sea surface; waves then enter a tube and compress air that is used to drive a generator that produces electricity (NRC 2024-TN10161). Some of these technologies are undergoing demonstration testing at commercial scales, but none are currently used to provide baseload power (BOEM Undated-TN7696). In the United States, there are currently several projects licensed or seeking permits, the largest of which is 20 MW (Duke Energy 2021-TN8897).

While Illinois borders Lake Michigan, application of wave energy technologies would not be viable, as wave energy technologies, particularly on lakes, are still in development and currently lack commercial application (EPRI 2011-TN8442). Therefore, ocean wave, current, and tide energy power generation is not a reasonable alternative to DNPS SLR.

2.4.8 Petroleum-Fired Power

The variable costs and environmental impacts of petroleum-fired generation tend to be greater than those of natural gas-fired generation. The historically higher cost of oil has also resulted in a steady decline in its use for electricity generation, and the EIA forecasts no growth in capacity using petroleum-fired power plants through 2040 (DOE/EIA 2013-TN2590, DOE/EIA 2015-TN4585). In 2021, Illinois signed the CEJA (TN11284) into law, requiring all EGUs and LGUs using oil as a fuel to “permanently reduce all CO_2e and co pollutant emissions to zero no later than January 1, 2030,” with exceptions for ongoing operation of LGUs and EGUs necessary to maintain power grid supply and reliability or as necessary to serve as an emergency backup to operations (Climate and Equitable Jobs Act of 2021-TN11284). Based on this information, petroleum-fired electricity generation is not a reasonable alternative to DNPS SLR.

2.4.9 Coal-Fired Power

Although coal has historically been the largest source of electricity in the United States, both natural gas generation and nuclear energy generation surpassed coal generation at the national level in 2020. Coal-fired electricity generation in the United States has continued to decrease as coal-fired generating units have been retired or converted to use other fuels and as the remaining coal-fired generating units have been used less often (DOE/EIA 2021-TN7718).

Baseload coal units have proven their reliability and can routinely sustain capacity factors as high as 85 percent. Among the technologies available, pulverized coal boilers producing supercritical steam (supercritical pulverized coal boilers) have become increasingly common at newer coal-fired plants, given their generally high thermal efficiencies and overall reliability.

Supercritical pulverized coal facilities are more expensive than subcritical coal-fired power plants to construct, but they consume less fuel per unit output, reducing environmental impacts. Integrated gasification combined cycle is another technology that generates electricity from coal. It combines modern coal gasification technology with both gas turbine and steam turbine power generation. The technology is cleaner than conventional pulverized coal plants because some of the major pollutants are removed from the gas stream before combustion. Although several smaller, integrated gasification combined-cycle power plants have been in operation since the mid-1990s, more recent large-scale projects using this technology have experienced setbacks and opposition that have hindered the technology from being fully integrated into the energy market. In 2021, Illinois signed the CEJA (TN11284) into law, requiring all EGUs and LGUs using coal as a fuel to “permanently reduce all CO_2e and copollutant emissions to zero no later than January 1, 2030,” with exceptions for ongoing operation of LGUs and EGUs necessary to maintain power grid supply and reliability or as necessary to serve as an emergency backup to operations (Climate and Equitable Jobs Act of 2021-TN11284). Based on this information, coal-fired electricity generation is not a reasonable alternative to DNPS SLR.

2.4.10 Fuel Cells

Fuel cells oxidize fuels without combustion and, therefore, without the environmental side effects of combustion. Fuel cells use a fuel (e.g., hydrogen) and oxygen to create electricity through an electrochemical process. The only byproducts are heat, water, and carbon dioxide (depending on the hydrogen fuel type). Hydrogen fuel can come from a variety of hydrocarbon resources. Natural gas is a typical hydrogen source. As of March 2024, the United States had approximately 380 MW of fuel cell generation capacity (EIA 2024-TN11062).

Currently, fuel cells are not economically or technologically competitive with other alternatives for electricity generation. The EIA estimates that fuel cells may cost $6,866 per installed kW (total overnight capital costs in 2020 dollars), which is high compared to other alternative technologies analyzed in this section (DOE/EIA 2022-TN7694). In June 2021, DOE launched an initiative to reduce the cost of hydrogen production to spur fuel cell and energy storage development over the next decade (DOE 2021-TN7693). However, it is unclear whether and to what degree this initiative will lead to increased development and deployment of fuel cell technologies in the future.

Furthermore, fuel cell units used for power production are likely to be small (approximately 10 MW). The world's largest industrial hydrogen fuel cell power plant is a 50 MWe plant that came online in South Korea in 2020 (Larson 2020-TN8401). Using 10 MW fuel cells to replace the power that DNPS provides would require the construction of approximately 185 units. Given the limited deployment and high cost of fuel cell technology, fuel cells are not a reasonable alternative to DNPS SLR.

2.4.11 Purchased Power

It is possible that replacement power may be purchased and imported from outside the DNPS region of influence. Although purchased power would likely have little or no measurable environmental impact in the immediate vicinity of DNPS, impacts could occur where the power is generated or anywhere along the transmission route, depending on the generation technologies used to supply the purchased power (NRC 2024-TN10161).

Purchased power is generally economically adverse because, historically, the cost of generating power has been less than the cost of purchasing the same amount of power from a third-party supplier. Power purchase agreements also carry the inherent risk that the supplying plant will not deliver the contracted power. Given the uncertainties of the availability of baseload power on a long-term basis at the scale of DNPS' power generation capacity and potential environmental impacts of developing new power generation, purchased power is not a reasonable alternative to DNPS SLR.

2.4.12 Delayed Retirement of Other Generating Facilities

Delaying the retirement of a power plant enables it to continue supplying electricity. A delayed retirement alternative would delay the retirement of generating facilities (other than DNPS) within or near the region of influence.

Power plants are retired for several reasons. Because generators are required to adhere to additional regulations that will require significant reductions in plant emissions, some power plant owners may opt for early retirement of older units (which often generate more pollutants and are less efficient) rather than incur the cost for compliance. Additional retirements may be driven by low competing commodity prices (such as low natural gas prices), slow growth in electricity demand, and the requirements of the EPA 's Mercury and Air Toxics Standards (DOE/EIA 2015-TN4585; EPA 2020-TN8379). CEG does not have any coal-, natural gas- or oil-fired power plants within Illinois that could provide replacement power within the same region of influence as DNPS. Four of CEG's nuclear generation assets in Illinois (i.e., Braidwood, Byron, LaSalle, and Quad Cities) are currently operating under licenses that would expire after the term of DNPS' renewed operating licenses; therefore, these assets would not be available to provide replacement power if DNPS were retired. Clinton Power Station, another CEG nuclear power plant in Illinois, is currently in the LR process but would not provide sufficient power to replace DNPS. Because of these conditions, delayed retirement of older power generating units is not a reasonable alternative to DNPS SLR.

2.4.13 Demand-Side Management/Energy Conservation/Energy Efficiency

Demand-side management refers to energy conservation and efficiency programs that do not require the addition of new generating capacity. To be a viable alternative for DNPS, a baseload reduction of 1,845 MWe would be required. Demand-side management programs can include reducing energy demand through consumer behavioral changes or through altering the characteristics of the electrical load. These programs can be initiated by a utility, transmission operators, the State, or other load serving entities. In general, residential electricity consumers have been responsible for the majority of peak load reductions, and participation in most demand-side management programs is voluntary (NRC 2024-TN10161).

The existence of a demand-side management program does not guarantee that reductions in electricity demand will occur. The LR GEIS concludes that, although the energy conservation or energy efficiency potential in the United States is substantial, there are no cases in which an energy efficiency or conservation program alone has been implemented expressly to replace or offset a large baseload generation station (NRC 2024-TN10161). Therefore, demand-side management programs alone are not a reasonable alternative to the DNPS SLR. However, in combination with other power generating technologies, demand-side management could be a reasonable alternative to DNPS SLR.

2.5 Comparison of Alternatives

In this chapter, the NRC staff present two alternatives to the proposed action (DNPS SLR): (1) natural gas and (2) renewable and natural gas combination. Chapter 3 describes the environmental impacts of the proposed action and alternatives to the proposed action. Table 2-2 summarizes these environmental impacts. The NRC assigns an environmental impact significance level of SMALL, MODERATE, or LARGE for nuclear plant-specific issues. For ecological resources subject to the ESA (TN1010) and the Magnuson–Stevens Fishery Conservation and Management Act of 1976, as amended (MSA) (TN9966); and historic and cultural resources subject to the NHPA (TN4157), the impact significance determination language is specific to the respective law.

The environmental impacts of the proposed action would be SMALL for all environmental issues except aquatic resources has a SMALL to MODERATE impact. In comparison, each of the replacement power alternatives have the potential to have greater environmental impacts than the proposed action. If the NRC does not renew the DNPS operating licenses (i.e., the no-action alternative), energy-planning decision-makers would have to choose a replacement power alternative similar to those evaluated in this SEIS. Based on the review of the replacement power alternatives, the no-action alternative, and the proposed action, the environmentally preferred alternative is the proposed action. Therefore, the NRC staff's preliminary recommendation is to renew the DNPS operating licenses.

Table 2-2 Summary of Environmental Impacts of the Proposed Action and Alternatives for Dresden Nuclear Power Station

Impact Area (Resource)	DNPS SLR (Proposed Action)	No-Action	Natural Gas	Renewable and Natural Gas Combination
Land Use	SMALL	SMALL	SMALL	LARGE
Visual Resources	SMALL	SMALL	SMALL	SMALL to LARGE
Air Quality	SMALL	SMALL	MODERATE	SMALL to MODERATE
Noise	SMALL	SMALL	SMALL	SMALL to MODERATE
Geologic Environment	SMALL	SMALL	SMALL	SMALL to MODERATE
Water Resources	SMALL	SMALL	SMALL	SMALL
Terrestrial Resources	SMALL	SMALL	SMALL	SMALL to LARGE
Aquatic Resources	SMALL to MODERATE	SMALL	SMALL	SMALL to MODERATE
Federally Protected Ecological Resources	See Note[(a)]	See Note[(b)]	See Note[(c)]	See Note[(c)]
Historic and Cultural Resources	See Note[(d)]	See Note[(e)]	See Note[(f)]	See Note[(f)]
Socioeconomics	SMALL	SMALL to MODERATE	SMALL to LARGE	SMALL to MODERATE
Transportation	SMALL	SMALL	SMALL to LARGE	SMALL to MODERATE
Human Health	SMALL[(g)]	SMALL	SMALL	SMALL
Waste Management	SMALL[(h)]	SMALL[(h)]	SMALL	SMALL
Greenhouse Gas Emissions	SMALL	SMALL	MODERATE	SMALL to MODERATE

CEG = Constellation Energy Generation, LLC; DNPS = Dresden Nuclear Power Station; EFH = essential fish habitat; NEPA = National Environmental Policy Act of 1969; NHPA= National Historic Preservation Act of 1966; NRC = U.S. Nuclear Regulatory Commission; SHPO = State historical preservation officer; SLR = subsequent license renewal; U.S.C. = *United States Code*.

(a) Table 3-17 presents effects determinations for federally listed species under U.S. Fish and Wildlife Service jurisdiction.

(b) Overall, the effects on federally listed species would likely be smaller under the no-action alternative than the effects under continued operation but would depend on the specific shut down activities as well as the listed species present when the no-action alternative is implemented.

(c) The types and magnitudes of adverse impacts to species listed in the Endangered Species Act of 1973 (TN1010), as amended (16 U.S.C 1531 et seq.), designated critical habitat, and EFH would depend on the proposed alternative site, facility design and operation, as well as listed species and habitats present when the alternative is implemented. Therefore, the NRC staff cannot forecast a level of impact for this alternative.

(d) Based on the presence of historic properties within and near the area of potential effect, Tribal input, CEG administrative procedures, and no planned physical changes or ground-disturbing activities, the proposed action (subsequent license renewal) would not adversely affect historic properties under Section 106 of the NHPA (TN4157) or historic and cultural resources under NEPA.

(e) Until the post-shutdown decommissioning activities report is submitted, the NRC cannot determine whether historic properties would be affected outside the existing industrial site boundary after the nuclear plant is shut down.

(f) The impact determination of this alternative would depend on the specific sites at which ground disturbing activities would occur. Impacts would be assessed, determined, and mitigated with the SHPO and any Tribe that attaches religious and cultural significance to identified historic properties through the Section 106 consultation process.

(g) The chronic effects of electromagnetic fields on human health associated with operating nuclear power and other electricity generating plants are uncertain.

Table 2 2 Summary of Environmental Impacts of the Proposed Action and Alternatives for Dresden Nuclear Power Station (Continued)

(h) NUREG-2157, *Generic Environmental Impact Statement for Continued Storage of Spent Nuclear Fuel* (NRC 2014-TN4117), discusses the environmental impacts of spent fuel storage for the time frame beyond the licensed life of the reactor operations.

3 AFFECTED ENVIRONMENT, ENVIRONMENTAL CONSEQUENCES, AND MITIGATING ACTIONS

3.1 Introduction

In conducting its review of the environmental effects of the proposed action of renewing the DNPS operating licenses for an additional 20 years, the NRC staff describe the environment that could be affected by the proposed action. The NRC staff also evaluate the environmental consequences of the proposed action as well as alternatives to the proposed action.

In this chapter, the NRC staff first define the affected environment as the environment that currently exists at and around the DNPS site. Because existing conditions are at least partially the result of past construction and nuclear power plant operations, this chapter considers the nature and impacts of past and ongoing actions and evaluates how, together, these actions have shaped the current environment. This chapter also describes reasonably foreseeable environmental trends. The effects of ongoing reactor operations at the site have become well established as environmental conditions have adjusted to the presence of the facility. Where appropriate, the NRC staff summarized referenced information (incorporated information by reference) in this SEIS. This allows the NRC staff to focus on new and potentially significant information identified since previous NEPA documentation became available for DNPS.

Sections 3.2 through 3.13 describe the affected environment for each resource area, followed by the NRC staff's evaluation of the environmental consequences of the proposed action and alternatives to the proposed action on each associated environmental issue. The NRC compares the environmental impacts of the proposed action with those of the no-action alternative and replacement power alternatives to determine whether the adverse environmental impacts of the proposed action are so great that preserving the option for energy-planning decisionmakers would be unreasonable.

The evaluation of environmental consequences includes the following:

- impacts associated with continued operations of DNPS during the period of extended operation
- impacts of replacement power alternatives to the proposed action and the no-action alternative (not issuing the renewed licenses)
- impacts common to all alternatives: (1) fuel cycle, including uranium fuel cycle, (2) terminating DNPS operations and decommissioning, and (3) GHG emissions and climate change
- impacts of postulated accidents (design-basis accidents and severe accidents)
- cumulative effects of the proposed action
- resource commitments associated with the proposed action, including unavoidable adverse impacts, the relationship between short-term use and long-term productivity, and irreversible and irretrievable commitment of resources
- new and potentially significant information about environmental issues related to the impacts of continued operations during the SLR term

As stated in Sections 1.4 and 1.5, this SEIS documents the NRC staff's environmental review of the DNPS SLRA (CEG 2024-TN11348) as a supplement to the LR GEIS (NRC 2024-TN10161). The LR GEIS identifies 80 issues (divided into Category 1 [generic] and Category 2 [nuclear plant-specific] issues) to be evaluated for the proposed action. Section 1.4 of this SEIS provides an explanation of the criteria for Category 1 issues and Category 2 issues, as well as the definitions of SMALL, MODERATE, and LARGE impact significance.

For the evaluation of Category 1 issues in this SEIS, the NRC staff rely on the analysis in the LR GEIS unless otherwise noted. Table 3-1 lists the impact findings for Category 1 issues applicable to DNPS SLRA. For these issues, which are discussed in Sections 3.2 to 3.13, the NRC staff did not identify any new and significant information that would change the conclusions of the LR GEIS. Section 3.14 describes the NRC staff's process for evaluating new and significant information.

Table 3-1 Applicable Category 1 (Generic) Issues for Dresden Nuclear Power Station

Environmental Category – Issue	LR GEIS Section	Impact Finding
Land Use – Onsite land use	4.2.1.1.1	SMALL
Land Use – Offsite land use	4.2.1.1.2	SMALL
Visual Resources – Aesthetic impacts	4.2.1.2.1	SMALL
Air Quality – Air quality impacts	4.3.1.1.1	SMALL
Air Quality – Air quality effects of transmission lines	4.3.1.1.2	SMALL
Noise – Noise impacts	4.3.1.2.1	SMALL
Geologic Environment – Geology and soils	4.4.1.1	SMALL
Surface Water Resources – Surface water use and quality (non-cooling system impacts)	4.5.1.1.1	SMALL
Surface Water Resources – Altered current patterns at intake and discharge structures	4.5.1.1.2	SMALL
Surface Water Resources – Scouring caused by discharged cooling water	4.5.1.1.5	SMALL
Surface Water Resources – Discharge of metals in cooling system effluent	4.5.1.1.6	SMALL
Surface Water Resources – Discharge of biocides, sanitary wastes, and minor chemical spills	4.5.1.1.7	SMALL
Surface Water Resources – Surface water use conflicts (plants with once-through cooling systems)	4.5.1.1.8	SMALL
Surface Water Resources – Effects of dredging on surface water quality	4.5.1.1.10	SMALL
Surface Water Resources – Temperature effects on sediment transport capacity	4.5.1.1.11	SMALL
Groundwater Resources – Groundwater contamination and use (non-cooling system impacts)	4.5.1.2.1	SMALL
Groundwater Resources – Groundwater use conflicts (plants that withdraw less than 100 gallons per minute [gpm])	4.5.1.2.2	SMALL
Groundwater Resources – Groundwater quality degradation resulting from water withdrawals	4.5.1.2.5	SMALL
Terrestrial Resources – Exposure of terrestrial organisms to radionuclides	4.6.1.1.2	SMALL
Terrestrial Resources – Cooling tower impacts on terrestrial plants	4.6.1.1.4	SMALL
Terrestrial Resources – Bird collisions with plant structures and transmission lines	4.6.1.1.5	SMALL

Table 3-1 Applicable Category 1 (Generic) Issues for Dresden Nuclear Power Station (Continued)

Environmental Category – Issue	LR GEIS Section	Impact Finding
Terrestrial Resources – Transmission line right-of-way (ROW) management impacts on terrestrial resources	4.6.1.1.7	SMALL
Terrestrial Resources – Electromagnetic fields effects on terrestrial plants and animals	4.6.1.1	SMALL
Aquatic Resources – Entrainment of phytoplankton and zooplankton	4.6.1.2.3	SMALL
Aquatic Resources – Infrequently reported effects of thermal effluents	4.6.1.2.6	SMALL
Aquatic Resources – Effects of nonradiological contaminants on aquatic organisms	4.6.1.2.7	SMALL
Aquatic Resources – Exposure of aquatic organisms to radionuclides	4.6.1.2.8	SMALL
Aquatic Resources – Effects of dredging on aquatic resources	4.6.1.2.9	SMALL
Aquatic Resources – Non-cooling system impacts on aquatic resources	4.6.1.2.11	SMALL
Aquatic Resources – Impacts of transmission line right-of-way on aquatic resources	4.6.1.2.12	SMALL
Socioeconomics – Employment and income, recreation, and tourism	4.8.1.1	SMALL
Socioeconomics – Tax revenue	4.8.1.2	SMALL
Socioeconomics – Community services and education	4.8.1.3	SMALL
Socioeconomics – Population and housing	4.8.1.4	SMALL
Socioeconomics – Transportation	4.8.1.5	SMALL
Human Health – Radiation exposures to plant workers	4.9.1.1.1	SMALL
Human Health – Radiation exposures to the public	4.9.1.1.1	SMALL
Human Health – Chemical hazards	4.9.1.1.2	SMALL
Human Health – Microbiological hazards to plant workers	4.9.1.1.3	SMALL
Human Health – Physical occupational hazards	4.9.1.1.5	SMALL
Postulated Accidents – Design-basis accidents	4.9.1.2.1	SMALL
Postulated Accidents – Severe accidents	4.9.1.2.1	SMALL[a]
Waste Management – Low-level waste storage and disposal	4.11.1.1	SMALL
Waste Management – Onsite storage of spent nuclear fuel	4.11.1.2	SMALL
Waste Management – Offsite radiological impacts of spent nuclear fuel and high-level waste disposal	4.11.1.3	[b]
Waste Management – Mixed-waste storage and disposal	4.11.1.4	SMALL
Waste Management – Nonradioactive waste storage and disposal	4.11.1.5	SMALL
Greenhouse Gas Emissions and Climate Change – Greenhouse gas impacts on climate change	4.12.1	SMALL
Uranium Fuel Cycle – Offsite radiological impacts—individual impacts from other than the disposal of spent fuel and high-level waste	4.14.1.5	SMALL
Uranium Fuel Cycle – Offsite radiological impacts—collective impacts from other than the disposal of spent fuel and high-level waste	4.14.1.5	[c]
Uranium Fuel Cycle – Nonradiological impacts of the uranium fuel cycle	4.14.1.5	SMALL
Uranium Fuel Cycle – Transportation	4.14.1.5	SMALL
Termination of Nuclear Power Plant Operations and Decommissioning	4.14.2.1.1	SMALL

Table 3-1 Applicable Category 1 (Generic) Issues for Dresden Nuclear Power Station (Continued)

CFR = *Code of Federal Regulations*; DNPS = Dresden Nuclear Power Station; LR GEIS = license renewal generic environmental impact statement; NEPA = National Environmental Policy Act; NRC = U.S. Nuclear Regulatory Commission; ROW = right-of-way; SAMA = severe accident mitigation alternative; SEIS = supplemental environmental impact statement.

(a) Although the probability-weighted consequences of atmospheric releases, fallout onto open bodies of water, releases to groundwater, and societal and economic impacts from severe accidents are small for all plants, the topic of SAMA analysis is separately considered in this SEIS as if it were a Category 2 issue because the NRC staff has not previously considered a SAMA analysis for DNPS as part of an environmental review and because 10 CFR 51.53(c)(3)(ii)(L) states that, "[i]f the staff has not previously considered severe accident mitigation alternatives for the applicant's plant, in an environmental impact statement or related supplement or in an environmental assessment, a consideration of alternatives to mitigate severe accidents must be provided" (TN10253).

(b) The ultimate disposal of spent fuel in a potential future geologic repository is a separate and independent licensing action that is outside the regulatory scope of this review. Per 10 CFR Part 51 (TN10253) Subpart A, the Commission concludes that the impacts presented in NUREG-2157 (NRC 2014-TN4117) would not be sufficiently large to require the NEPA conclusion, for any plant, that the option of extended operation under 10 CFR Part 54 (TN4878) should be eliminated. Accordingly, while the Commission has not assigned a single level of significance for the impacts of spent nuclear fuel and high-level waste disposal, this issue is considered generic to all nuclear power plants.

(c) There are no regulatory limits applicable to collective doses to the general public from fuel cycle facilities. The practice of estimating health effects on the basis of collective doses may not be meaningful. All fuel cycle facilities are designed and operated to meet the applicable regulatory limits and standards. As stated in the LR GEIS, "The Commission concludes that the impacts are acceptable in that these impacts would not be sufficiently large to require the NEPA conclusion, for any plant, that the option of extended operation under 10 CFR Part 54 should be eliminated" (NRC 2024-TN10161).

Sources: Table B-1 in Appendix B to Subpart A of 10 CFR Part 51-TN10253; NRC 2024-TN10161.

The NRC staff analyzed the Category 2 (nuclear plant-specific) issues applicable to DNPS during the proposed SLR term and assigned impacts to these issues as shown in Table 3-2.

Table 3-2 Applicable Category 2 (Plant-Specific) Issues for Dresden Nuclear Power Station

Environmental Category – Issue	LR GEIS Section	Impact Finding[a]
Surface Water Resources – Surface water use conflicts (plants with cooling ponds or cooling towers using makeup water from a river)	4.5.1.1.9	SMALL
Groundwater Resources – Groundwater use conflicts (plants with closed-cycle cooling systems that withdraw makeup water from a river)	4.5.1.2.4	SMALL
Groundwater Resources – Groundwater quality degradation (plants with cooling ponds)	4.5.1.2.6	SMALL
Groundwater Resources – Radionuclides released to groundwater	4.5.1.2.7	SMALL
Terrestrial Resources – Non-cooling system impacts on terrestrial resources	4.6.1.1.1	SMALL
Terrestrial Resources – Water use conflicts with terrestrial resources (plants with cooling ponds or cooling towers using makeup water from a river)	4.6.1.1.6	SMALL
Aquatic Resources – Impingement mortality and entrainment of aquatic organisms (plants with oncethrough cooling systems or cooling ponds)	4.6.1.2.1	SMALL
Aquatic Resources – Effects of thermal effluents on aquatic organisms (plants with once-through cooling systems or cooling ponds)	4.6.1.2.4	SMALL
Aquatic Resources – Water use conflicts with aquatic resources (plants with cooling ponds or colling towers using makeup water from a river)	4.6.1.2.10	SMALL to MODERATE

Table 3-2 Applicable Category 2 (Plant-Specific) Issues for Dresden Nuclear Power Station (Continued)

Environmental Category – Issue	LR GEIS Section	Impact Finding[(a)]
Federally Protected Ecological Resources – Endangered Species Act: Federally listed species and critical habitats under U.S. Fish and Wildlife Service jurisdiction[(b)]	4.6.1.3.1	See Section 3.8 of this SEIS.
Historic and Cultural Resources – Historic and cultural resources	4.7.1	See Section 3.9 of this SEIS.
Human Health – Microbiological hazards to the public	4.9.1.1.3	SMALL
Human Health – Electromagnetic fields (EMFs)[(c)]	4.9.1.1.4	Uncategorized (Uncertain Impact)
Human Health – Electric shock hazards	4.9.1.1.5	SMALL
Greenhouse Gas Emissions and Climate Change – Climate change impacts on environmental resources	4.12.2	See Section 3.15.3.3.2 of this SEIS.
Cumulative Effects – Cumulative effects	4.13	See Section 3.16 of this SEIS.

CFR = *Code of Federal Regulations*; EMFs = electromagnetic fields; LR GEIS = license renewal generic environmental impact statement; SEIS = supplemental environmental impact statement.

(a) Impact determinations for Category 2 issues based on findings described in Sections 3.2 to 3.13, as applicable, for the proposed action.

(b) Staff have determined that no federally listed species and critical habitats under the National Marine Fisheries Service jurisdiction occur within the action area; similarly, no Essential Fish Habitat or National Marine Sanctuaries occur near the proposed project.

(c) This issue was not designated as Category 1 or Category 2 and is discussed in Section 3.11.6.2.

Sources: Table B-1 in Appendix B to Subpart A of 10 CFR Part 51-TN10253; NRC 2024-TN10161.

3.2 Land Use and Visual Resources

Operating nuclear power plants are located on land specifically designated and zoned for industrial use. The visual appearance of the nuclear power plant is also industrial. Sections 2.2.1, 2.2.8.3, and 2.2.8.4 of the SEIS for the initial LR of DNPS describe land use and visual resource conditions at DNPS (NRC 2004-TN7247). This information is incorporated here by reference.

The following describes current land use and visual resource conditions in the vicinity of the DNPS site, as well as the potential impacts from the proposed action of SLR and alternatives to the proposed action. Section 3.2 of CEG’s ER describes current DNPS onsite and offsite land use conditions as well as visual resources (CEG 2024-TN11347).

3.2.1 Land Use

DNPS is located on approximately 2,459 ac (955 ha) to the south of the Illinois River, at the confluence of the Kankakee and Des Plaines Rivers in northeastern Illinois. Most of the DNPS site is located in Grundy County, while a portion of the cooling lake and site boundary extends into Will County.

The nearest communities to DNPS are Channahon (population 13,383), located approximately 4 mi (6 km) to the northeast, and Minhooka (population 12,758) located approximately 5 mi (8 km) to the north. The City of Chicago (population 2,746,388) is located approximately 45 mi (72 km) northeast of DNPS.

3.2.1.1 Onsite Land Use

The developed portions of the DNPS site comprise the reactor facilities and supporting infrastructure, intake and discharge canal system, cooling lake, railroad lines, and shoreline areas along the Kankakee, Des Plaines, and Illinois Rivers. Much of the land within the site boundary is designated for industrial use. As shown in Table 3-3, the predominant land cover within the DNPS site is open water (48 percent), which is primarily associated with the cooling lake. The rest of the DNPS site is in natural conditions (e.g., grassland/herbaceous and woody wetlands).

Table 3-3 Land Use/Land Cover within the Dresden Nuclear Power Station Site

Category	Acres	Percentage
Open Water	1,196.70	48.3
Developed, Open Space	27.60	1.1
Developed, Low Intensity	155.20	6.3
Developed, Medium Intensity	92.70	3.7
Developed, High Intensity	125.40	5.1
Barren Land (Rock/Sand/Clay)	3.34	0.1
Deciduous Forest	24.00	1.0
Shrub/Scrub	0.70	0.0
Grassland/Herbaceous	553.50	22.3
Hay/Pasture	90.07	3.6
Cultivated Crops	7.80	0.3
Woody Wetlands	134.30	5.4
Emergent Herbaceous Wetlands	65.60	2.6
Total	**2,476.91**	**100**

Source: CEG 2024-TN11347.

The DNPS site is zoned by Grundy County as an Industrial District, while the portion in Will County is zoned as A-1 for agricultural use (GEDC 2014-TN11662; WC 2019-TN11663).

DNPS is not located in a coastal zone as defined in the National Coastal Zone Management Program; as such, compliance with the Coastal Zone Management Act is not required.

Access to DNPS is primarily via North Dresden Road, while Interstate 55 serves as the primary transportation corridor. A spur rail from the Canadian National Railway provides access to DNPS (CEG 2024-TN11347).

3.2.1.2 Offsite Land Use

Offsite land use within a 6 mi (10 km) radius of DNPS includes portions of Grundy and Will Counties. As shown in Table 3-4, the largest land use/land cover in the vicinity is cultivated crops (28 percent), with other predominant land uses including grassland/herbaceous (12 percent), open water (11 percent), deciduous forest (11 percent), and woody wetlands (10 percent).

Table 3-4 Land Cover within a 6 mi Radius of the Dresden Nuclear Power Station

Category	Acres	Percentage
Open Water	7,772.25	10.7
Developed, Open Space	3,248.96	4.5
Developed, Low Intensity	5,552.97	7.7
Developed, Medium Intensity	3,851.21	5.3
Developed, High Intensity	2,793.28	3.9
Barren Land (Rock/Sand/Clay)	275.10	0.40
Deciduous Forest	7,749.56	10.7
Evergreen Forest	15.35	0.02
Mixed Forest	97.19	0.10
Shrub/Scrub	44.48	0.10
Grassland/Herbaceous	8,514.82	11.8
Hay/Pasture	2,222.83	3.1
Cultivated Crops	19,921.67	27.5
Woody Wetlands	7,373.27	10.2
Emergent Herbaceous Wetlands	2,983.65	4.1
TOTAL	**72,416.59**	**100**

Source: CEG 2024-TN11347.

Grundy County comprises 267,576 ac (108,284 ha), of which 188,601 ac (76,324 ha) are farmland. As of 2022, there were 437 farms within Grundy County, producing crops including corn for grain, soybeans, forage, wheat for grain, and nursery stock crops. Livestock includes hogs and pigs, layers, cattle and calves, sheep and lambs, goats, turkeys, and horses and ponies. Other agricultural uses include woodland and pastureland (USDA 2022-TN11664).

Will County comprises 535,255 ac (216,610 ha), of which 241,269 ac (97,638 ha) are farmland. As of 2022, there were 780 farms within Will County, producing crops including soybeans, corn for grain, forage, wheat for grain, and nursery stock crops. Livestock includes broilers, hogs and pigs, layers, pullets, horses and ponies, cattle and calves, goats, sheep and lambs, and turkeys. Other agricultural uses include woodland and pastureland (USDA 2022-TN11665).

Both Grundy and Will Counties issued comprehensive plans to guide planning and development within the respective county. Grundy County's Comprehensive Plan was issued in 2014 (TN11662), while Will County's Masterplan was updated in 2019 (TN11663).

Offsite transportation includes four railroads within 5 mi (8 km) of DNPS, Grundy County Transit, Amtrak, seven airports within 10 mi (16 km) of DNPS, and cargo barges, including barges passing through the Dresden Island Lock and Dam, located approximately 1 mi (1.6 km) northeast of DNPS (CEG 2024-TN11347).

3.2.2 Visual Resources

Predominant visual features at DNPS include the Units 2 and 3 reactor containment building, turbine building, Unit 1 containment sphere, chimneys, and transmission lines. The Units 2 and 3 chimney is the tallest and most visible feature on the site at approximately 310 ft (94 m) tall. Fogging associated with the cooling lake can be seen during colder months under certain weather conditions. Trees have been planted to provide visual screening, although the DNPS facilities can be seen from residential areas along North Dresden Road and East Collins Road to the south, by recreational and commercial traffic on the Illinois, Kankakee, and Des Plaines Rivers, and via the Illinois and Michigan Canal trail that runs on the north bank of the Illinois and Des Plaines Rivers.

3.2.3 Proposed Action

As explained in the LR GEIS (NRC 2024-TN10161), land use and visual resources would be unaffected by SLR and continued nuclear power plant operations and refurbishment-related activities. Nuclear power plant operations at the DNPS site have not changed appreciably with time, and no change in the industrial use and visual appearance of the nuclear power plant are expected during the SLR term. As cited in Table 3-1, land use and visual impacts of nuclear power plant SLR would be SMALL. In addition, the NRC staff did not identify any new and significant information that would change the SLR land use and visual impact conclusions in the LR GEIS.

3.2.3.1 Onsite Land Use

Operational activities during the SLR term would be consistent with the industrial use of the site and would be no different from those already occurring at DNPS. Current onsite industrial land use activities would continue unchanged. There would be no additional land use changes during the SLR term.

3.2.3.2 Offsite Land Use

LR activities have had little to no effect on population or tax revenue in communities near nuclear power plants. Employment levels at DNPS have remained relatively unchanged with no increased demand for housing, infrastructure improvements, or services. Operational activities during the SLR term would be no different from those currently occurring at the DNPS site and would not affect offsite land use beyond what has already been affected.

3.2.3.3 Visual Resources

Nuclear power plant operations activities have not changed appreciably with time, and there are no plans for new construction or refurbishment at DNPS that would change the visual appearance of the nuclear power plant during the SLR term. The industrial appearance of the DNPS site and associated transmission lines would not change during the SLR term.

3.2.4 No-Action Alternative

3.2.4.1 Land Use

Under the no-action alternative, the NRC would not renew the operating licenses, and DNPS reactors would shut down on or before the expiration of the current renewed operating licenses (Unit 2 on December 22, 2029 and Unit 3 on January 12, 2031). Existing facilities would remain until decommissioning is completed. Grounds and facilities maintenance and other human activities would continue, though at lower intensity. The LR GEIS (NRC 2024-TN10161) notes that land use impacts could occur beyond the nuclear plant site if new power generating facilities are needed. Transmission lines are likely to remain in service after the reactors are no longer operating. The NRC staff conclude that the land use impacts from the termination of DNPS operations would be SMALL.

3.2.4.2 Visual Resources

Shutdown of the DNPS would not significantly change the industrial appearance of the site. Therefore, the NRC staff conclude that the visual impacts of the no-action alternative would be SMALL.

3.2.5 Replacement Power Alternatives: Common Impacts

The following sections describe the potential environmental effects of replacement energy technologies that could be implemented as a consequence of the NRC not renewing the DNPS operating licenses in the case of a no-action alternative.

3.2.5.1 Land Use

Land use impacts are determined by the change in use and the amount of land affected by the construction and operation of a replacement energy generating facility. Table 3-5 summarizes land use impacts of the replacement energy alternatives.

Table 3-5 Land Use Impacts of Replacement Power Alternatives for Dresden Nuclear Power Station

Alternative	Resource Requirements	Impacts	Discussion
Natural Gas Alternative	74 ac at the DNPS site.	SMALL	Construction and operations activities would be limited to the DNPS site. A natural gas transmission line is near the DNPS site to supply natural gas. Little to no additional land would be needed for new infrastructure.
Renewable and Natural Gas Combination Alternative	NGCC: 74 ac at the DNPS site. Solar: Approximately 308 ac on site and 32,600 ac at multiple off site locations. Wind: Approximately 154,200 ac at multiple offsite locations. Transmission Lines: Approximately 19,100 ac for all offsite locations.	LARGE	Construction and operations activities of NGCC, solar, and wind installations would require multiple areas located on and off the DNPS site. Additional land will also be needed for offsite solar and wind installations for transmission line rights-of-way.

DNPS = Dresden Nuclear Power Station; NGCC = natural gas combined cycle.

3.2.5.2 Visual Resources

Visual impacts are determined by the degree of contrast between the replacement power generating facility and surrounding landscapes.

<u>Construction</u>

Installation of power generating facilities and support structures at existing power plant sites would be consistent with the visual appearance of the industrial site. Construction of a replacement power generating facility may require clearing, excavation, and the use of construction equipment. Temporary visual impacts may occur if cranes and other construction equipment are in use. Visual impacts would be minimal if new facilities are constructed at DNPS. However, new solar and wind turbine installations could result in visual impacts. As such, the NRC staff conclude that natural gas installation would have a SMALL visual impact and the renewable and natural gas combination alternative, involving the installation of solar and wind energy facilities and associated transmission infrastructure, would have a MODERATE TO LARGE visual impact.

Operations

Visual impacts during operation of any of the replacement power generating facilities would be similar to one another. Wind turbines and solar panels, depending on their heights, could be seen from a distance, depending on the landscape and screening vegetation. New transmission lines would be visible, unless screened. Vapor plumes from MDCTs would be noticeable and would be visible from a distance. Aircraft warning lights on power plant stacks, towers, or wind turbines would be visible at night. The NRC staff conclude that operations of replacement power facilities would have a SMALL visual impact.

3.3 Meteorology, Air Quality, and Noise

3.3.1 Meteorology and Climatology

The climate in the State of Illinois is continental, characterized by cold winters and warm summers. The lack of mountains to the north and south result in the movement of cold air masses from the Artic in the winter and humid air masses from the Gulf in the summer (Frankson et al. 2022-TN11050). During fall, winter, and spring, the polar jet stream is located near or over northeastern Illinois, which causes large-scale synoptic storms to move through the area bringing precipitation, winds, and often dramatic temperature changes (ISC 2024-TN10952). Temperature and precipitation conditions vary widely throughout Illinois with a noticeable north-south contrast. Annual average temperature difference ranges 10°F (5.6°C) across north to south. Average precipitation ranges from 50 inches (in.) (1.27 m) a year in the south part of the State to 35 in. (0.89 m) in the north part of the State (Frankson et al. 2022-TN11050).

CEG maintains a meteorological monitoring program that consists of a meteorological tower located approximately 3,000 ft (914 m) west of the reactor building. DNPS' meteorological monitoring program measures wind direction and speed, temperature, and precipitation. In its ER, CEG provided meteorological observations (temperature, wind conditions, and precipitation) from the meteorological system for the 1991–2021 period (CEG 2024-TN11347). The NRC staff obtained meteorological observations from the Chicago (KORD) weather station. The station is approximately 50 mi (80 km) from DNPS and is used to characterize the region's climate because of its relative location and long period of record.

The mean annual temperature from DNPS' onsite meteorological tower for the 1991–2021 period is 51.4°F (10.8°C) with a mean monthly temperature ranging from a low of 25.1°F (-3.8°C) in January and a high of 74.5°F (23.6°C) in July. The mean annual temperature from the Chicago weather station for the 1959–2022 period is 49.8°F (9.9°C) with a mean monthly annual temperature ranging from a low of 22.8°F (-5.1°C) in January and a high of 73.9°F (23.3°C) in July (NOAA 2022-TN11811). The mean total precipitation from DNPS' onsite meteorological tower for the 1991–2021 period is 30.19 in. (0.77 m), with a mean monthly precipitation ranging from 1.34 in. (3.4 cm) in February and 4.02 in. (10.2 cm) in June. The mean total precipitation from the Chicago weather station for the 1959–2022 period is 35.43 in. (0.90 m), with a mean monthly precipitation ranging from 1.70 in. (4.32 cm) in February and 4.15 in. (10.54 cm) in August (NOAA 2022-TN11811). The mean annual wind speed from DNPS's onsite meteorological tower is 7.9 miles per hour (mph) (12.7 kilometers per hour [km/h]) with a prevailing wind direction from the west. The mean annual wind speed from Chicago's weather station for the 1984–2022 period is 9.9 mph (15.9 km/h) with a prevailing wind direction from the west (NOAA 2022-TN11811).

Grundy County experiences severe weather. For the January 1950 through December 2024 period of record, the following events were recorded (NOAA 2025-TN11814):

- Flood: 25 events
- Hail: 75 events
- Tornado: 23 events
- Blizzards: 4

3.3.2 Air Quality

The EPA has set primary and secondary National Ambient Air Quality Standards (NAAQS) at 40 CFR Part 50 (TN1089) for six common criteria pollutants to protect sensitive populations and the environment. The NAAQS criteria pollutants include carbon monoxide (CO), lead (Pb), nitrogen dioxide (NO_2), ozone (O_3), sulfur dioxide (SO_2), and particulate matter (PM). Particulate matter is further categorized by size—PM_{10} (diameter of 10 micrometers [µm] or less) and $PM_{2.5}$ (diameter of 2.5 µm or less).

The EPA designates areas of attainment and nonattainment with respect to meeting NAAQS. Areas for which there are insufficient data to determine attainment or nonattainment are designated as unclassifiable. Areas that were once in nonattainment, but are now in attainment, are called maintenance areas; these areas are under a 10-year monitoring plan to maintain their attainment designation status. States have primary responsibility for ensuring attainment and maintenance of the NAAQS. Under Clean Air Act (CAA) Section 110 and related provisions, codified at 42 U.S.C. 7410 (TN1141), States are to submit, for EPA approval, State implementation plans that provide for the timely attainment and maintenance of the NAAQS.

In Illinois, air quality designations are made at the county level. For the purpose of planning and maintaining ambient air quality with respect to the NAAQS, the EPA has developed air quality control regions (AQCRs). AQCRs are intra-State or inter-State areas that share a common airshed. DNPS is located in Grundy County, which is part of the Metropolitan Chicago Intrastate AQCR (40 CFR Part 81.14) (TN7226). With respect to NAAQS, the EPA designated Grundy County as nonattainment for ozone (1-hr and 8-hr 2015 standard) and maintenance for ozone (8-hr 1997 and 2008 standards) and $PM_{2.5}$ (EPA 2024-TN10954).

The Illinois Environmental Protection Agency (IEPA) regulates air emissions at DNPS under a Federally Enforceable State Operating Permit (FESOP) No. 063806AAC and an open burn Permit No. 043083. Table 3-6 identifies the equipment and conditions covered under FESOP No. 063806AAC. On March 31, 2024, CEG submitted a renewal application to IEPA for FESOP No. 063806AAC and the air permit is administratively extended and remains in effect (CEG 2025-TN11341). CEG did not request sources to be added as part of the FESOP renewal application (CEG 2025-TN11341). Open burn permit No. 043083 was issued to CEG on February 23, 2024. DNPS conducts firefighting training for its personnel to manage potential emergencies; the open burn permit allows firefighters to train in controlled situations (CEG 2025-TN11341). The open burn permit limits the quantity of fuel (e.g., gasoline, propane, distillate oil/kerosene) per session for firefighting training (CEG 2025-TN11341).

Table 3-6 Permitted Air Emissions Sources at Dresden Nuclear Power Station

Source/Equipment	Air Permit Condition
Two auxiliary boilers (one natural gas boiler and one distillate oil boiler)	Natural Gas-Fired Auxiliar Boiler: CO emissions limited to 9.03 tons/year NO_x emissions limited to 10.75 tons/year PM emissions limited to 0.82 tons/year SO_2 limited to 0.06 tons/year VOM emissions limited to 0.59 tons/year Distillate Oil Fired Auxiliar Boiler: Burn distillate fuel oil containing no more than 15 ppm of sulfur CO emissions limited to 0.80 tons/year NO_x emissions limited to 3.22 tons/year PM emissions limited to 0.32 tons/year SO_2 emissions limited to 0.03 tons/year VOM emissions limited to 0.05 tons/year
Five large diesel generators	Burn distillate fuel containing no more than 15 ppm sulfur CO emissions limited to 7.44 tons/year NO_x emissions limited to 28 tons/year PM emissions limited to 0.88 tons/year SO_2 emissions limited to 0.01 tons/year VOM emissions limited to 0.72 tons/year
Small diesel-powered emergency generators	Burn distillate fuel oil containing no more than 15 ppm sulfur CO emissions limited to 0.63 tons/year NO_x emissions limited to 2.93 tons/year PM emissions limited to 0.21 tons/year SO_2 emissions limited to 0.01 tons/year VOM emissions limited to 0.24 tons/year
Gasoline storage and dispensing facility	Annual throughput of gasoline limited to 8,000 gallons/month and 50,000 gallons/year VOM emissions limited to 104 lb/month and 0.33 tons/year
Cooling towers	PM_{10} limited to 75.69 tons/year

CO = carbon monoxide; NO_x = nitrogen oxide; PM = particulate matter; PM_{10} = particulate matter less than 10 microns; ppm = parts per million; SO_2 = sulfur dioxide; VOM = volatile organic matter.
Source: CEG 2024-TN11347.

Table 3-7 presents annual air emissions for 2018 through 2023 for the permitted sources listed in Table 3-6. The contributions of air emissions from permitted sources at DNPS represent less than 1 percent of Grundy County's emissions and below *de minimis* levels set forth at 40 CFR 93.153(b) (TN2495) that serve as screening values to determine if a conformity determination must be undertaken for a proposed Federal action. CEG reports that it has not received any notices of violation or noncompliance associated with DNPS' FESOP from January 2018 through October 2024 (CEG 2024-TN11347, CEG 2025-TN11341). The NRC staff reviewed EPA's Enforcement and Compliance History Online tool for DNPS and did not find any notices of violation or noncompliance associated with DNPS' FESOP from March 2022 through December 2024 (EPA 2025-TN11918).

Table 3-7 Annual Air Pollutant Emissions from Permitted Sources at Dresden Nuclear Power Station (Tons per Year)

Year	PM	PM_{10}	SO_2	NO_x	CO	VOM
2018	16.26	16.26	0.03	12.17	4.20	0.45
2019	13.93	13.93	0.04	7.39	3.35	0.34
2020	10.26	10.26	0.02	13.37	4.74	0.49
2021	11.1	11.1	0.02	11.81	4.81	0.47
2022	12.69	12.69	0.02	11.57	4.72	0.45
2023	23.50	22.18	0.01	7.79	3.29	0.35
Grundy County 2020 Emissions	N/A	3,787	47.7	2,842	7,046	4,985

CO = carbon monoxide; N/A = not applicable; NO_X = nitrogen oxides; SO_2 = sulfur dioxide; PM = particulate matter; PM_{10} = particulate matter less than 10 micrometers; VOM = volatile organic matter.
To convert tons per year to metric tons per year, multiply by 0.90718.
Sources: CEG 2024-TN11347, CEG 2025-TN11341; EPA 2023-TN11884.

Small amounts of O_3 and substantially smaller amounts of nitrogen oxides (NO_x) are produced during corona, a phenomenon that occurs when air ionizes near isolated irregularities on the conductor surface of transmission lines. During corona, O_3 is approximately 90 percent of the oxidants generated, and 10 percent is NO_x (BLM 2010-TN9626). CEG has not conduced field tests of O_3 or NO_x emissions generated by DNPS' 138 kV and 345 kV in scope transmission lines (CEG 2024-TN11347). However, 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).

The EPA promulgated the Regional Haze Rule to improve and protect visibility in national parks and wilderness areas from haze, which is caused by numerous, diverse air pollutant sources located across a broad region (40 CFR 51.308–309) (TN1090). Specifically, 40 CFR Part 81, Subpart D (TN7226), "Identification of Mandatory Class I Federal Areas Where Visibility Is an Important Value," lists mandatory Federal areas where visibility is an important value. The Regional Haze Rule requires States to develop State implementation plans to reduce visibility impairment at Class I Federal Areas. Federal land management agencies that administer Class I Federal Areas consider an air pollutant source that is located more than 31 mi (50 km) from a Class I area to have negligible impacts with respect to Class I areas if the total SO_2, NO_x, PM_{10}, and sulfuric acid annual emissions from the source are less than 500 tons per year (70 FR 39104-TN8374; NPS 2010-TN7925). There are no Class I Federal Areas within 100 mi (160 km) of DNPS. Therefore, the NRC staff conclude emissions from DNPS would not adversely affect the air quality of Class I Federal Areas.

3.3.3 Noise

Noise is unwanted sound and can be generated by many sources. Sound is described in terms of amplitude (perceived as loudness) and frequency (perceived as pitch). Amplitude, the strength of a sound wave, is measured in decibels (dB), and referred to as the sound pressure level. Frequency is the number of times a sound wave repeats itself and is measured in cycles per second, or hertz. Sound is composed of many frequencies. Noise sources have discrete frequencies grouped into standardized octave bands and a sound pressure level is quoted for each of the bands. The human ear does not hear very low or very high frequencies. To account for human sensitivity to frequencies, 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 dBA.

Noise levels attenuate rapidly with distance. When distance is doubled from a point source, noise levels decrease by 6 dBA (DOT 2017-TN6567). Generally, a 3 dBA change over existing noise levels is considered to be a “just noticeable” difference, a 5 dBA increase is readily perceptible, and a 10 dBA increase is subjectively perceived as a doubling in loudness (DOT 2017-TN6567).

Several different terms are commonly used to describe sounds that vary in intensity over time. The equivalent sound intensity level (Leq) represents the average sound intensity level over a specified interval, often 1 hr. The day-night sound intensity level is a single value calculated from hourly Leq during a 24-hr period, with the addition of 10 dBA to sound levels from 10 p.m. to 7 a.m. This addition accounts for the greater sensitivity of most people to nighttime noise. Statistical sound level is the sound level that is exceeded ‘n’ percent of the time during a given period. For example, L90 is the sound level exceeded 90 percent of time and is considered the background level.

The State of Illinois has noise regulations that stipulate allowable octave band sound pressure levels emitted from a property line source to any receiving land (IAC 35-TN11236). A residence is classified as Class A Land and a nuclear power plant a Class C Land. The IEPA, however, no longer runs a noise pollution program and no longer investigates alleged noise pollution (IPCB 2015-TN11211). However, a formal noise complaint can be filed with the Illinois Pollution Control Board. Table 3-8 presents Illinois’ allowable octave band sound pressure levels of sound emitted to any receiving Class A Land from a Class C Land. Illinois’ daytime and nighttime combined octave band sound pressure levels (i.e., overall noise level across the range of frequencies) equate to an overall sound level of 61 and 51 dBA, respectively. Overall sound levels are not specified in Illinois’ regulations.

Primary offsite noise sources in the immediate vicinity of DNPS include agricultural equipment, vehicles, trains, and river traffic from cargo barges and recreational boating (CEG 2024-TN11347). Nearby noise sensitive receptors include residences along the western bank of the Kankakee River, approximately 0.5 mi (0.80 km) from the reactors and the Goose Lake Prairie State Natural Area, approximately 1 mi (1.6 km) from the reactors (CEG 2024-TN11347). Primary noise sources at DNPS include cooling towers, exhaust fans, transformers, water pumps, transmission lines, relieve valves, siphon pipes, and onsite vehicle traffic (CEG 2024-TN11347). The cooling towers are the primary noise source contributing to offsite noise to nearby sensitive noise receptors. Cooling towers operate on an as needed basis when DNPS operates in indirect open-cycle mode to maintain water temperatures within the NPDES permit limits (CEG 2024-TN11347). There are a total of 42 tower cells along the hot canal and 12 tower cells along the cold canal. The 12 tower cells along the cold canal were installed in 1999, 36 hot canal tower cells were installed in 2000, and 6 additional hot canal cooling towers were installed in 2003 (Exelon 2003-TN11723; CEG 2024-TN11347). After installation of the 36 hot canal tower cells, CEG recorded sound level measurements at the site boundary and levels were found to exceed Illinois’ nighttime limits. In response, CEG constructed an earthen berm in 2001, south of the hot leg cooling towers, approximately 30 ft (9 m) high, to attenuate noise from the towers (Exelon 2003-TN11723). In 2002, after construction of the earthen berm, CEG recoded sound level measurements with 48 tower cells in operation; measurements were below 65 dBA but exceeded Illinois’ nighttime limits (NRC 2004-TN7247; Exelon 2003-TN11723).

In 2017, CEG commissioned a noise evaluation at the nearest resident to the cooling towers (approximately 0.15 mi [0.24 km] away). The results are presented in Table 3-8. Sound levels at the nearest residence to the cooling towers exceeded the Illinois nighttime sound pressure levels for seven of the octave bands. In response to the results of the noise evaluation, in 2024, CEG planted 150 black hill evergreen trees between the hot and cold canal and Dresden Road to mitigate noise from the cooling towers (CEG 2025-TN11341). The black hill evergreen trees are approximately 4–5 ft (1.2–1.5 m) tall and 1–2 ft (0.3–0.6 m) wide but expected to grow up to 40 ft (12 m) tall and 20 ft (6 m) wide at a rate of 6–12 in. (15–30 cm) per year (CEG 2025-TN11341). Between 2018 and October 2024, CEG did not receive noise complaints with respect to operations of DNPS (CEG 2025-TN11341). CEG has not received a notice of violation or non-compliance from the Illinois Pollution Control Board with respect to noise levels due to operations at DNPS (CEG 2025-TN11341).

Table 3-8 Allowable Illinois State Limits on Octave Band Sound Pressure Levels and Octave Band Sound Pressure Levels at the Nearest Resident to the Cooling Towers

Sound Pressure Level	Octave Band Center Frequency 31.5 Hz	Octave Band Center Frequency 63 Hz	Octave Band Center Frequency 125 Hz	Octave Band Center Frequency 250 Hz	Octave Band Center Frequency 500 Hz	Octave Band Center Frequency 1,000 Hz	Octave Band Center Frequency 2,000 Hz	Octave Band Center Frequency 4,000 Hz	Octave Band Center Frequency 8,000 Hz	Overall Sound Level (dBA)[(a)]
Illinois Daytime Allowable (dB)	75	74	69	64	58	52	47	43	40	61
Illinois Nighttime Allowable (dB)	69	67	62	54	47	41	36	32	32	51
At Nearest Resident (dB)[(b)]	68	66	63	58	54	53	49	44	37	58

dB = decibel(s); dBA = A-weighted decibel(s); Hz = hertz.

(a) Overall sound level calculated from octave band sound pressure levels and is the representative sound level for the frequency spectrum: The State of Illinois noise regulations do not stipulate an overall sound level. State of Illinois noise regulations stipulate allowable octave band sound pressure levels emitted from a property line source to any receiving land (IAC 35-TN11236).

(b) Sound pressure levels at the nearest resident attributed to cooling towers: to quantify sound levels at the nearest resident due to cooling tower operation, measurements were taken at two locations while the cooling towers were in operation. Locations included the nearest residence to the cooling towers (approximately 0.15 mile) and a control location which was a residence farther removed from the cooling towers (approximately 1.4 mile away from the hot leg cooling towers). Measurement duration was approximately 1 hour at the nearest resident. Sound pressure level measurements taken at the control location were subtracted from sound pressure level measurements at the nearest resident.

Sources: IAC 35-TN11236: Part 901; CEG 2024-TN11347, CEG 2025-TN11342.

3.3.4 Proposed Action

3.3.4.1 Air Quality

As described in the LR GEIS (NRC 2024-TN10161) and as cited in Table 3-1 of this SEIS for generic issues related to air quality, the impacts of nuclear power plant license renewal and continued operations would be SMALL. The NRC staff’s review did not identify any new and significant information that would change the conclusion in the LR GEIS. As discussed in Section 3.3.2, air emissions from sources at DNPS represent a small fraction of the annual emissions from Grundy County. CEG does not anticipate future upgrades or replacement activities of air emission sources during the SLR term to support plant operation. Thus, as concluded in Section 4.3.1.2.1 of the LR GEIS, for these Category 1 (generic) issues, the impacts of continued operation of DNPS on air quality would be SMALL. There are no plant-specific (Category 2) air quality issues applicable to DNPS (Table 3-2).

3.3.4.2 Noise

As described in the LR GEIS (NRC 2024-TN10161) and as cited in Table 3-1 of this SEIS for generic issues related to noise, the impacts of nuclear power plant license renewal and continued operations would be SMALL. The NRC staff's review did not identify any new and significant information that would change the conclusion in the LR GEIS. CEG does not anticipate future upgrades or replacement activities to support plant operation during the SLR term that could introduce new noise sources or increases in sound levels. As discussed in Section 3.3.3, octave band sound pressure levels measured at the nearest residence exceed Illinois nighttime octave band sound pressure levels (Table 3-8). Illinois' nighttime combined octave band sound pressure levels equal an overall sound level of 51 dBA and the nighttime overall sound level at the nearest resident is 58 dBA. The LR GEIS (NRC 2024-TN10161) identifies that offsite noise levels from nuclear power plant operation may exceed EPA's recommended day-night average threshold of 55 dBA but have been found to be below the Federal Housing Administration day-night average guideline of 65 dBA. The 2017 noise evaluation CEG commissioned did not calculate day-night average sound levels. The 2017 noise evaluation measured an Leq of 58 dBA at the nearest resident to the cooling towers. Assuming a steady and continuous Leq of 58 dBA for every hour, the day-night sound level would be 64.4 dBA and, therefore, below the Federal Housing Administration day-night average sound level of 65 dBA. Furthermore, as discussed in Section 3.3.3, CEG planted 150 black hill evergreen trees between the hot and cold canal and Dresden Road to abate noise from the cooling towers (CEG 2025-TN11341). CEG plans to conduct a noise evaluation 5 years from the planting date of the black hill evergreen trees to ensure compliance with Illinois noise pollution regulations. CEG has a Noise Exceedance Mitigation Action Plan in place that is tracked via their Corrective Action Program to achieve and maintain compliance with State noise pollution regulations (CEG 2025-TN11341).

Given that (1) offsite sound pressure levels in the vicinity of DNPS are comparable to those discussed in the LR GEIS, (2) CEG has not received any notices of noise violations from the State of Illinois, (3) CEG has not received any noise complaints from DNPS operations within the last 5 years, and (4) no new noise sources are anticipated during the SLR term, the NRC staff's review did not identify any new and significant information that would change the conclusion in the LR GEIS. Thus, as concluded in the LR GEIS, for these Category 1 (generic) issues, the impacts of continued operation of DNPS on noise would be SMALL. There are no plant-specific (Category 2) air quality issues applicable to DNPS (Table 3-2).

3.3.5 No-Action Alternative

3.3.5.1 Air Quality

Under the no-action alternative, the cessation of DNPS operations would reduce overall air pollutant emissions (e.g., from diesel generators and vehicular traffic). Therefore, the NRC staff conclude that, if emissions decrease, the impact on air quality from the direct shutdown of DNPS would be SMALL.

3.3.5.2 Noise

The permanent cessation of DNPS operations would result in a reduction in noise from the cooling towers, exhaust fans, transformers, water pumps, transmission lines, relieve valves, siphon pipes, and onsite vehicle traffic. As site activities are reduced, the NRC staff expect the impact on ambient noise levels to be less than current plant operations; therefore, the NRC staff conclude that impacts on noise levels from the no-action alternative would be SMALL.

3.3.6 Replacement Power Alternatives: Common Impacts

3.3.6.1 Air Quality

Construction

Construction of a replacement power alternative would result in temporary impacts on local air quality. Air emissions include criteria air pollutants (e.g., PM, NO_x, CO, and SO_2), volatile organic compounds (VOCs), hazardous air pollutants, and GHGs. Air emissions would be intermittent and would vary based on the level and duration of specific activities throughout the construction phase. During the construction phase, the primary sources of air emissions would consist of engine exhaust and fugitive dust emissions. Engine exhaust emissions would be from heavy construction equipment and commuter, delivery, and support vehicular traffic traveling to and from the facility as well as within the site. Fugitive dust emissions would be from soil disturbances by heavy construction equipment (e.g., earthmoving, excavating, and bulldozing), vehicle traffic on unpaved surfaces, concrete batch plant operations, and, to a lesser extent, wind erosion. Various mitigation techniques and best management practices (BMPs) (e.g., watering disturbed areas, reducing equipment idle times, and using ultra-low sulfur diesel fuel) could be used to minimize air emissions and to reduce fugitive dust.

Operations

The impacts on air quality from operation of a facility for a replacement power alternative would depend on the energy technology (e.g., natural gas or renewable). Worker vehicles, auxiliary power equipment, and mechanical cooling towers would result in air emissions.

3.3.6.2 Noise

Construction

Construction of a replacement power facility would be similar to the construction of any industrial facility, in that they all involve many noise-generating activities. In general, noise emissions would vary during each phase of construction, depending on the level of activity, types of equipment and machinery used, and site-specific conditions. Typical construction equipment, such as dump trucks, loaders, bulldozers, graders, scrapers, air compressors, generators, and mobile cranes, would be used, and pile-driving and blasting activities could take place. Other noise sources include construction worker vehicle and truck delivery traffic. However, noise from vehicular traffic would be intermittent.

Operations

Noise generated during operations could include noise from transformers, MDCTs, turbines, equipment, speakers, as well as offsite sources, such as employee and delivery vehicular traffic. Noise from vehicles would be intermittent.

3.3.7 Natural Gas Alternative

3.3.7.1 Air Quality

For the natural gas alternative, air emissions and sources for construction would include those identified as common to all replacement power alternatives in Section 3.3.6.1. The natural gas alternative would be located at the DNPS site. Use of the existing infrastructure would be maximized and repurposed, including the transmission lines, access roads, and cooling system. Overall, air emissions from construction of the natural gas alternative would be intermittent, short-term, and temporary.

Operation of a natural gas alternative would result in emissions of criteria pollutants. The NRC staff estimated air emissions for the natural gas alternative using emission factors developed by the DOE's NETL (NETL 2022-TN10530). The NRC staff estimate the following annual air emissions would result from operation from of a natural gas alternative with a design capacity of 2,120 MWe (gross):

- carbon monoxide—111 tons (101 metric tons [MT])
- nitrogen oxides—204 tons (185 MT)
- sulfur dioxide—55 tons (50 MT)
- particulate matter—111 tons (101 MT)

Operation of MDCTs and worker vehicles would result in additional air emissions. A new natural gas alternative would need to secure a permit from the IEPA for air pollutants associated with its operation. The natural gas alternative would have the potential to emit 100 tons (91 MT) per year of a criteria air pollutant and would thus qualify as a major emitting industrial facility. As such, the new natural gas plant would be subject to Prevention of Significant Deterioration and Title V air permitting requirements under the Clean Air Act of 1970, as amended (TN1141), to ensure that air emissions are minimized and that the local air quality is not degraded substantially. In comparing criteria air emissions from the proposed action to those of the natural gas alternative, emissions from the natural gas alternative would be 1 to 2 orders of magnitude greater. SO_2 emissions in particular would be significantly greater when compared to the proposed action. Therefore, the NRC staff conclude that the overall air quality impacts associated with operation of a natural gas alternative would be MODERATE.

3.3.7.2 Noise

Noise generated during the construction and operation of a natural gas plant would be similar to noise for all replacement power alternatives as discussed in Section 3.3.6.2. Noise impacts during construction would be limited to the immediate vicinity of the DNPS site. The nearest resident is approximately 0.30 mi (0.48 km) from the closest edge of the 74 ac (30 ha) construction area site immediately to the west of the cooling towers. Noise levels attenuate rapidly with distance. For example, at 0.18 mi (0.3 km) from construction, equipment with a source strength sound level in the 80–85 dBA range, sound levels decrease to 59–69 dBA; at 0.5 mi (0.8 km) sound levels decrease to 51–61 dBA (NRC 2002-TN7254). Therefore, the NRC staff conclude that noise generated as a result of construction of a natural gas alternative at the DNPS site would not be noticeable given the existing industrial setting, distance of noise-sensitive receptors from the site, and consideration of noise attenuation from the construction site.

During operations, noise sources from a natural gas alternative would include those discussed in Section 3.3.6.2, as well as offsite mechanical noise from compressor stations and pipeline blowdowns. Most of the noise-producing equipment (e.g., turbines, pumps, and MDCTs) would be located inside the power block. Since the natural gas alternative would be located at the DNPS site, the NRC staff do not anticipate noise levels at noise-sensitive receptors to be significantly greater than currently or previously experienced from operation of DNPS. The Federal Energy Regulatory Commission requires that any new compressor station, compression added to an existing station, or any modification, upgrade, or update of an existing station must not exceed day–night sound intensity level of 55 dBA at any pre-existing noise sensitive area (18 CFR 157.206(b)(5)(i) [TN7483]). As discussed in Section 3.3.3, the State of Illinois has noise regulations that stipulate allowable daytime and nighttime octave band sound pressure levels (dB) emitted from a property line source to any receiving land. Noise from pipeline blowdowns would not constitute a new noise source since natural gas pipelines are present near the site due to the natural gas-fueled combined cycle electric generation facility (Three Rivers Energy Center) located southwest of the DNPS site. Therefore, the NRC staff conclude that the noise impacts from construction and operation of a natural gas alternative would be SMALL.

3.3.8 Renewable and Natural Gas Combination Alternative

3.3.8.1 Air Quality

Air emissions associated with construction of the natural gas portion of the combination alternative would be similar to those associated with the natural gas alternative discussed in Section 3.3.7.1, given the design capacity of the natural gas portion, and that it would be located at the DNPS site, which would maximize and reuse the existing infrastructure. Air emissions and sources for construction of the renewable portion of this alternative would include those identified as common to all replacement power alternatives in Section 3.3.6.1. Unlike the natural gas portion, the solar and wind portions with battery storage would not have power block buildings. Accordingly, the number of heavy equipment and workforce, level of activities, and construction duration would be lower and consequently less air emissions would be generated compared to the natural gas portion. However, offsite installations of the solar and wind portion would require construction of new transmission lines and a significant amount of land would be disturbed (19,100 ac [7,700 ha]). Additionally, a significant amount of land would be disturbed (4,500 ac [1,800 ha]) for installation of the wind portion. This could result in noticeable particulate air emissions during the construction phase.

Air emissions associated with operation of the natural gas portion of the combination alternative would be similar, but less than, those associated with the natural gas alternative discussed in Section 3.3.7.1, since it would consist of a lower capacity (1,484 MWe) natural gas plant at the DNPS site. The NRC staff estimated air emissions for the natural gas alternative using emission factors developed by the DOE’s NETL (NETL 2022-TN10530). The NRC staff estimate the following annual air emissions would result from the operation of a natural gas component with a design capacity of 1,484 MWe (gross):

- carbon monoxide—78 tons (71 MT)
- nitrogen oxides—143 tons (130 MT)
- sulfur dioxide—39 tons (35 MT)
- particulate matter—78 tons (71 MT)

Operation of MDCTs and worker vehicles would result in additional air emissions. Direct air emissions associated with operation of the solar with battery storage components of this alternative would be negligible because no fossil fuels would be burned to generate electricity. Emissions would include fugitive dust and engine exhaust from worker vehicles and heavy equipment associated with site inspections, maintenance activities, and wind erosion from cleared lands and access roads. Emissions would be localized and intermittent.

As discussed in Section 2.3.2.2, the natural gas portion of this alternative would be phased out entirely by 2045 and replaced with offsite solar and wind energy installations with battery storage. Therefore, once the natural gas portion is replaced entirely with the solar and wind portions, air emissions of the combination alternative would be negligible since this alternative would consist entirely of renewable energy sources.

The combination alternative would result in an initial increase in air emissions from the natural gas portion (1 to 2 degrees of magnitude greater than operation of DNPS). Once the natural gas portion is phased out, emissions would be negligible. Therefore, the NRC staff conclude that the overall air quality impacts associated with operation in the combination alternative would be SMALL to MODERATE.

3.3.8.2 Noise

Construction-related noise sources for the natural gas portion of the combination alternative would be similar to the natural gas alternative discussed in Section 3.3.7.2. Unlike the natural gas portion, the solar and wind with battery portions of this alternative would have no power block buildings requiring construction. The amount of heavy equipment, size of workforce involved, level of activities, and construction duration would be lower compared to that of other alternatives. Noise levels generated by construction activities of a solar facility can range from 70–80 dBA at 50 ft (15 m) (BLM 2019-TN8386). Blasting may be required during construction for turbine foundations (WAPA/FWS 2015-TN8725; BLM 2013-TN8882). Depending on the distance from the site and associated transmission lines corridor to nearby receptors, noise levels may be noticeable during construction of the offsite (i.e., not located at the DNPS site) solar and wind components.

Operation-related noise sources for the natural gas portion of the combination alternative would be similar to the natural gas alternative discussed in Section 3.3.7.2. Because the solar with battery storage portion of this alternative would have no power block or cooling towers, a minimal number of noise sources, such as transformers and vehicular traffic, would be associated with maintenance and inspection activities. Noise generated by wind turbines would include aerodynamic noise from the blades and mechanical noise from turbine drivetrain components (generator and gearbox). Depending on the location, layout, and proximity of wind turbines to noise sensitive receptors, noise associated with operation of the wind portion of the combination alternative could be noticeable.

Given that noise levels may be noticeable during construction of the offsite solar and wind component and noise levels may be noticeable during operation of wind turbines, the NRC staff conclude that the overall noise impacts associated with the renewable and natural gas combination alternative would be SMALL to MODERATE.

3.4 Geologic Environment

This section summarizes information on the geologic environment of the DNPS site, site vicinity, and site region with discussions of site and regional physiography and geology (including bedrock stratigraphy and surficial deposits), geologic resources, soils (including onsite soils, erosion potential, and prime farmland soils), and seismic setting. The analysis by the NRC staff related to potential environmental impacts on geology and soils from the proposed action and alternatives to the proposed action follows the information summary. Except as otherwise cited for clarity, the NRC staff's summary in the subsections below is based on information provided in Section 3.5 of CEG's ER (CEG 2024-TN11347). NRC staff did not identify any new and significant information related to the geologic environment during the environmental site audit, the scoping process, or review of available information cited.

3.4.1 Physiography and Geology

The DNPS site is located in northeastern Illinois within the Central Lowlands physiographic province, a large region covering most of the northern half of the central United States north of the Ohio and Missouri Rivers. The DNPS site lies near the boundary of the Till Plains and Eastern Lake sections of the province. The region was shaped by repeated glaciation and is characterized by low relief and glacial deposits overlying bedrock. Surface elevations in Grundy County vary from about 650 ft (198 m) in the north and south to about 500 ft (152 m) along the Illinois River. Surficial deposits in the DNPS region consist of fine-grained glacial till plain and moraine deposits, laminated silt and clay slackwater and lake deposits, sand and gravel outwash and near-shore deposits, and bedded silts, clays, sand, and gravel deposited in floodplains and channels of modern rivers (ISGS 2000-TN11727). Bedrock in the region consists of a sequence of consolidated Paleozoic sedimentary rocks (primarily siltstone, shale, sandstone, limestone, and dolomite) generally increasing in thickness to the south-southeast (Lloyd and Lyke 1995-TN4988). The underlying Precambrian-age basement rock has been shaped by tectonic forces, which created arches, domes, and basins that control thickness and distribution of the sedimentary bedrock units throughout the Central Lowlands province.

Overburden deposits at the DNPS site consist of sandy clay with some gravel, are of limited areal extent, and are typically less than 5 ft (1.5 m) thick (CEG 2024-TN11347). Sand and gravel fill is present within the protected area at depths up to 30 ft (9.1 m) below ground surface. Bedrock at the DNPS site includes the Pennsylvanian-age Pottsville Formation sandstone, which is absent in the northeast corner of Grundy County and thickens toward the south. The Pottsville sandstone, which is present under the main buildings area of the DNPS site, was excavated for construction of the hot and cold canals, the intake canals, and at least a portion of the discharge canal (CEG 2024-TN11347). Where present near the DNPS site, the Pottsville sandstone is 25 to 30 ft (7.6 to 9.1 m) thick (CEG 2024-TN11347). Where the Pottsville Formation sandstone is absent north of the plant and in areas to the west and southeast of the plant, the uppermost bedrock unit is the Ordovician Maquoketa Formation, which at the DNPS site includes the Divine Limestone Member and the underlying Maquoketa Shale Member. The Divine Limestone unit is 25 to 30 ft (7.6 to 9.1 m) thick at the DNPS site and the Maquoketa Shale unit is 64 to 68 ft (19.5 to 20.7 m) thick. Both rock units dip to the southeast about 25 ft per mile (CEG 2024-TN11347). The Unit 1 turbine building was excavated to the top of the Divine Limestone. The Unit 1 sphere, spent nuclear fuel pool and fuel handling buildings, and the Units 2 and 3 reactor and radwaste buildings were all excavated to the top of the Maquoketa shale. The cooling lake was excavated to a depth of about 16 ft (4.9 m) with the bottom of the excavation assumed to be in the Divine Limestone (CEG 2024-TN11347). The low permeability Maquoketa Shale Formation lies above the Galena Dolomite, which is about 230 ft (70.1 m) thick (CEG 2024-TN11347). Other Ordovician and Cambrian dolomite, limestone, and sandstone units lie between the Galena formation and the Precambrian basement several thousand feet below ground surface (Lloyd and Lyke 1995-TN4988). Figure 3-5 in Section 3.5.2.1 is a geologic cross-section oriented southwest to northeast through the DNPS Protected Area that illustrates the occurrence of the uppermost Paleozoic sedimentary bedrock units at the site.

3.4.2 Geologic Resources

Mineral resources produced in the DNPS region include sand and gravel, limestone, and coal (USGS 2025-TN11885, CEG 2024-TN11347). The DNPS cooling lake is located over an abandoned coal mine (CEG 2024-TN11347) and coal has been extensively mined in areas immediately south of the DNPS site (ISGS 2025-TN11728). Past and present sand and gravel quarries are generally located near streams and rivers in the region, while limestone and other rock quarries are scattered throughout the area (USGS 2025-TN11885). No critical minerals have been identified in the region (USGS 2025-TN11885).

3.4.3 Soils

Topsoil at the DNPS site is characterized as black silt with some sand, clay, and organic matter that is typically 1 to 2.5 ft (0.3 to 0.8 m) thick and derived from glacial deposits (CEG 2024-TN11347). The soils at the site were mapped by the Natural Resources Conservation Service as silt loams and shallow loamy soil cover (orthents) (CEG 2024-TN11347). Most of the mapped area consists of well-drained soils. The silt loam soils are classified as prime farmland or farmland of statewide importance and occupy most of the area on the DNPS site that lies west of the hot and cold canals (USDA 2025-TN11797).

Soils at the site generally have low to moderate potential for erosion due to characteristics of the soil materials and relatively low slopes (CEG 2024-TN11347; USDA 2025-TN11797). No areas prone to soil erosion have been identified at the site. CEG implements BMPs to prevent erosion from runoff as part of the Stormwater Pollution Prevention Plan (SWPP) and controls runoff from construction sites as part of the NPDES general permit. The canals and cooling lake are regularly inspected for evidence of erosion. Should areas of erosion develop, CEG would provide vegetative and non-vegetative cover and other controls to reduce or eliminate the amount of soil erosion (CEG 2024-TN11347).

3.4.4 Seismic Setting

Earthquake activity in the DNPS region has historically been low. CEG identified two earthquakes since 1800 that were of significant intensity in the region (CEG 2024-TN11347). These earthquakes occurred in 1909 and 1912 and were estimated to have intensities capable of producing strong to very strong ground shaking at the DNPS site but would cause negligible damage in buildings of good design and construction. The closest area of significant earthquake activity is the New Madrid Seismic Zone in the Mississippi Valley that is more than 200 mi (322 km) from DNPS. The nearest mapped fault is approximately 6 mi (10 km) northeast of the DNPS, but there is no evidence of movement on this fault during the last 10,000 years (CEG 2024-TN11347). From 1970 through 2024, eight earthquakes with a magnitude equal to or greater than 3.0 have been recorded within a 100 mi (161 km) radius of DNPS (USGS 2025-TN11749). The largest magnitude was 4.2 for an earthquake located about 30 mi (48 km) west of the site.

Seismic hazard (i.e., peak ground acceleration) for a specific location due to shaking induced by an earthquake is expressed as a percentage of *g*, the gravitational acceleration near the Earth's surface, to assess the potential impact of the earthquake on engineered structures. Several factors, including the properties of rock and sedimentary materials through which the earthquake waves travel, as well as earthquake magnitude and location, control the level of ground shaking that can occur. Based on the 2023 seismic hazard maps published by the U.S. Geological Survey (USGS), DNPS is in an area with a predicted peak horizontal ground acceleration about 0.12 *g* for a 2 percent probability of exceedance in 50 years, corresponding to a return period of about 2,500 years (Petersen et al. 2023-TN11233). The estimated Modified Mercalli Intensity level for the same return period is VI (strong shaking), indicating a very low risk for damaging ground shaking in the next 50 years.

The impacts of natural phenomena associated with geologic and seismic hazards on nuclear power plant systems, structures, and components are outside the scope of the NRC staff's SLR environmental review. The DNPS was originally sited, designed, and licensed with due consideration for applicable geologic and seismic criteria. Seismic issues at operating nuclear power plants are assessed as part of the NRC's ongoing regulatory oversight of plant safety. The NRC requires all licensees to consider seismic activity to maintain safe operating conditions at nuclear power plants. When new seismic data bearing on potential earthquake hazard become available, NRC staff evaluate those data to determine whether any changes are necessary at existing nuclear power plants to ensure safe plant operation. This oversight process, which considers seismic safety, is separate and distinct from the SLR environmental review performed by NRC staff.

3.4.5 Proposed Action

As documented in Table 3-1 for the geology and soils issue, the impact of SLR and continued operations for DNPS on geology and soils would be SMALL. The finding in 10 CFR Part 51 (TN10253), Subpart A, Appendix B, Table B-1 related to geology and soils indicates that this generic Category 1 issue would result in a SMALL impact for all nuclear power plants.

NRC staff independently reviewed applicable information for geology and soils in CEG's ER (CEG 2024-TN11347) and associated references therein, considered information discussed during the environmental site audit and the scoping process, and independently reviewed pertinent information about the seismic setting. The NRC staff did not identify any new and significant information related to geology and soils that would change the environmental impact determination stated in the LR GEIS (NRC 2024-TN10161) for this Category 1 generic issue. No significant impacts on geology and soils are anticipated during the SLR term that would be different from those occurring during the current license term. Thus, the staff concludes that the impacts of SLR related to the geology and soils issue would be SMALL for DNPS. There are no Category 2 issues related to the geologic environment that require consideration.

3.4.6 No-Action Alternative

Under the no-action alternative, there would be few or no incremental impacts onsite geology and soils associated with shutdown of DNPS. Before beginning decommissioning activities, little or no new ground disturbance would occur at the plant site as operational activities are reduced and eventually cease. Any contamination of onsite geology or soils would be assessed during decommissioning, whether at the end of the current licensing period or at the end of the proposed SLR term. A license termination plan would describe any necessary actions needed for site-specific cleanup before release of the DNPS site. As a result, NRC staff conclude that the impact of the no-action alternative on geology and soils would be SMALL.

3.4.7 Replacement Power Alternatives: Common Impacts

Construction

During facility construction for replacement power alternatives and associated components, aggregate material such as crushed stone, riprap, sand, and gravel would be required to construct buildings, foundations, roads, parking lots, pad sites, transmission lines, and other supporting infrastructure, as applicable. NRC staff expect these resources would be obtained by commercial suppliers from local or regional sources. Land clearing, grading, and excavation expose soils to erosion and alter surface drainage. NRC staff also anticipate that BMPs would be implemented in accordance with applicable State and local permitting requirements to reduce soil erosion and associated offsite impacts. These practices would include measures such as sediment fencing, staked hay bales, check dams, sediment ponds, and riprap aprons at construction and laydown yard entrances; mulching and geotextile matting of disturbed areas; and rapid reseeding of temporarily disturbed areas, where applicable. Standard construction practice dictates that topsoil removed during construction and any suitable excavated materials would be stored on site for redistribution such as for backfill at the end of construction.

Operations

Replacement power facilities would be built in accordance with applicable State and local building codes and would consider such siting and design factors to mitigate potential impacts from natural phenomena. Once facility construction is completed, areas disturbed during construction would be within the footprint of the completed facilities, overlain by other impervious surfaces such as roadways and parking lots, or revegetated or stabilized as appropriate. Therefore, there would be no additional land disturbance and no direct operational impacts on geology and soils. Consumption of aggregate materials or topsoil for maintenance purposes during operations would be negligible.

3.4.8 Natural Gas Alternative

The impacts on geology and soils from construction and operations associated with the natural gas alternative would be limited to the common impacts described in Section 3.4.7. The NGCC plant would not require deep excavations and would be constructed on the DNPS site using existing infrastructure (CEG 2024-TN11347), which would reduce soil disturbance. The flat topography of the proposed construction area would limit the potential for significant soil erosion and no critical geologic resources would be affected. Based on these considerations, NRC staff conclude that the potential impacts on geology and soils from the NGCC would be SMALL.

3.4.9 Renewable and Natural Gas Combination Alternative

The impacts on geology and soils from construction and operations associated with the renewable and natural gas combination alternative would be limited to the common impacts described in Section 3.4.7. No deep excavations would be required for this alternative and NRC staff expect that the facilities would be sited to avoid significant slope stability concerns and impacts to rare or critical geologic resources. Impacts on soils for this alternative would be larger than for the natural gas alternative due to the increased area that would be disturbed to construct the onsite and offsite solar and wind generation components. Overall impacts would be driven by the potential for soil erosion and loss of natural soils and sediments from the conversion of land to industrial uses. NRC staff anticipate that potential soil erosion impacts would be mitigated by the implementation of BMPs in accordance with applicable State and local permitting requirements. Based on these considerations, NRC staff conclude that potential impacts on geology and soils from the renewable and natural gas combination alternative could range from SMALL to MODERATE.

3.5 Water Resources

This section describes surface water and groundwater resources at and around the DNPS site. The description of the resources is followed by the NRC staff's analysis of the potential impacts on surface water and groundwater resources from the proposed SLR action and alternatives to the proposed action.

3.5.1 Surface Water Resources

Surface water encompasses all water bodies that occur above the ground surface, including rivers, streams, lakes, ponds, and man-made reservoirs or impoundments.

3.5.1.1 Surface Water Hydrology

Local and Regional Hydrology

DNPS is located at the confluence of the Des Plaines and Kankakee Rivers (Figure 3-1), which forms the Illinois River, a tributary of the Mississippi River whose watershed covers 32,081 mi^2 (83,089 km^2) (CEG 2024-TN11347). The Des Plaines and Kankakee are large rivers that originate outside of the State – the Des Plaines in southeastern Wisconsin and Kankakee in northeastern Indiana. The DNPS site is bounded to the east by the Kankakee River, the northeast by the Des Plaines River, and to the north by the Illinois River. Numerous small lakes and wetlands are located south and southwest of the site (Figure 3-1).

The Illinois and the Des Plaines Rivers are major components of the Illinois Waterway, a network of extensively engineered rivers and canals that enable barge transportation between Lake Michigan (and the Great Lakes) and the Mississippi River. From downstream to upstream, the Illinois Waterway includes the Illinois River, the Des Plaines River, the Chicago Sanitary and Ship Canal, and the Chicago River. The Illinois Waterway covers over 300 mi (483 km), spanning from its downstream terminus at the confluence of the Illinois River and Mississippi River near Grafton, Illinois to its upstream origin located at the outlet of the Chicago River in Lake Michigan. To ensure navigability, the channels along the Illinois Waterway have been modified to have a width of at least 300 ft (91.4 m) and depth of at least 9 ft (2.7 m) (CEG 2024-TN11347). Water level (and flow) along the Illinois Waterway are regulated by a network of eight locks and dams managed by the U.S. Army Corps of Engineers (USACE) (CEG 2024-TN11347). The system of dams and locks alter natural streamflow patterns to maintain flow and water levels in the lock and pool system. Seasonal high flows typically occur during spring (March through May), and low flows typically occur during late summer and early fall (August through October). One of the locks and dams, the 22-ft (6.7 m) high Dresden Island Lock and Dam (Dresden Island Dam), is located a short distance downstream (approximately 1.5 mi [2.4 km]) of the confluence of the Des Plaines and Kankakee Rivers (Figure 3-1). Notable engineered surface water features within the DNPS site boundary include a large man-made cooling lake, hot and cold cooling water canals, two intake canals, and two discharge canals (Figure 3-1).

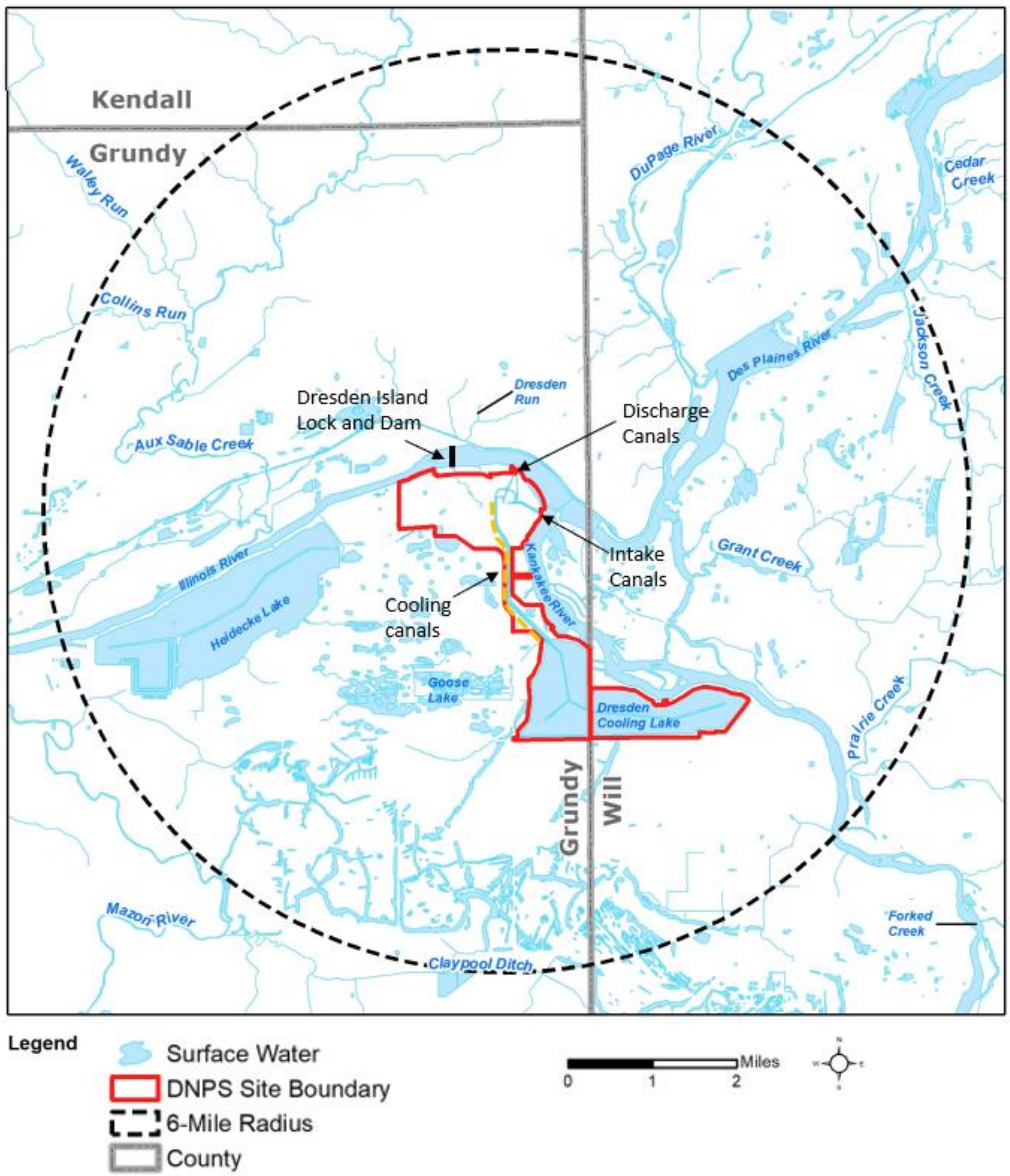

Figure 3-1 Major Surface Water Features in the Vicinity of the Dresden Nuclear Power Station. Cooling canal location indicated by dashed orange line. Adapted from: CEG 2024-TN11347.

The intake canals are approximately 2,000 ft long (610 m), 56 ft wide (17 m) vertical-sided canals that route water from the Kankakee River to DNPS (CEG 2024-TN11347). One of the intake canals served Unit 1 and is no longer used, while the other serves Units 2 and 3. The cooling lake is a shallow (average depth of 8 ft [2.4 m]) 1,142 ac (4.6 million m^2) man-made lake with 9,136 ac ft (11.27 million m^3) of storage that occupies the majority of the southeastern portion of the DNPS site (Exelon 2021-TN11343). DNPS can operate under four different operational modes, discussed in more detail in Section 3.5.1.2, that utilize the canal system and cooling lake in different ways that affect the specific flow paths of intake and cooling water discharge. The cooling lake receives cooling water discharge which is routed south from Units 2 and 3 via the "hot canal." After cooling water circulates through the cooling lake (residence time is 2-3 days) it is routed northwards from the cooling lake via the cold canal towards the flow-regulating station near DNPS Units 2 and 3. The flow-regulating station near DNPS Units 2 and 3 has three gates which allow station operators to either route water to the Illinois River, back to the Intake Canal, or from the lake bypass canal to the cold canal to the Illinois River (CEG 2024-TN11347). The water level of the cooling lake is controlled by a concreate spillway along the north shore of the cooling lake near the cold canal. The spillway has weir gates that can control outflow from the cooling lake to the cold canal. The spillway is also engineered to allow flow from the cooling lake if lake levels are too high. CEG's ER Figure 2.2-1 illustrates the DNPS site water balance and is incorporated here by reference (CEG 2024-TN11347).

Flooding

Nuclear power plant structures, systems, and components important to safety are designed to withstand the effects of natural phenomena, such as flooding, without loss of capability to perform safety functions. The Updated Final Safety Analysis Report for Dresden Units 1, 2, and 3 includes an evaluation of the effects of flooding at the DNPS site including an evaluation that the engineered safety measures adequately protect DNPS from a probable maximum flood event (Exelon 2021-TN11343).

Additionally, the NRC staff evaluate nuclear power plant operating conditions and physical infrastructure to ensure ongoing safe operations through its Reactor Oversight Process, which is separate from the NRC's license renewal review process. If new information about changing environmental conditions becomes available, the NRC staff will evaluate the new information to determine if any safety-related changes are needed. The NRC staff also evaluate new information important to flood projections and independently confirms that a licensee's actions appropriately consider potential changes in flooding hazards at the site. As shown in Figure 3-2, the Federal Emergency Management Agency has delineated flood hazard areas in the vicinity of DNPS. According to the Federal Emergency Management Agency's analysis, the DNPS area is in a zone of minimal flood hazard (Zone X). The eastern and northern portions of the site along the Kankakee and Illinois Rivers are classified as either river floodplains (Zone AE) or floodways (Zone AE-Floodway). The cooling lake is assigned a one percent annual chance of flooding (Zone A). The NRC staff has characterized the hazard from a local probable maximum precipitation event and the probable maximum flood and concluded that a maximum probable precipitation event would not impact safety-related equipment (Exelon 2021-TN11343).

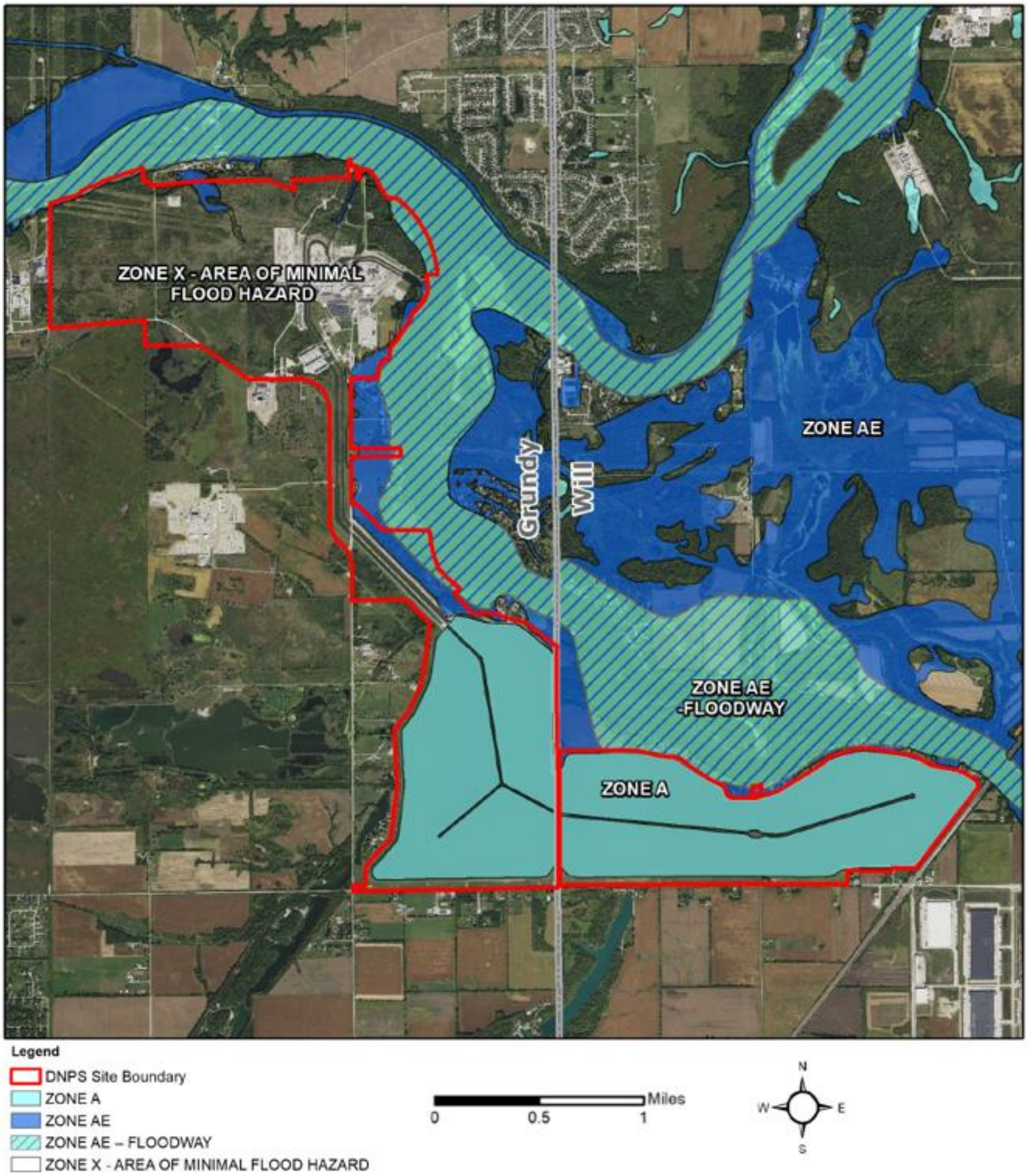

Figure 3-2 Federal Emergency Management Agency Flood Hazard Designation for the Dresden Nuclear Power Station Site. Source: CEG 2024-TN11347.

3.5.1.2 Surface Water Use

DNPS withdraws water from the Kankakee River via the Units 2 and 3 intake canal. There is no formal permit associated with surface water withdrawals for DNPS and per the Water Use Act of 1983 (525 ILCS 45), there are no regulations that limit monthly or annual withdrawal volumes (IL Stat. 525-TN11677). The only requirement of the Water Use Act of 1983 is that annual withdrawals are reported to the state if they exceed 100,000 gallons per day (378,541 liters per day). It should be noted that while the Units 2 and 3 intake canal is located along the shoreline of the Kankakee River, it is close enough to the confluence with the Des Plaines River that during periods of low flow a larger fraction of the of the withdrawal is sourced from the Des Plaines River (NRC 2004-TN7247).

The majority of surface water withdrawals are used for condenser cooling (CEG 2024-TN11347). Surface water is also used for the service water system and fire protection system – a comprehensive overview of surface water uses for the cooling and auxiliary water systems is presented in CEG's ER Section 2.2.3 (CEG 2024-TN11347). DNPS is not connected to a municipal water supply and sources its potable and sanitary water entirely from groundwater (CEG 2024-TN11347). Recent surface water withdrawals for DNPS are summarized in Table 3-9. Over the 2018 – 2023 period, DNPS withdrew an annual average of 198,576 million gallons per year (mgy) (544 million gallons per day [mgd] or 2,059 million liters per day [MLd]), with a maximum of 203,486 mgy (557 mgd or 2,108 MLd). During the 5-year period, monthly maximum withdrawals were 47,027 million gallons per month (mgm) (1,568 mgd or 5,935 MLd) and minimum were 2,135 mgm (71 mgd or 269 MLd).

Table 3-9 Recent Surface Water Withdrawals for Dresden Nuclear Power Station, 2018–2023

Year	Monthly Average (mgm)	Monthly Minimum (mgm)	Monthly Maximum (mgm)	Yearly Total (mgy)
2018	16,957	2,135	47,012	203,486
2019	16,845	2,339	47,027	202,140
2020	16,601	2,422	45,399	199,211
2021	16,347	2,339	45,399	196,169
2022	16,202	2,339	45,399	194,429
2023	16,335	2,339	45,399	196,018

All reported values are rounded.
Sources: 2018–2022 data from CEG 2024-TN11347, 2023 data from CEG 2025-TN11341.

Not evident in the annual withdrawal statistics (Table 3-9) is a large seasonality in surface water withdrawals due to DNPS following different seasonal operational modes for its cooling water system. Over 2018 to 2023, withdrawals between October and May were around 2,500 mgm (9,463 mlm) and during June through September they were around 45,000 mgm (170,343 mlm). The operational modes are summarized as follows and illustrated in Figure 2-4:

- Indirect open-cycle (June 15 to September 30): Cooling water is routed through the hot canal, the cooling lake, and the cold canal and discharged into the Illinois River. This operational mode is analogous to DNPS operating as a once-through cooling system with a run-of-river diversion. Routing the cooling effluent through the hot canal, cooling lake, and the cold canal allows thermal attenuation of the cooling water before it is discharged into the Illinois River.

- Closed-cycle with makeup/dilution flow (October 1 to June 14): Cooling water is routed through the hot canal, the cooling lake, and the cold canal. However, in this mode, the majority of the flow in the cold canal is routed back to the Units 2 and 3 intake canal and only a small fraction is discharged to the Illinois River as blowdown. The closed-cycle mode greatly reduces surface water withdrawals, as withdrawals are only needed to offset losses from evaporation, cooling lake seepage, and blowdown discharged to the Illinois River.

- Direct open-cycle (lake bypass): Only allowed when both Units 2 and 3 generating units are out of service and is rarely used. In this mode, cooling water is discharged to the Illinois River without flowing through the hot and cold canals or the cooling lake.

- Closed-cycle: A variation of closed-cycle mode with no diversion of flow to the Illinois River is utilized during cooling lake siphon system operation. In this mode water from the cooling lake is discharged into the Kankakee River to help prevent ice buildup. This mode is described in detail in Section 3.5.1.3.

MDCTs are located along the hot and cold canals. Three towers (42 cells) are operated for the hot canal and one tower (12 cells) is operated for the cold canal (Figure 2-4). The MDCTs are operated on an "as needed" basis to comply with NPDES permit temperature limits (Exelon 2021-TN11654). MDCTs are one of the main sources of consumptive losses of cooling water withdrawals and are primarily operated during warm summer months between June and August CEG 2025-TN11341). Average consumptive losses during indirect open-cycle mode are estimated at 57 mgd (216 MLd), of which 24 mgd (91 MLd) are associated with MDCT evaporative losses (Exelon 2021-TN11654). During closed-cycle mode with makeup flow, losses are estimated at 29 mgd (110 MLd) - about 50 percent lower than open indirect open-cycle mode, largely due to the limited use of MDCTs during closed-cycle mode months (Exelon 2021-TN11654).

Over 99 percent of surface water withdrawals in Grundy County, where DNPS is located, are associated with power generation (Dieter et al. 2018-TN9686). Power generation also accounts for almost all (98 percent) of surface water withdrawals in nearby Will County, which lies to the east and immediately upstream of Grundy County (Dieter et al. 2018-TN9686). More broadly, the primary regional uses of surface water in the Des Plaines River and Illinois River watersheds are transportation, sewage disposal, and condenser cooling for power plants, and uses in the Kankakee River are domestic supply and recreation (Exelon 2021-TN11343). The closest downstream use of surface water for municipal supply is the city of Peoria, Illinois, located approximately 100 mi (161 km) downstream from DNPS (Exelon 2021-TN11343).

3.5.1.3 Surface Water Quality and Effluents

Water Quality Assessment and Regulation

In accordance with Section 303(c) of the Federal Water Pollution Control Act (i.e., Clean Water Act of 1972, as amended) (CWA) (TN662), States have the primary responsibility for establishing, reviewing, and revising water quality standards for the Nation's navigable waters. Such standards include the designated uses of a water body or water body segment, the water quality criteria necessary to protect those designated uses, and an antidegradation policy with respect to ambient water quality. As established under CWA Section 101(a), water quality standards are intended to restore and maintain the chemical, physical, and biological integrity of the Nation's waters and to attain a level of water quality that provides for designated uses. EPA reviews each State's water quality standards to ensure they meet the goals of the CWA and Federal water quality standards regulations 40 CFR Part 131 (TN4814), "Water Quality Standards."

CWA Section 303(d) requires States to identify all "impaired" waters for which effluent limitations and pollution control activities are not sufficient to attain water quality standards in such waters. Similarly, CWA Section 305(b) requires States to assess and report on the overall quality of waters in their State. States prepare a CWA Section 303(d) list that identifies those water quality limited stream segments that require the development of total maximum daily loads to assure future compliance with water quality standards. The list also identifies the pollutant or stressor causing the impairment and establishes a priority for developing a control plan to address the impairment. States are required to update and resubmit their impaired waters list every 2 years, which ensures that impaired waters continue to be monitored and assessed by the State until applicable water quality standards are met. A review of the IEPA 2022 303(d) list of impaired waters (IEPA 2025-TN11270) identified the following impaired waters in the vicinity of DNPS:

- Des Plaines River (Segments IL_G-12, IL_G-24): Impaired for fish consumption and primary contact. Impaired by mercury, polychlorinated biphenyls (PCBs), and fecal coliform
- Kankakee River (Segments IL_F-01, IL_F-16): Impaired for fish consumption, primary contact, and public and food processing water supply. Impairment by aldrin, dieldrin, endrin, heptachlor, mercury, mirex, PCBs, toxaphene, primary contact, iron, and fecal coliform.
- Illinois River (Segments IL_D-10, IL_D-23): Impaired for fish consumption, primary contact, and aquatic life. Impaired by mercury, PCBs, aldrin, dieldrin, endrin, heptachlor, mirex, toxaphene, and fecal coliform.
- Illinois and Michigan Canal (Segment IL_GBA): Impaired for fish consumption by mercury.
- Aux Sable Creek (Segment IL_DW-01): Impaired for primary contact. Impaired by fecal coliform.
- Du Page River (Segment IL_GB-01*)*: Impaired for fish consumption. Impaired by mercury and PCBs.
- Grant Creek (Segment IL_GA-01): Impairment to aquatic life by cause unknown.
- Mazon River (Segment IL_DV-04): Impaired for fish consumption and primary contact. Impaired by mercury, PCBs, and fecal coliform.
- Heidecke (Collins) Lake (Segment IL_SDX): Impaired for fish consumption. Impaired by aldrin, dieldrin, endrin, heptachlor, mercury, mirex, PCBs, and toxaphene.

DNPS likely does not contribute to any of the water quality impairments because DNPS does not knowingly discharge any constituents that could contribute to downstream impairments (CEG 2025-TN11341). However, DNPS' NPDES permit does not require monitoring of many of the constituents identified as impairing surface water bodies in the vicinity of DNPS.

Review of DNPS Annual Radiological Environmental Operating Reports from 2019 through 2023 (NRC 2024-TN11680) shows that surface water samples collected upstream and downstream of DNPS have detectable tritium levels up to 2,540 and 1,420 picocuries per liter (pCi/L), respectively. Surface water samples are collected upstream of DNPS on the Kankakee (station D-57) and Des Plaines Rivers (station D-52) and at one location downstream of DNPS on the Illinois River (station D-21). Generally, the upstream D-57 station's results exceed that of the downstream station (D-21). The likely source of the upstream tritium detections is routine liquid waste effluent batch releases from the Braidwood Generating Station (CEG 2024-TN11678) which is located on the Kankakee River approximately 14 mi (23 km) upstream of DNPS. The lower measured concentrations at station D-21 result from dilution inflow from the Des Plaines River, which typically has less than detectable levels of tritium. All tritium detections are far below the EPA drinking water maximum contaminant level of 20,000 pCi/L.

Pollutant Discharge Eliminating System Permitting Status and Plant Effluents

To operate a nuclear power plant, NRC licensees must comply with the CWA, including associated requirements imposed by the EPA or the State, as part of the NPDES permitting system under Section 402 of the CWA. The Federal NPDES permit program addresses water pollution by regulating point sources (i.e., pipes, ditches) that discharge pollutants to waters of the United States. NRC licensees must also meet State water quality certification requirements under Section 401 of the CWA. The EPA or the States, not the NRC, sets the limits for effluents and operational parameters in plant-specific NPDES permits. Nuclear power plants cannot operate without a valid NPDES permit and a current Section 401 Water Quality Certification.

Since October 23, 1977, the State of Illinois has had the authority to administer the NPDES program (IEPA 2025-TN11682). NPDES permits are typically issued on a 5-year renewal cycle. DNPS operates under the administratively extended NPDES permit no. IL0002224, which was issued on September 2, 2016, and expired on August 31, 2021 (CEG 2024-TN11347). Per 35 Illinois Administrative Code (IAC) 309.104(a)(2), the "terms and conditions of an expiring NPDES permit remain effective and enforceable until the agency takes final action on the pending permit application" provided that (1) the applicant submitted the renewal in a timely manner (the renewal application was submitted on March 4, 2021) and (2) the agency (IEPA), through no fault of the permittee, does not issue a new permit on or before the expiration date of the previous permit. Thus, NPDES permit no. IL0002224 will remain under administrative extension pending review by IEPA. DNPS discharges covered by its NPDES permit include cooling and process waters, sanitary wastewater, stormwater runoff, and cooling lake siphon discharge. The administratively extended NPDES permit No. IL0002224 authorizes monitored discharges from nine outfalls (Figure 3-3): four internal (A02, B02, C02, and D02) and five external (001, 002, 003, 004, and 005). External outfalls discharge directly to a surface water body or feature that connects directly to a water body, while internal outfalls are associated with flow from waste streams that are eventually discharged into an external outfall. Two external outfalls (001 and 002) discharge to the Illinois River, and three external outfalls (003, 004, and 005) discharge to the Kankakee River. The four internal outfalls all discharge to the Illinois River via external outfall 002. The associated NPDES monitoring and reporting requirements and discharge limits are summarized in CEG's ER Table 3.6-1 and DNPS' NPDES permit is included as Attachment B of CEG's ER (CEG 2024-TN11347). Below is a summary of the effluent sources for each outfall.

- Outfall 001 (Illinois River): Unit 1 fire pump and equipment cooling water.
- Outfall 002 (Illinois River): Discharge from the four internal outfalls, Unit 2 and 3 condenser cooling water, Unit 2 and 3 crib house service waters, recovery well groundwater (groundwater tritium remediation), and stormwater runoff from the north and northwest plant area.
- Outfall 003 (Kankakee River): Sewage treatment plant effluent. DNPS treats sanitary wastewater at an on-site sewage treatment plant.
- Outfall 004 (Kankakee River): Cooling Lake siphon discharge
- Outfall 005 (Kankakee River): Stormwater runoff from the southern plant area

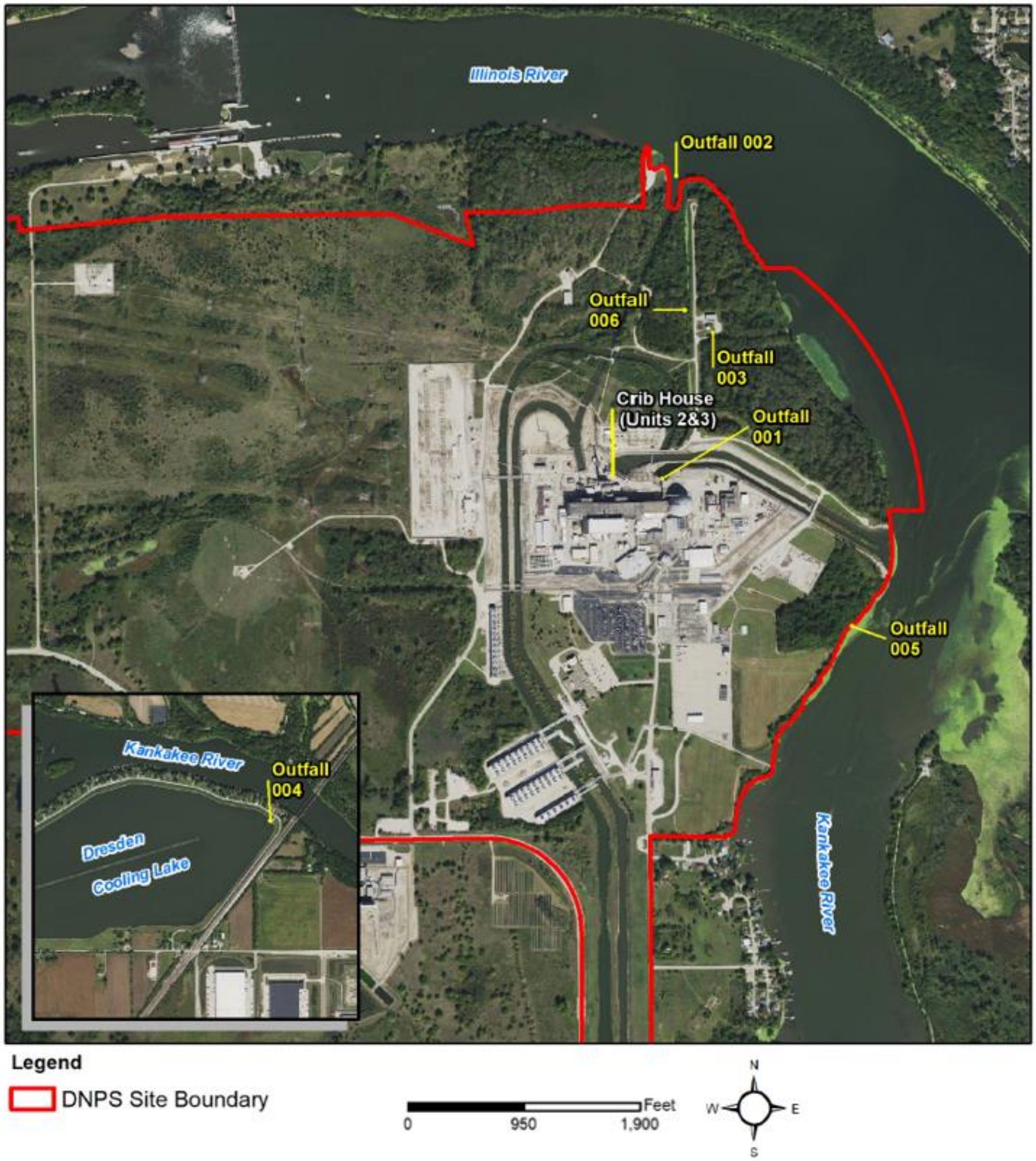

Figure 3-3 Locations of NPDES Permitted Outfalls for Dresden Nuclear Power Station. Source: CEG 2024-TN11347.

The NPDES permit requires continuous temperature monitoring and establishes thermal limits for cooling water discharge to prevent adverse impacts to aquatic life in the Illinois River. The thermal limits outlined in the NPDES permit are supported by observational data and thermal modeling as part of the 2016 NPDES permit renewal application. During closed-cycle mode (October 1 – June 14), thermal limit criteria apply to temperatures outside of the mixing zone (approximate extent documented in Exhibit 1, Appendix D of Petition to Approve Alternative

Thermal Effluent Limitations) (PCB 2015-TN11686). During this period, cooling water discharge cannot raise the temperature of the Illinois River by more than 5°F (2.8°C) above natural background temperatures and cannot cause river temperatures to exceed monthly limits outlined in Special Condition 3 of the NPDES permit for more than one percent of hours in any 12-month period. Additionally, discharges cannot cause temperature outside of the mixing zone to exceed 63°F (17.2°C) during December – March and 93°F (33.9°C) for the rest of the months when DNPS is operated in closed-cycle mode (April – June 14). Less stringent thermal limits, termed “alternate thermal limits,” apply during indirect open-cycle mode (June 15 – September 30). During this period, discharge temperatures measured at Outfall 002 cannot exceed 90°F (32.2°C) more than 10 percent of the time and have a maximum allowable temperature of 95°F (35°C). Indirect open-cycle mode thermal criteria also specify that any single period of exceedance cannot last more than 24 hours and that discharge temperatures above 93°F (33.9°C) are only permissible when intake temperatures are above 90°F (32.2°C). The variable blowdown plan applies to the brief transitional period between June 1 to June 14 when intake temperatures exceed 88°F (31.1°C) and is outlined in the NPDES permit. Monthly average intake temperatures from 2010 to 2023 show a slight warming trend in March, but not in other months (Figure 3-4). Monthly average discharge temperatures over the same period, available at CEG 2024-TN11342**,** do not show any increasing trends in discharge temperatures.

In addition to the effluents described for Outfall 002 in the NPDES permit, Outfall 002 has also been the discharge pathway for tritiated groundwater pumped from recovery well RW-DN-100S (location shown in Figure 3-6 presented in Section 3.5.2). RW-DN-100S has been used since 2016 to remove groundwater from a subsurface release in the power block area. This source of tritium discharge to surface water is accounted for in Annual Radioactive Effluent Release Reports as a continuous liquid release (CEG 2025-TN11341).

The NPDES permit also outlines procedures for operation of the cooling lake siphon system (Outfall 004). The cooling lake siphon system is operated to reduce the accumulation of ice on the Kankakee River, which can damage infrastructure (bridges) and shoreline property. The siphon system was installed by the USACE and consists of three, 3-ft diameter pipes that can move water via gravity drainage from the cooling pond to the Kankakee at a rate of 50 cubic feet per second (cfs) per pipe, with a maximum permitted cumulative heat input of 0.5 billion British thermal units (Btu) per hour. DNPS can be directed by the Will County Emergency Management Agency to activate the siphon system if severe icing conditions are anticipated on the Kankakee. The NPDES permit limits the siphon operation to two, 2-week periods per winter (up to March 15).

For all monitored effluents, DNPS submits discharge monitoring reports to the IEPA in accordance with the reporting schedule specified in the NPDES permit No. IL0002224. No notices of violation associated with wastewater discharges were issued over the 2018 to 2023 period. However, CEG self-reported NPDES permit noncompliance for missed visual stormwater observations at Outfalls 002 and 005 in the fourth quarter of 2022 and the second quarter of 2023 (CEG 2024-TN11347). These were associated with two qualifying rain events (> 0.1 in.) where visual inspection of stormwater discharge should have been conducted.

<u>Other Surface Water Resources Permits and Approvals</u>

Section 401 of the CWA requires applicants (in this case, CEG) for a federal license that might result in a discharge to navigable waters to provide the licensing agency with either (1) a waiver from the State or (2) a certification from the State that the discharge will comply with applicable CWA requirements. NRC cannot issue a license unless the applicant has received a Section 401 certification or waiver from the certifying authority.

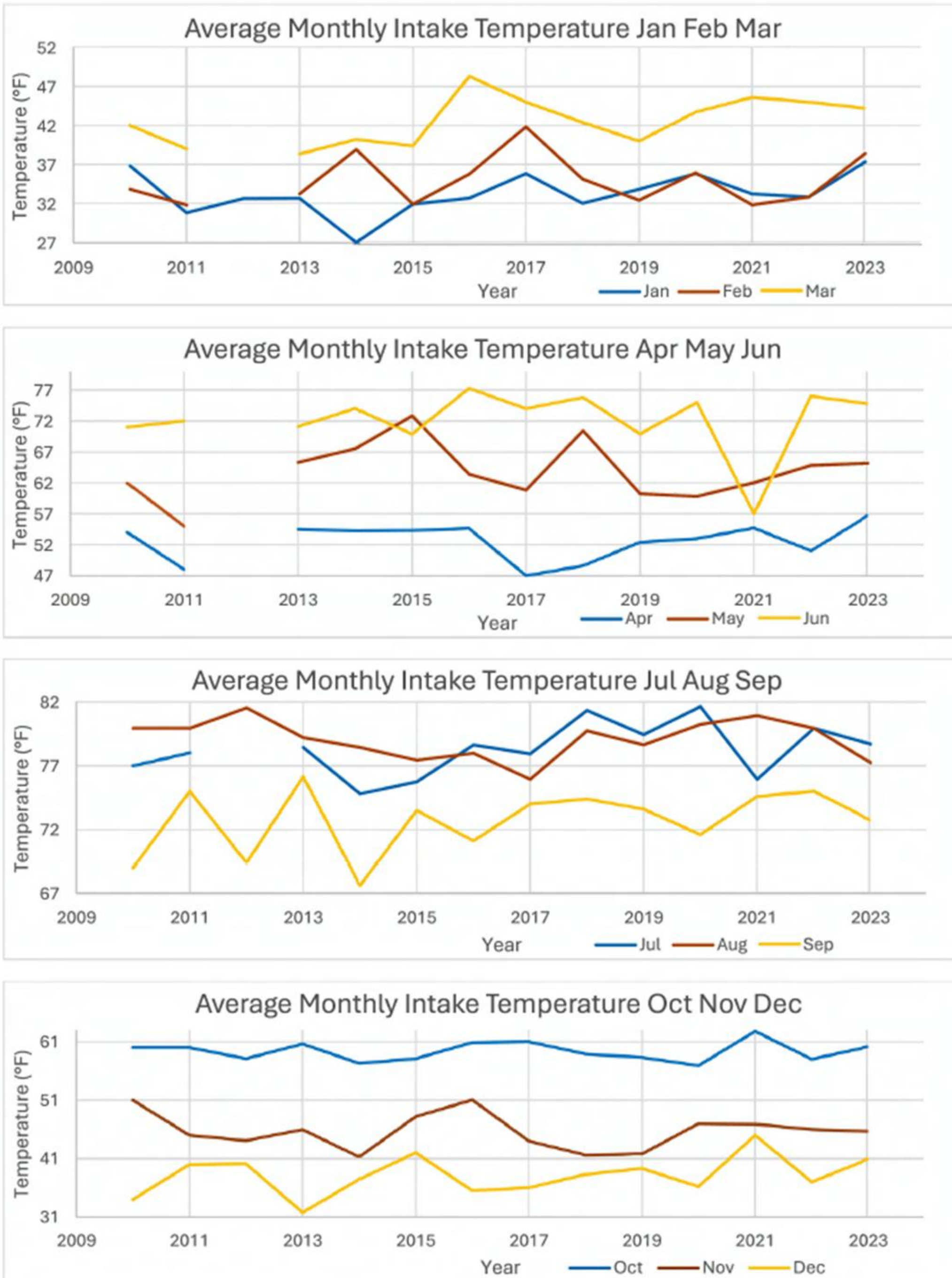

Figure 3-4 Average Monthly Intake Temperature over the 2010 to 2023 Period. Source: CEG 2025-TN11342.

As part of preparing the SLR application for Units 2 and 3 of DNPS, CEG requested confirmation from IEPA that the Section 401 Certification would be valid for the SLR term. In response to CEG's request, the IEPA issued a 401 Certification waiver on February 3, 2023 (CEG 2024-TN11347). Based on the NRC staff's review of this correspondence, the staff has determined that no further action is required by the NRC as the responsible Federal licensing or permitting agency as related to the CWA Section 401 certification process.

Stormwater associated with DNPS industrial activities is regulated by NPDES permit no. IL0002224. The NPDES permit mandates that CEG maintains and implements a stormwater pollution prevention plan (SWPPP) to reduce stormwater pollution from Outfalls 002 and 005, which drain runoff from the approximately 70 ac (28.3 ha) of land used for industrial activities at the DNPS site (CEG 2024-TN11347). The SWPPP identifies potential sources of pollution that would be reasonably expected to impact water quality of runoff and manages these with BMPs that prevent or reduce pollutants in stormwater discharge. The SWPPP includes three oil water separators that remove oil from stormwater. Stormwater for the Unit 1 and Units 2 and 3 oil water separators is routed to the wastewater treatment plant prior to discharge to surface water. The SWPPP requires quarterly inspections, in addition to at least one annual inspection when stormwater discharge is occurring (CEG 2025-TN11341). The SWPPP will be revised if any change occurs that may affect the discharge of significant quantities of pollutants, a quarterly or annual inspection identifies a need for an amendment, or a discharge violates a condition in the NPDES permit (CEG 2025-TN11341). DNPS does not hold a Section 404 permit required for dredging. While no dredging is planned for the SLR term, dredging may be required based on routine bathymetric survey results, which are performed during refueling outages for the intake canal (every outage) and the discharge canals (every four outages). CEG would follow the necessary procedures to obtain a Section 404 permit if dredging is deemed necessary to prevent sediment accumulation in the intake canal or discharge canals. DNPS operates, inspects, and maintains the DNPS cooling lake dam and its appurtenances in accordance with approved plans and in accordance with the latest edition of the “Rules for Construction and Maintenance of Dams” adopted by the Illinois Department of Transportation (CEG 2025-TN11341). CEG also has a permit from the Illinois Department of Natural Resources (IDNR) for operation and maintenance of the cooling lake dike and associated structures. The permit requires that the cooling lake dike is inspected every two months. Additionally, the cooling lake dike is inspected annually by a third-party engineering company (Exelon 2003-TN11723). DNPS is subject to the reporting provisions of 40 CFR Part 110 as it relates to the discharge of oil in such quantities as may be harmful pursuant to Section 311(b)(4) of the federal Water Pollution Control Act. DNPS is also subject to the reporting provisions of 40 CFR 262.34(d)(5)(iv)(C) as it relates to a fire, explosion, or other release of hazardous waste that could threaten human health outside the facility boundary, or when the facility has knowledge that a spill has reached a surface water. There were no reportable spills of hazardous and non-hazardous waste over the 2018 to 2023 period (CEG 2024-TN11347). Under CWA Section 311(j)(1)(C), DNPS is required to develop a spill prevention, control, and countermeasures (SPCC) plan. CEG maintains a SPCC plan that identifies and describes the procedures, materials, equipment, and facilities used at the station to minimize the frequency and severity of oil spills (CEG 2024-TN11347). CEG is required to review and evaluate the SPCC plan at least once every 5 years or immediately following a reportable spill event (CEG 2025-TN11341). The SPCC plan is also required to be updated within six months of a change in facility design, construction, operation, or maintenance that could significantly affect the facility’s potential for offsite discharges of oil (CEG 2025-TN11341).

3.5.2 Groundwater Resources

This section describes the groundwater flow systems (aquifers), groundwater use, and groundwater quality in and around the DNPS site. An aquifer is a saturated, permeable geologic formation, group of formations, or part of a formation that transmits water in sufficient quantities to supply water to pumping wells and/or springs.

3.5.2.1 Local and Regional Groundwater Resources

Section 3.6.2 of CEG's ER (CEG 2024-TN11347) describes groundwater resources in the vicinity of the DNPS site. NRC staff reviewed CEG's ER and evaluated other information related to groundwater resources during the environmental site audit, the scoping process, and review of other available information as cited in this SEIS.

As described in Section 3.4, the DNPS site, located in northeastern Grundy County and eastern Will County, is in a region with physiography shaped by repeated glaciation. The region is characterized by low relief and glacial deposits overlying a sequence of relatively flat-lying, indurated (i.e., hardened or lithified), sedimentary rocks of Paleozoic age. Quaternary sand and gravel deposits that occur primarily in current and former river valleys constitute the surficial aquifer system. The Quaternary deposits in the DNPS region are generally less than 100 ft (30 m) thick (Lloyd and Lyke 1995-TN4988). Pennsylvanian rocks (primarily sandstone) are productive aquifers across southern and central Illinois that thicken to the southwest in the DNPS region and pinch out in northeastern Grundy County. Silurian-Devonian dolomite and limestone aquifers occur across northeastern Illinois but are absent at and in the vicinity of the DNPS site. These shallow carbonate aquifers are a significant source of water in Will County (Roadcap et al. 2015-TN11687). The Cambrian-Ordovician aquifer system in the DNPS region consists of a series of primarily sandstone aquifers confined by leaky siltstone and shale confining units (Abrams et al. 2015-TN11688). The uppermost hydrogeologic unit of the Cambrian-Ordovician aquifer system is the Maquoketa confining unit, consisting primarily of shale. The underlying Galena Dolomite is used for water supply, particularly where the confining shale unit is absent. The older, principal aquifers of the Cambrian-Ordovician aquifer system are a significant source of fresh water for northeastern Illinois, including in the DNPS site region (Roadcap et al. 2015-TN11687). These aquifers include the St. Peter (Ancell) and Ironton-Galesville rock units (Abrams et al. 2015-TN11688). Salinity of the Mt. Simon sandstone aquifer limits its use as a freshwater supply in the DNPS region (Abrams et al. 2015-TN11688; Lloyd and Lyke 1995-TN4988). The designated sole source aquifer closest to the DNPS site is the Quaternary Mahomet Aquifer located about 40 mi (64 km) to the south (EPA 2025-TN11845). A sole source aquifer is an aquifer that supplies at least 50 percent of the drinking water for an associated service area and no reasonably available alternative drinking water sources exist should the aquifer become contaminated (EPA 2020-TN6464).

Features of the DNPS site include the Kankakee and Illinois Rivers bordering the site and the relatively flat terrain of the site and surrounding area south and west of the rivers. As described in Section 3.4.1, DNPS site geology includes less than 5 ft (1.5 m) of unconsolidated overburden consisting of sandy clay with some gravel; 25 to 30 ft (7.6 to 9.1 m) of the Pennsylvanian Pottsville sandstone that is absent in the northern portion of the site but present across the main buildings area and excavated for much of the plant infrastructure; 25 to 30 ft (7.6 to 9.1 m) of the Ordovician Divine Limestone, the uppermost bedrock where the Pottsville sandstone is absent; and about 65 ft (19.8 m) of the Ordovician Maquoketa Shale low permeability confining unit that served as the excavation base for many of the major plant structures. Below the shale are other units of the Cambrian-Ordovician aquifer system. The upper portion of the Galena Dolomite underlying the Maquoketa Shale was reported to be unsaturated, indicating a lack of flow across the shale and dewatering of the lower aquifer due to regional groundwater use (RETEC 2005-TN11690). Other unconsolidated subsurface materials present in the protected area include up to 30 ft (9.1 m) of sand and gravel fill. Figure 3-5 shows a geologic cross-section through the DNPS protected area illustrating the subsurface materials that occur at the site and in some of the excavations into bedrock for plant buildings and canals.

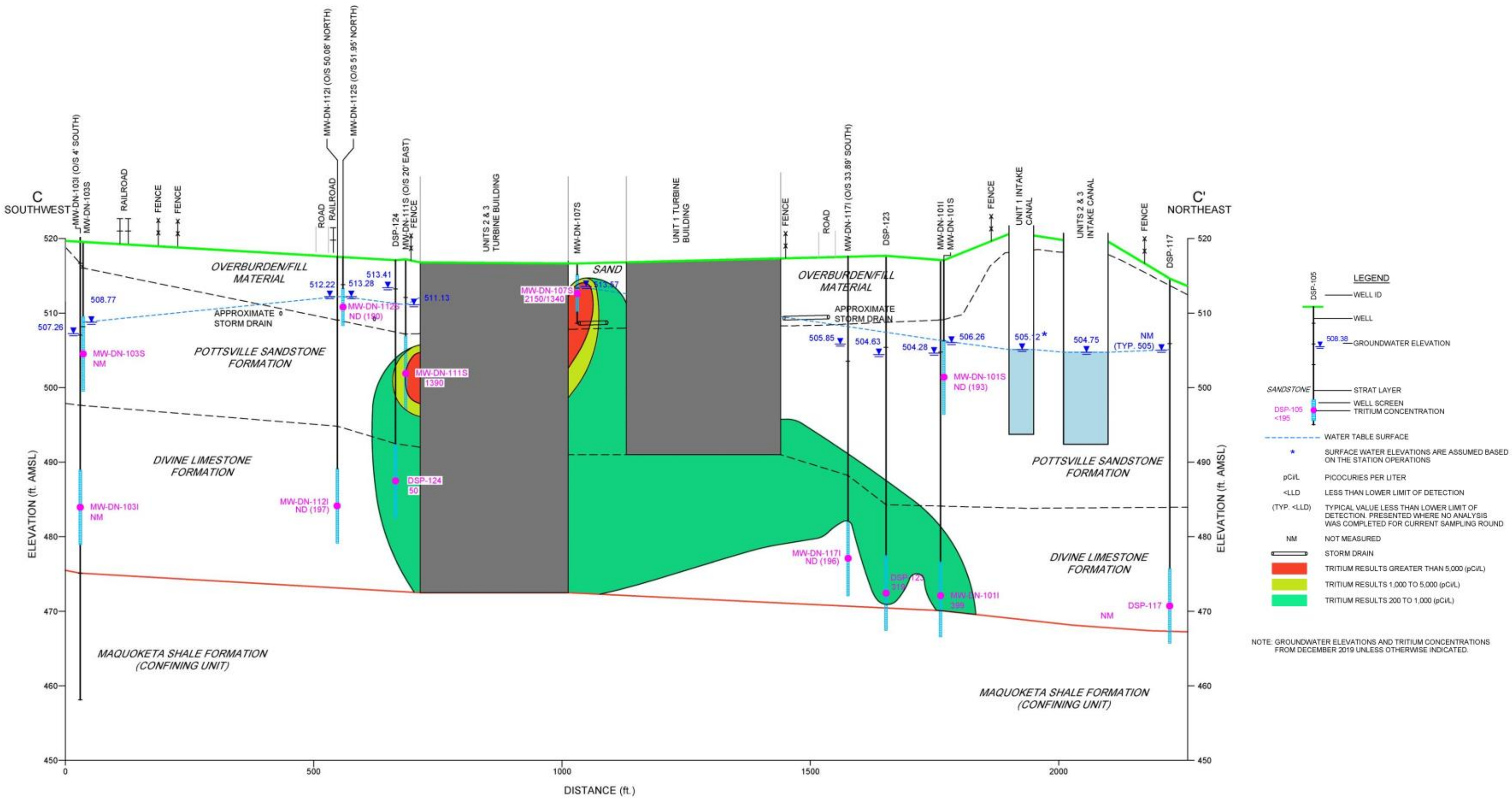

Figure 3-5 Southwest to Northeast Geologic Cross Section through the Dresden Nuclear Power Station Protected Area. Source: CEG 2024-TN11347.

Groundwater at the DNPS site occurs in the unconsolidated overburden materials and the sandstone and limestone bedrock, which constitute the surficial (water table) aquifer (CEG 2024-TN11347). Subsurface exploration for the ISFSI expansion site included rock coring in five boreholes (CEG 2025-TN11341). A minimum of 25 ft (7.6 m) of rock coring was performed at each of these borings. Boring logs describe the sandstone encountered as highly to moderately weathered and fractured. Boring logs describe the limestone encountered as moderately fractured. In some boreholes, the upper approximately 1 ft (0.3 m) of sandstone was described as more weathered and fractured than the underlying sandstone rock (CEG 2025-TN11341). Other boring logs also identified bedrock fractures (RETEC 2005-TN11690). Accessible groundwater in the bedrock likely occurs in fractures, bedding planes, and areas of weathered rock. The DNPS region is not an area where significant solution channel development in the dolomite is expected (CEG 2024-TN11347).

In the DNPS site region, recharge to groundwater is from precipitation, with water moving primarily through the unconsolidated deposits and shallow bedrock and discharging to streams. Deep circulation of fresh groundwater in the Cambrian-Ordovician aquifer system occurs in northern Illinois due to recharge in outcrop and shallow subcrop areas of these rocks in Wisconsin (Lloyd and Lyke 1995-TN4988). Shallow groundwater near the DNPS site is hydraulicly connected to and influenced by the surface water bodies in the area. The cooling lake and the intake, discharge, hot, and cold canals are excavated into bedrock and are unlined. Groundwater and surface water interaction is determined by the relative hydraulic heads (water levels) in the surface water bodies and the adjacent groundwater. Local groundwater flow paths on the DNPS site are influenced by building foundations, underground utilities, and the presence of transmissive materials (e.g., coarse-grained fill) or geologic features (e.g., fractures). Groundwater in the surficial aquifer at the DNPS site ultimately discharges to the Kankakee and Illinois Rivers.

Information about DNPS site groundwater conditions is obtained from a network of wells installed at shallow (S) and intermediate (I or M) depths in the surficial aquifer. Locations of the wells are shown on Figure 3-6. Many wells are installed in multi-level clusters with the intermediate depth wells screened just above the shale confining unit and the co-located shallow wells screened closer to the upper groundwater level (water table) (Figure 3-6). Three well clusters (DSP-157, DSP-158, and DSP-159) include a deep well screened just below the shale (RETEC 2005-TN11690). Plant grade at DNPS is 517 ft (157.6 m) mean sea level. During December 2019, groundwater elevations for shallow wells installed around the power block buildings ranged from 504.9 ft (153.9 m) near the Unit 1 intake (well MW-DN-116S) to 513.7 ft (156.6 m) south of the Units 2 and 3 reactor and turbine buildings (wells MW-DN-102S and MW-DN-113S) (CEG 2024-TN11347). Water levels in the intermediate depth wells were similar during this same time period. The average gage height of the Kankakee River at the intake canal during December 2019 was 504.6 ft (153.8 m), with only minor fluctuations in the average monthly level of the river (USGS 2025-TN11693). Concurrent measurements of water levels in the surface water bodies were not reported. Water surface elevations during the May 2023 annual cooling lake and circulating water canal examination were reported to be about 522 ft (159.1 m) in the cooling lake at the spillway, 506.25 ft (154.3 m) in the hot canal, and 510.50 ft (155.6 m) in the cold canal. Both canal elevations were measured at the Dresden Road bridge over the canals (CEG 2025-TN11341). Elevations in piezometers located around the cooling lake ranged from 520.9 ft to 506.4 ft (158.8 m to 154.4 m) during the May 2023 examination (CEG 2025-TN11341).

Based on the water levels provided above, the NRC staff estimated a horizontal hydraulic gradient between the power block and the Kankakee River of 0.005 and between the power block and the hot canal of 0.015. These values are similar to the horizontal hydraulic gradient estimates reported in CEG's ER as 0.008 based on shallow well data and 0.012 based on intermediate well data (CEG 2024-TN11347). Horizontal gradients as high as 0.035 were estimated for areas outside the protected area based on well data from 2004 and 2005 (RETEC 2005-TN11690). Comparisons between water levels in shallow and intermediate wells showed a vertical gradient for downward flow in the surficial aquifer at most locations. Maximum reported downward vertical gradients were estimated by the NRC staff as 0.22 (CEG 2024-TN11347), 0.02 (RETEC 2005-TN11690), and 0.06 based on the December 2019 water level data provided in CEG's ER.

To evaluate saturated hydraulic conductivities at the DNPS site, rising and falling head slug tests were conducted in eight wells screened at shallow and intermediate depths (DSP-121, DSP-149R, DSP-157S/M, DSP-158S/M, and DSP-159S/M) (RETEC 2005-TN11690). Average hydraulic conductivity for the shallow wells screened in the Pottsville Sandstone was 34 ft/day (1.2×10^{-2} cm/s). Average hydraulic conductivity for the intermediate wells screened in the Divine Limestone was 0.7 ft/day (2.5×10^{-4} cm/s). Estimates of the vertical saturated hydraulic conductivity for the Maquoketa Shale were 8.6×10^{-7} to 1.7×10^{-4} ft/d (3.0×10^{-10} to 6.0×10^{-8} cm/s) (CEG 2024-TN11347). Porosity was assumed to be 0.3 for the sandstone and 0.1 for the limestone (CEG 2024-TN11347). Porosity of the sandstone is representative of the bulk rock, and the effective porosity would be smaller if flow is predominantly through fractures or zones of weathered rock. An effective sandstone porosity of 0.15 was assumed in RETEC 2005-TN11690.

Groundwater velocities and transport pathways in the plant area are difficult to estimate due to the variable subsurface materials, site infrastructure, and limited data. In addition, transport in groundwater is affected by water level variations in canals. Because porosity of the intact bedrock is low, the NRC staff expect that groundwater flow and the transport of any contaminants in bedrock would occur mainly along fractures, bedding planes, and areas of weathered rock. In addition, the NRC staff expect that flow, and transport would occur where relatively coarse sand and gravel fill is present. Based on groundwater conditions described in CEG's ER and summarized in this section, the general direction of groundwater flow is from the site toward the Kankakee River. However, groundwater flow in the protected area is locally influenced by the canals and site infrastructure, with flow paths that appear to radiate out from the power block area and some groundwater discharge into the canals. Elevation of the cooling lake indicates that it is a local source of groundwater recharge. Using the estimated hydraulic conductivity and effective porosity values described above, the NRC staff estimated horizontal groundwater velocities of about 1 to 3 ft/day (0.3 to 0.9 m/day) in the sandstone and about 0.1 ft/day (0.03 m/day) in the limestone. NRC staff expect that downward vertical groundwater flow velocities would be smaller due to hydraulic conductivity anisotropy in the bedrock (i.e., vertical conductivities would be smaller than the horizontal conductivity estimates from the slug tests). Interpretations of the tritium data from historical releases indicate that transport in the vertical direction has a significant effect on the distribution of tritium in groundwater, as evidenced by the presence of elevated tritium in the intermediate depth wells (e.g., see Figure 3-5 and other cross-section figures in CEG 2024-TN11347). The presence of the low permeability shale confining layer prevents significant groundwater flow from the surficial aquifer to deeper aquifers.

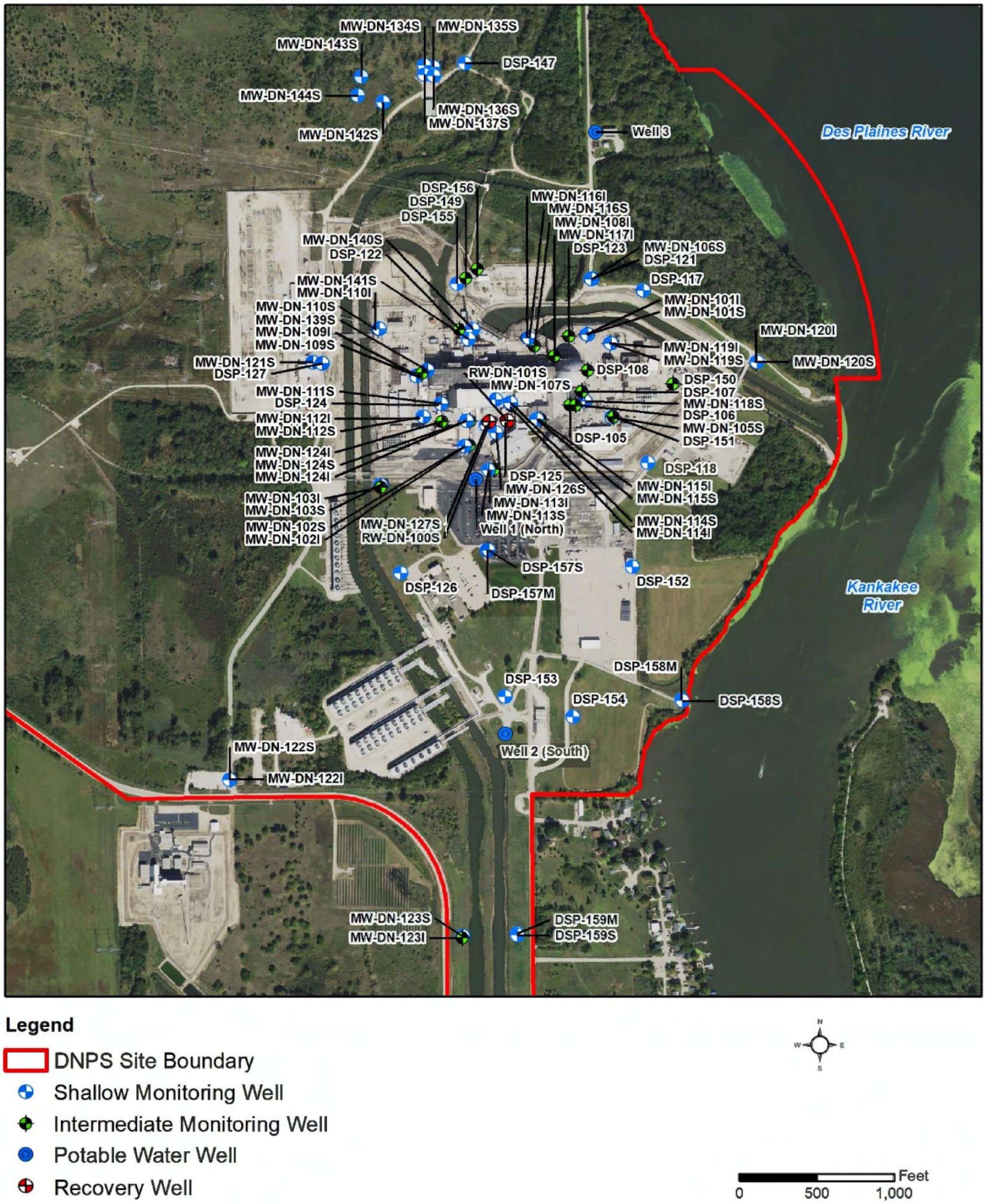

Figure 3-6 On-site Wells at Dresden Nuclear Power Station. Source: CEG 2024-TN11347.

3.5.2.2 Local and Regional Groundwater Use

DNPS uses groundwater for potable water and sanitary needs and a variety of plant operation needs (CEG 2024-TN11347). Drinking water is provided under Water System No. IL3083196 (CEG 2024-TN11347). Three on-site wells are used to supply water (see Figure 3-6 for locations of wells). The two primary wells (Wells 1 and 2) each have a pumping capacity of 200 gpm and were drilled to a depth of 1500 ft (457 m) into the Ironton-Galesville sandstone aquifer. Average water use for these two wells was 24.5 gpm (1.55 liters per second (Lps) during 2018 through 2022 (CEG 2024-TN11347). The third well has a pumping capacity of 30 gpm (1.9 Lps), supplies water for operation of the sewage treatment plant, and is drilled into the Galena-Platteville carbonate aquifer. This well is used intermittently with an average daily pumping rate of 0.2 gpm (0.01 Lps) (CEG 2024-TN11347). Mandatory reporting to the State is required for groundwater withdrawals exceeding 70 gpm (4.4 Lps), but no permit is required (IDNR 2025-TN11694).

A groundwater recovery well (RW-DN-100S in Figure 3-6) is operated for tritium removal from the surficial aquifer. This well has operated continuously since September 2019 with over 1 Mgal (3.8 million liters) of groundwater reported to have been pumped as of February 2024 (CEG 2024-TN11347). The average rate of pumping for groundwater recovery based on this duration and pumped volume is less than 1 gpm (0.06 Lps). Recovered water is discharged to the Illinois River via NPDES Outfall 002 (CEG 2024-TN11347).

The Cambrian-Ordovician sandstone aquifers are the principal source of groundwater in Grundy, Will, and Kendall Counties for public and industrial uses, although use of the shallower carbonate and sand and gravel aquifers is not uncommon in areas distant from the DNPS site (Roadcap et al. 2015-TN11687). Withdrawal of fresh groundwater in the three counties totaled 45.54 mgd (172.4 million liters per day) in 2015 (Dieter et al. 2018-TN9686) with about 7.5 percent of that total in Grundy County. The largest uses for the three-county area were for public water supply (61.3 percent), industrial use (16.6 percent), and domestic use (18.8 percent). In Grundy County alone, public supply, industrial, and domestic uses were 37.6, 48.9, and 9.5 percent of the county's total groundwater withdrawals, respectively. Virtually all of the public supply and domestic water withdrawals in 2015 in the three counties were from groundwater sources. About two-thirds of the industrial use had a surface water source. Intensive groundwater use in northeastern Illinois resulted in significant drawdowns in hydraulic head levels in the Cambrian-Ordovician sandstone aquifers (Abrams et al. 2015-TN11688). Aquifer levels have recovered since 1980 as communities in the Chicago, Illinois area switched to surface water supplies, although levels in Kendall and Will Counties continued to decrease, and the risk of future desaturation in the St. Peter (Ancell) and Ironton-Galesville sandstone aquifers is high in the DNPS region (Abrams et al. 2015-TN11688; Mannix et al. 2015-TN11689; Hadley et al. 2023-TN11695).

CEG identified nearly 300 registered groundwater wells located within 2 mi of the DNPS center point (CEG 2024-TN11347). Average depth of these wells was 300 ft (91.4 m), with about 14 percent having a depth less than 125 ft (38.1 m). Illinois State Water Survey well records indicate the wells are typically open within the rock formations with most of the wells deriving water from carbonate rocks (ISGS 2025-TN11696).

3.5.2.3 Groundwater Quality

Groundwater quality of the bedrock aquifers in the DNPS region is generally good as evidenced by its prevalent use for public, industrial, and domestic needs. Typical water quality concerns include elevated total dissolved solids, high levels of hardness, and potential exceedance of sulfate and iron (Lloyd and Lyke 1995-TN4988; Roadcap et al. 2013-TN11697). Dissolved solids concentrations tend to increase with depth. The southern limit of freshwater in the St. Peter (Ancell) and Ironton-Galesville aquifers is near southern Grundy County (Lloyd and Lyke 1995-TN4988). As noted previously, the Mt. Simon aquifer is too saline in the DNPS region for freshwater uses. Bedrock aquifers in the region are generally of the calcium-magnesium-carbonate type with local increases in sodium and chloride (Lloyd and Lyke 1995-TN4988; Roadcap et al. 2013-TN11697).

Illinois designates groundwater into four classes for the application of water quality standards (IAC 35-TN11236). Class I groundwater is suitable for potable use and is protected to drinking water standards. A region immediately to the west of DNPS, including the southwestern portion of the DNPS site, that contributes groundwater to the Goose Lake Prairie Nature Preserve, has been designated as a Class III Special Resource Groundwater, which renders it subject to the Class I water quality standards (CEG 2024-TN11347). Groundwater regulations also include a non-degradation provision to prevent release of contaminants that would degrade or preclude an existing or potential designated groundwater use.

<u>Nonradiological Spills</u>

CEG controls the use and storage of chemicals associated with DNPS maintenance and operations in accordance with the applicable Federal, State, and county authorizations (CEG 2024-TN11347). In addition, the plant maintains a spill prevention control and countermeasure plan to minimize the accidental release of hazardous materials. No inadvertent releases or spills of nonradioactive contaminants is known to have affected groundwater quality occurred at the site between 2018 and 2023 and no nonradiological remediation activities are active (CEG 2024-TN11347).

<u>Historical Radiological Spills and Tritium in Groundwater</u>

Groundwater Protection Program

CEG has adopted procedures to implement the Industry Groundwater Protection Initiative (NEI 2019-TN6775). A groundwater study conducted in 2006 to evaluate the impact of plant operations on site groundwater identified tritium in almost half of the 39 wells sampled within the protected area and attributed the contamination to historical leaks and spills from above-ground tanks and buried lines (CEG 2024-TN11347). Tritium was detected in 2 of 26 wells located outside the protected area. A review of the site conceptual model was most recently completed in 2020 to satisfy requirements of the Groundwater Protection Initiative. The DNPS Radiological Groundwater Protection Program (RGPP) currently includes monitoring of 61 wells, the locations of which are selected to provided early detection of leaks from high risk systems, structures, and components, monitor the movement of existing and potential contamination before it migrates off site, monitor systems, structures, and components where decommissioning has been initiated, and provide information on background conditions of groundwater unaffected by plant operations (CEG 2024-TN11347). Groundwater monitoring wells are sampled annually, semiannually, or quarterly for tritium depending on the purpose for each well. Samples are analyzed for gamma emitting radionuclides every 2 years. Samples from wells monitoring systems, structures, and components are analyzed for Fe-55, Ni-63, Sr-89, and Sr-90 radionuclides. Seventeen additional wells are available but not monitored as part of the RGPP. Surface water sources were monitored in the past but were removed from RGPP monitoring beginning in 2020. Notification of spills, leaks, or discovery of contamination are made to the NRC and other outside agencies when these meet specified criteria. RGPP monitoring results and the result of off-site groundwater monitoring as part of the Radiological Environmental Monitoring Program (REMP) are reported in the Annual Radiological Environmental Operating Reports and publicly available from the NRC (e.g., NRC 2025-TN11680).

The State of Illinois requires licensees to report unpermitted releases of station-generated liquids that result in tritium concentrations of 200 pCi/L or more outside of the licensee-controlled area (IAC 35-TN11236), which is the DNPS property boundary. RGPP and REMP monitoring are used to ensure this requirement is met (CEG 2025-TN11341). An internal procedure is also maintained for reporting unpermitted releases of radionuclides in accordance with 35 IAC 1010.200 requirements.

Radiological Releases

An investigation of tritium in groundwater was conducted in response to a 2004 release from the condensate storage tank (CST) system (RETEC 2005-TN11690). Tritium was determined to have migrated both east and west into storm sewer catch basins that intersected the upper groundwater level (the water table). Tritium in groundwater was determined to be confined to a small area entirely within the protected area with the bulk of the contamination flowing to the east and northwest under the influence of the hydraulic gradient near and around the plant buildings. The most recent inadvertent release of tritium to groundwater was in June 2014 from a CST tank just south of the Units 2 and 3 turbine building (CEG 2024-TN11347). Monitoring of the groundwater in the vicinity of the release determined that the contamination was limited to a small area near the CST. Two groundwater extraction wells were installed in January 2015 near the area of release to recover contaminated groundwater, although only recovery well RW-DN-100S had sufficient inflow to operate (Figure 3-6). Groundwater recovery in well RW-DN-100S began in 2016, operated intermittently until 2019, and has operated continuously since then. No additional recovery wells are planned. Groundwater monitoring results indicate that tritium in groundwater migrated downward in the surficial aquifer to the shale confining layer and was transported north and northwestward around and under the plant buildings in both the shallow and deeper groundwater of the surficial aquifer. No reportable inadvertent release of tritium to groundwater has occurred since 2014.

The maximum observed tritium activity in a groundwater sample at DNPS was 10,312,000 pCi/L in July 2004 (NRC 2024-TN11047). Tritium in shallow groundwater near the CST release was 2,300,000 pCi/L in June 2014 (CEG 2024-TN11347). Tritium activity at this location has decreased consistently over time, with activity varying from 4,330 to 12,700 pCi/L during 2023 (NRC 2025-TN11680). Tritium activity during 2023 in the operating recovery well ranged from 880 pCi/L to 1430 pCi/L. With the exception of monitoring wells MW-DN-111S and DSP-122, tritium activities in wells impacted by the 2014 inadvertent release have decreased between 2019 and 2023. Activities in all wells have been below the EPA’s drinking water standard (20,000 pCi/L) since 2020 (NRC 2025-TN11680). Tritium activity in well MW-DN-111S, a shallow groundwater well located on the west side of the Units 2 and 3 turbine building, increased from an average value of about 700 pCi/L in 2019 to an average of 6,300 pCi/L in 2023. Tritium in well DSP-122, an intermediate depth well in the same area, increased from less than 500 pCi/L to about 1400 pCi/L over the same period. The maximum tritium activity in groundwater samples during 2023 was 19,000 pCi/L at the inoperable recovery well RW-DN-101-S (NRC 2025-TN11680).

3.5.3 Proposed Action

3.5.3.1 Surface Water Resources

As described in the LR GEIS (NRC 2024-TN10161) and as cited in Table 3-1 of this SEIS, for generic surface water resources issues, the impacts of nuclear power plant license renewal and continued operations would be SMALL for Category 1 issues applicable to DNPS (listed below). No significant surface water impacts with respect to applicable Category 1 (generic) issues are anticipated during the SLR term that would be different from those occurring during the current license term.

- Surface water use and quality (non-cooling system impacts)
- Altered current patterns at intake and discharge structures
- Scouring caused by discharged cooling water
- Discharge of metals in cooling system effluent
- Discharge of biocides, sanitary wastes, and minor chemical spills
- Surface water use conflicts (plants with once-through cooling systems)
- Effects of dredging on surface water quality
- Temperature effects on sediment transport capacity

Two of the generic surface water resources issues, “Altered salinity gradients” and “Altered thermal stratification of lakes,” listed in the LR GEIS (NRC 2024-TN10161) do not apply to DNPS. As stated in the LR GEIS, altered salinity gradients applies to plants located on estuaries where cooling system water withdrawals and discharges may cause changes in salinity. Because DNPS is not located on an estuary, this issue does not apply. Altered thermal stratification of lakes applies to plants whose intake and/or discharge structures are located on a lake. This issue does not apply because DNPS’ intake and discharge structures are located along the Kankakee and Illinois Rivers.

The NRC staff’s review did not identify any new and significant information that would change the conclusion in the LR GEIS. Thus, as concluded in the GEIS, for these Category 1 (generic) issues, the impacts of continued operation of DNPS on surface water resources would be SMALL.

The LR GEIS lists one Category 2 issue for surface water resources—"Surface water use conflicts (plants with cooling ponds or cooling towers using makeup water from a river)” (NRC 2024-TN10161). This Category 2 issue is applicable to DNPS as cooling water and makeup water for the plant cooling pond and MDCTs is sourced from the Kankakee and Des Plaines Rivers. Evaporative losses from cooling lake seepage and evaporation from the cooling lake and MDCTs are made up by surface water withdrawals from the Units 2 and 3 intake canal. While the Units 2 and 3 intake canal is located along the Kankakee River, it is located in close proximity to the confluence with the Des Plaines River (Figure 2-1), such that during low flow conditions withdrawals can also be comprised of Des Plaines flows (CEG 2024-TN11347). The analysis of this Category 2 issue includes statistics on the combined flow of the Des Plaines and Kankakee Rivers, measured both upstream and downstream of DNPS. The upstream combined flow, derived from USGS gauges 05537980 (Des Plaines River) and 05527500 (Kankakee River), represents an estimate of the *upper* bound of consumptive use impacts, since these gauges have smaller contributing watershed areas than at their confluence near the DNPS site, and because no major surface water use occurs between these gauges and DNPS. The closest downstream USGS gauge is Station 05542500 on the Illinois River near Morris, Illinois, approximately 8 mi (12.9 km) downstream of DNPS. However, this station has a very short period of record (2016 to January 2025). The next downstream gauge (Station 05543500 at Marseilles, Illinois), approximately 25 mi (40.2 km) downstream from DNPS, with a much longer period of record spanning from October 1919 to January 2025, is used for this analysis. The flow at the downstream gauge has a larger contributing area than at the DNPS site and provides an estimate of the *lower* bound of consumptive use impacts.

As discussed in Section 3.5.1.2, DNPS predominantly follows two operational modes (the third mode is only used when both generating units are offline). Water consumption during both operational modes is relatively small, especially compared to flow in the Illinois River. Estimated average daily consumption during closed-cycle mode is 45 cfs (110 MLd) and during indirect open-cycle is 87 cfs (213 MLd) (CEG 2024-TN11347). This analysis presents the percentage of daily average consumption at DNPS relative to the 5^{th} percentile and median (50^{th} percentile) mean daily flows upstream and downstream of DNPS (Figure 3-7). Using the upstream and downstream flow statistics to bound consumptive use impacts, water consumption ranges from approximately 0.3 to 2.5 percent of median flows (Figure 3-7b) and between approximately 0.7 to 5.3 percent of 5^{th} percentile low flows (Figure 3-7a). The historical data supports that DNPS consumptive use represents a small fraction of seasonal surface water flows, even when considering low flow conditions (5^{th} percentile) for the upstream combined flow (black line in Figure 3-7a). Moreover, Illinois regulations for surface water use (525 ILCS 45) set no limit on surface water withdrawals for DNPS (or any other user) and only require that annual water withdrawals are reported to the State. Based on this analysis, the impact of the Category 2 issue related to surface water use conflicts (plants with cooling ponds or cooling towers using makeup water from a river) is SMALL.

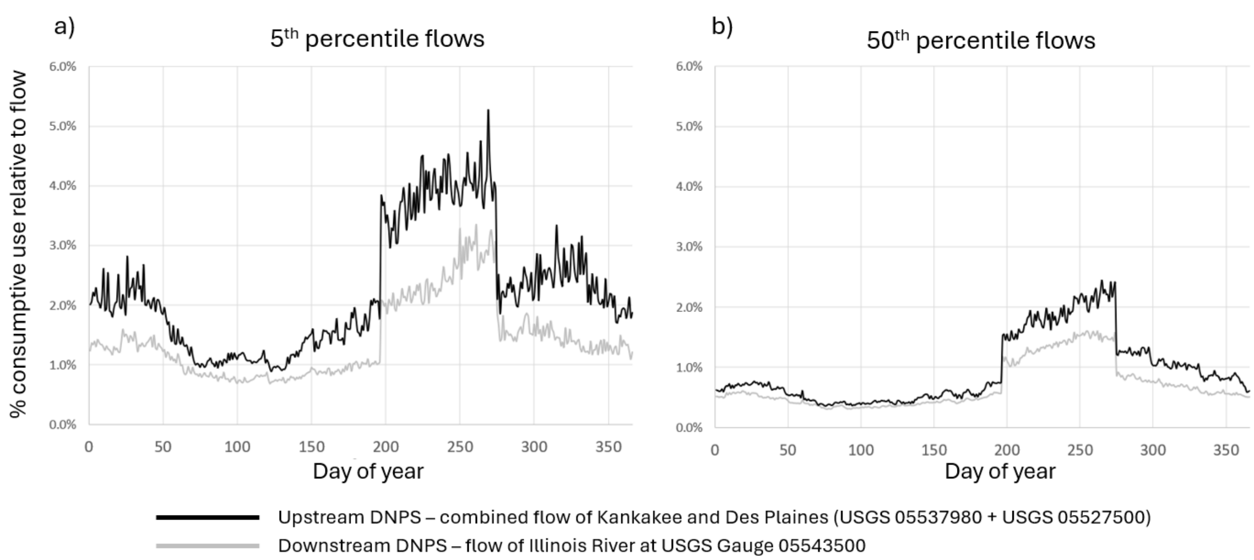

Figure 3-7 Fraction of Daily Average Consumptive Water Use Compared to 5^{th} Percentile Low Flows (a) and 50^{th} Percentile Flows (b) Relative to the Combined Upstream Flow of the Kankakee and Des Plaines Rivers (black line) and Downstream Flow of the Illinois River (gray line). Flow statistic values are based on recorded daily average flows. Data: USGS 2025-TN11698, USGS 2025-TN11699, USGS 2025-TN11700, USGS 2025-TN11701, USGS 2025-TN11702, USGS 2025-TN11703.

3.5.3.2 Groundwater Resources

As documented in the LR GEIS (NRC 2024-TN10161) and cited in Table 3-1, for generic groundwater resources issues, the impacts of nuclear power plant LR and continued operations would be SMALL for the Category 1 issues applicable to DNPS. These issues are:

- Groundwater contamination and use (non-cooling system impacts)
- Groundwater use conflicts (plants that withdraw less than 100 gpm)
- Groundwater quality degradation resulting from water withdrawals

These applicable Category 1 issues were determined to result in a SMALL impact in 10 CFR Part 51 (TN10253), Subpart A, Appendix B, Table B-1. No significant groundwater impacts with respect to Category 1 (generic) issues are anticipated during the SLR term that would be different from those occurring during the current license term. As discussed in Section 3.5.2, the NRC staff performed a review of groundwater use and quality. This review, including independent review of CEG's ER, the scoping process, the environmental site audit, and evaluation of available information, did not identify any new and significant information that would change the conclusions reached in the LR GEIS. Based on this review, the NRC staff conclude the following:

- No dewatering is currently used for control of groundwater levels and no dewatering is expected during the renewal period. Groundwater pumping for tritium control has been continuous since 2019 and may occur during the renewal period. The current average rate of pumping (less than 1 gpm [0.06 Lps]) is too low to have any noticeable effect on other groundwater users. No discharges to groundwater requiring permits by regulatory agencies are expected during the renewal period. In addition, the NRC staff expect CEG to maintain SWPP and SPCC plans to prevent and reduce contamination of surface and groundwater.

- The NRC staff understand that CEG does not have planned modifications to DNPS operations during the renewal term that would significantly increase the rate of groundwater use above its current average value of about 25 gpm (1.6 Lps). Groundwater levels in the deep sandstone aquifers in the DNPS region are dominated by large withdrawals exceeding 1 mgd (44 Lps) (Abrams et al. 2015-TN11688). Continued pumping at DNPS is not expected to have a noticeable effect on groundwater levels beyond the site boundary.

- Groundwater withdrawals at DNPS are too low to draw water from the Kankakee, Des Plaines, or Illinois Rivers into the aquifer and thereby potentially degrade aquifer water quality for other groundwater users. No increase in groundwater use at DNPS is planned during the renewal period that could result in impacts from this issue.

As shown in Table 3-2, the NRC staff identified 3 plant-specific (Category 2) issues related to groundwater resources applicable to DNPS during the SLR term. These Category 2 issues are analyzed below.

<u>Groundwater use conflicts (plants with closed-cycle cooling systems that withdraw makeup water from a river)</u>

This issue was included in the LR GEIS (NRC 2024-TN10161) because water withdrawals from a river for consumptive use in the closed-cycle cooling system of a large nuclear power plant could affect groundwater levels in a hydraulically connected aquifer, particularly for an alluvial aquifer in a river valley. The NRC concluded in the LR GEIS that impacts for this issue could be SMALL, MODERATE, or LARGE depending on site-specific factors such as the amount of surface water decline in response to plant withdrawals, groundwater use rates, locations of wells, and hydrogeologic conditions. As described in Section 3.5.1.2, DNPS operates in closed-cycle mode with make-up withdrawals from the Kankakee River during a typical winter (i.e., October to June). Consumptive water use for this mode, however, is about half of the consumptive use by the plant while operating in the indirect open-cycle mode due to the limited use of the cooling towers during the winter (Section 3.5.1.2). In addition, as described in Section 3.5.3.1, consumptive use of river water for closed-cycle cooling is a minor fraction of average winter flow in the Kankakee River. Based on these site-specific conditions, the NRC staff determined that changes in groundwater levels in response to withdrawal of Kankakee River water for makeup during closed-cycle cooling at DNPS would not be noticeable. Therefore, NRC staff conclude that groundwater use conflicts from water use at the plant would be SMALL.

<u>Groundwater quality degradation (plants with cooling ponds)</u>

This issue considers the possibility of groundwater quality and beneficial use (based on applicable water use classification) being degraded by migration of contaminants discharged to cooling ponds. As described in the LR GEIS, contaminants in plant effluents discharged to cooling ponds can interact with the shallow groundwater system when ponds are unlined. The NRC concluded in the LR GEIS (NRC 2024-TN10161) that groundwater quality degradation for nuclear plants using cooling ponds at an inland site could be SMALL or MODERATE depending on site-specific issues, which include cooling pond construction and operation; water quality of the pond and potentially affected groundwater; site hydrogeological conditions; and location, depth, and pumping rate of affected wells.

As described in Section 3.4.1, the cooling lake at DNPS was constructed to a depth of about 16 ft (4.9 m) with the lake bottom in the Divine Limestone Formation. The lake is unlined, but an impervious, earthen-fill dike surrounds it (CEG 2024-TN11347). As described in Section 3.5.1.2, plant cooling water is routed through the lake in all operating modes except for the direct open-cycle (lake bypass) mode, which is rarely used. As described in Section 3.5.2.1, the water level in the cooling lake is about 15 ft (4.6 m) above the level in the adjacent Kankakee River and above the water levels in piezometers located around the cooling lake. Based on these conditions, the NRC staff expect that the cooling lake is discharging to the underlying limestone. The rate of discharge is dependent on the unknown conductance of any sediment on the bottom of the lakebed and hydraulic conductivity of the limestone. Groundwater flow in the surficial aquifer under and surrounding the cooling lake is expected to be toward the Kankakee River. Limited water quality data are available for the cooling lake. Quarterly tritium measurements from lake samples obtained during 2015 to 2019 varied from less than 200 pCi/L to 1800 pCi/L (NRC 2025-TN11680), similar to tritium activities in the Kankakee River adjacent to the DNPS site (Section 3.5.1.3), with an average tritium activity of 730 pCi/L. Samples from the cooling lake were not collected as part of the RGPP after 2019.

As described in Section 3.5.2.2, there are many groundwater wells located within 2 mi (3.2 km) of the DNPS center point. In addition, there are numerous registered groundwater wells for domestic use located between the cooling lake and the Kankakee River (ISGS 2025-TN11696). Characteristics of the wells (i.e., depth, construction, source of water) near the cooling lake appear to be similar to those nearer the DNPS center point. Based on well summary sheets (ISGS 2025-TN11696), most of these wells derive water from deep aquifers and would not be affected by potential discharge from the cooling lake into the surficial aquifer. Some wells are only cased to the uppermost rock unit encountered. In those cases, water from the wells may have contributions from more than one water-bearing rock unit, but contributions from the Divine Limestone Member of the Maquoketa Formation are unlikely to be significant because this formation functions mostly as a confining unit throughout the region (Abrams et al. 2015-TN11688).

Based on the information reviewed for this issue, the NRC staff determined that the DNPS cooling lake is discharging water to the surficial aquifer, which subsequently discharges to the Kankakee River. Tritium levels in the cooling lake are similar to those in the river. In addition, the surficial aquifer is not a significant source of water for wells located near the cooling lake. Therefore, the NRC staff conclude that groundwater resources impacts due to the operation of the cooling lake would be SMALL during the DNPS SLR term.

Radionuclides Released to Groundwater

This issue was included in the LR GEIS revision (NRC 2024-TN10161) because of the accidental releases of liquids containing radioactive material into the groundwater at nuclear power reactor sites (NRC 2024-TN11047). Most of the inadvertent releases that occurred at operating plants involved leaks of water containing tritium or other radioactive isotopes from spent fuel pools, buried piping, or failed valves on effluent discharge lines. In 2006, the NRC released a report titled “Liquid Radioactive Release Lessons Learned Task Force Report” documenting lessons learned from a review of those incidents. The report concluded that these instances had not adversely affected public health and safety (NRC 2006-TN1000). The report also concluded that groundwater affected by radionuclide releases is generally expected to remain on site, but that instances of offsite migration have occurred. Therefore, the LR GEIS (NRC 2024-TN10161) determined that impacts on groundwater quality from the release of radionuclides could be SMALL or MODERATE depending on magnitude of the leak, radionuclides involved, hydrogeologic factors, distance to receptors, and response time of plant personnel to identify and stop the leak. Consistent with the LR GEIS, this is a Category 2 issue requiring a site-specific evaluation.

The issue of radionuclides released to groundwater was discussed in Section 4.5.19 of CEG’s ER (CEG 2024-TN11347). CEG monitors groundwater at DNPS as part of its RGPP, which is implemented to conform with Nuclear Energy Institute (NEI) 07-07 (NEI 2019-TN6775) and satisfy the requirements of 10 CFR 20.1501 (TN283). Section 3.6.4.2 of CEG’s ER describes the detection of tritium in samples from wells located near CST tanks south of the Units 2 and 3 turbine building from a leak that occurred in 2014. Based on information provided in CEG’s ER and annual radiological environmental operating reports and information reviewed by NRC staff during the environmental site audit, wells affected by the 2014 leak are located near the power block buildings. As described in Section 3.5.2.3, tritium activities are currently decreasing at most well locations but have increased in two wells located north of the Units 2 and 3 reactor building. All tritium activities in groundwater wells reported since 2020 have been less than EPA’s drinking water standard of 20,000 pCi/L.

Based on the information reviewed, the NRC staff determined that elevated tritium levels occur in groundwater beneath and surrounding buildings in the protected area. Tritium from the inadvertent releases in 2006 and 2014 that occurred south of the Units 2 and 3 turbine building migrated downward to the shale unit that forms the bottom of the surficial aquifer and was transported to the west and east around the building foundations that are sited on the shale unit. Tritium activity in 2019 exceeded the drinking water standard (20,000 pCi/L) in intermediate depth well MW-DN-124I located west of the CST that leaked in 2016. All groundwater samples collected during 2020 through 2023 were below the tritium drinking water standard. The data reviewed by the NRC staff indicate that the tritium contamination has been mostly confined to the protected area. Recent increases in tritium levels in monitoring wells located north of the Units 2 and 3 reactor building suggest that elevated tritium occurs just outside the protected area north of the plant intake and discharge. The only perimeter well sampled as part of the RGPP that has consistently had tritium levels above the detection limit (200 pCi/L) is located in this same area. Average tritium activity in this perimeter well (DSP-149R) was about 400 pCi/L during 2019 to 2023 based on data reported in the Annual Radiological Environmental Operating Reports (NRC 2025-TN11680).

Groundwater impacted by the plant is limited to the surficial aquifer due to the continuous presence of the low permeability shale unit across the site. The surficial aquifer is not used as a drinking water source near the plant. Groundwater conditions reviewed by the NRC staff indicate that shallow groundwater at the site may locally discharge into the onsite canals, but the site-wide surficial aquifer groundwater flow is east and northeast with groundwater ultimately discharging into the Kankakee or Illinois rivers. Available data show that tritium has been detected near the plant buildings but has not been transported to the site boundary at detectable levels (i.e., greater than 200 pCi/L). Offsite users of groundwater are unlikely to be affected by any accidental releases of radionuclides to groundwater because the contamination is localized in the protected area of the plant and site groundwater flow paths are towards the river rather than in the direction of the nearby domestic groundwater wells. Therefore, the NRC staff conclude that groundwater resources impact due to the release of radionuclides to groundwater would be SMALL during the DNPS SLR term.

3.5.4 No-Action Alternative

3.5.4.1 Surface Water Resources

Under the no-action alternative, the NRC would not renew the DNPS operating licenses and DNPS operations would cease at the end of the current license term. With the cessation of operations, there would be a large reduction in the amount of water withdrawn from the Kankakee and Des Plaines Rivers. Wastewater discharges would also greatly decrease. Stormwater runoff would continue to be discharged from the site. As a result, DNPS shutdown would reduce the overall impacts on surface water use and quality. Therefore, the NRC staff conclude that the impact of the no action alternative on surface water resources would be SMALL.

3.5.4.2 Groundwater Resources

With the cessation of operations, there would be few or no additional impacts on groundwater quality. Any contamination of onsite soil and groundwater would be assessed during decommissioning, whether the plant is decommissioned at the end of the current licensing period or at the end of the proposed SLR term. A license termination plan would describe actions needed for site remediation to meet the NRC criteria for radiological dose and site-specific clean up criteria to be met before release of the DNPS site. The NRC staff anticipate that groundwater use for site maintenance prior to decommissioning would be no greater than current use. Therefore, the NRC staff conclude that impact of the no-action alternative on groundwater resources would be SMALL.

3.5.5 Replacement Power Alternatives: Common Impacts

3.5.5.1 Surface Water Resources

Construction

Construction activities associated with replacement power alternatives may cause temporary impacts on surface water quality by increasing sediment loading to water bodies and waterways. Construction of intake and discharge structures, if needed, could result in within water activities including dredge-and-fill, underwater construction, and tunneling. Construction activities might also affect surface water quality through pollutants in stormwater runoff from disturbed areas and excavations, spills and leaks from construction equipment, and from sediment and other pollutants disturbed due to associated dredge-and-fill activities. These pollutants could be detrimental to downstream surface water quality, where applicable, and to ambient water quality in waterways near work sites.

Facility construction activities might alter surface water drainage features within the construction footprints of replacement power facilities, including any wetland areas. Impervious areas may increase, resulting in a potential for greater and quicker surface runoff. Potential hydrologic impacts would vary depending on the nature and acreage of the land area disturbed and the intensity of excavation work. Changes in stormwater runoff volume, timing, and quality are usually controlled and managed with applicable Federal, State, and local permits and the implementation of BMPs.

The NRC staff assume that construction contractors would implement BMPs for soil erosion and sediment control to minimize water quality impacts in accordance with applicable Federal, State, and local permitting requirements. These measures would include spill prevention and response procedures, such as measures to avoid and respond to spills and leaks of fuels and other materials from construction equipment and activities. Surface water use during construction is generally related to concrete preparation, dust suppression, and potable and sanitary water for the workforce and is limited to the construction duration. These water needs are usually small compared to cooling water needs during thermoelectric plant operation.

Operation

Surface water to support facility operations may require new water use permits from and agreements with State and local agencies if the construction of permanent intake structures are required. Potable and sanitary water use for the facilities would depend on the facility location, workforce size and, therefore, may also require new potable water use permits from and sanitary water disposal agreements with local agencies or municipalities.

Discharge of wastewater including cooling system discharges would require permits from Federal, State, and local agencies, including a certification that the discharges are consistent with State water quality standards. Wastewater discharges would be subject to treatment, monitoring and reporting requirements of relevant permitting agencies. The NRC staff assume that plant operations would follow the requirements of any applicable Federal, State, and local permits.

3.5.5.2 Groundwater Resources

<u>Construction</u>

Excavation dewatering for foundations and substructures during construction of replacement power generation facilities may be required to stabilize slopes and permit placement of foundations and substructures below the water table. Groundwater levels in the immediate area surrounding an excavation may be affected, depending on hydrogeologic conditions of the site, duration of dewatering, and dewatering methods. The NRC staff expect that any impacts on groundwater flow and quality caused by dewatering would be highly localized, of short duration, and not affect offsite groundwater users. The NRC staff anticipates that discharges resulting from dewatering operations would be released in accordance with applicable State and local permits.

Although foundations, substructures, and backfill may alter local groundwater flow patterns, site-wide and regional trends would remain unaffected. Construction of replacement power generating facilities may contribute to onsite changes in groundwater infiltration and quality due to the removal of vegetation and construction of buildings, parking lots, and other impervious surfaces. The potential impacts of increased runoff and subsurface pollutant infiltration or discharge to nearby water bodies would be prevented or mitigated through implementation of BMPs and a SWPPP.

In addition to construction dewatering, onsite groundwater could be used to support construction activities (e.g., dust abatement, soil compaction, water for concrete batch plants). Groundwater withdrawal during construction could temporarily affect the local water table or groundwater flow, and these withdrawals and resulting discharges would be subject to applicable permitting requirements.

<u>Operation</u>

Because no deep excavations are required for the replacement power facilities, dewatering of building foundations and substructures is not expected during operations. Groundwater may be used during operations for various purposes, including general service water, fire protection, potable, sanitary, and cleaning purposes. Water for these and other uses could be obtained from onsite groundwater wells or from a local water supply utility. Groundwater use during operation for the replacement power alternatives is assumed to be less than 100 gpm (380 Lpm), which would likely have a minimal impact on surrounding offsite groundwater use or quality. Onsite groundwater withdrawals would be subject to applicable State water appropriation, permitting, and registration requirements.

Effluent discharges (e.g., cooling water, sanitary wastewater, and stormwater) from a facility are subject to applicable Federal, State, and other permits specifying discharge standards and monitoring requirements. Adherence by replacement power facility operators to proper procedures during all material, chemical, and waste handling and conveyance activities would reduce the potential for any releases to the environment, including releases to soil and groundwater.

3.5.6 Natural Gas Alternative

3.5.6.1 Surface Water Resources

This alternative consists of an NGCC plant with a design capacity of 2,120 MWe (gross)/1,845 MWe (assuming an 87 percent capacity factor) constructed at the DNPS site (EIA 2022-TN10537). The NGCC plant would use MDCTs with the Kankakee and Des Plaines Rivers as the source of cooling water. As discussed in Section 3.5.1.2, no permit is required and there is no annual limit on surface water withdrawals in Illinois. The hydrologic and water quality assumptions for construction and operation described in Section 3.5.5.1 as common impacts to all replacement power alternatives also apply to this alternative. The water withdrawal rates of the proposed NGCC plant would be less than that of the current DNPS Units 2 and 3. Consumptive water use for an NGCC plant would likely be similar to current operations assuming that a cooling pond system along with MDCTs are used, and less than current operations if MDCTs without a cooling pond are employed (NRC 2024-TN10161).

The operational work force needed for a NGCC plant is less than that currently at DNPS. DNPS currently uses groundwater to meet potable and sanitary water demands. It is assumed these water demands would be similarly met for the replacement power alternative and that they therefore have no impact on surface water use.

Some water quality impacts could result from erosion and runoff associated with construction and operations that would be controlled by implementation of BMPs and compliance with stormwater permits along with applicable regulations. The use of the Illinois River for plant discharges would require compliance with appropriate NPDES permits. Based on this analysis, the NRC staff concludes that the overall impacts on surface water resources from construction and operation under the NGCC alternative would be SMALL.

3.5.6.2 Groundwater Resources

The groundwater resources assumptions and implications related to construction and operations described in Section 3.5.5.2 as common to all replacement power alternatives apply to this alternative. Some dewatering may be required during construction of the NGCC plant, but the effects on groundwater would be temporary and localized to the construction area. The existing DNPS groundwater supply wells would be used to support the NGCC plant operations, but groundwater would not be used for cooling (CEG 2024-TN11347). The NRC staff expects that construction practices and plant operations would be managed to avoid impacts to the Goose Lake Prairie Nature Preserve designated Class III Special Resource Groundwater. The NRC staff did not identify any impacts on groundwater resources for this alternative beyond those discussed as being common to all replacement power alternatives. Therefore, the NRC staff concludes that the impacts on groundwater resources from construction and operations under the natural gas alternative would be SMALL.

3.5.7 Renewable and Natural Gas Combination Alternative

3.5.7.1 Surface Water Resources

Common impacts to surface water resources described in Section 3.5.5.1 would also apply to this alternative. This alternative includes a proposed 1,484 MWe/1,291 MWe (87 percent capacity factor) NGCC plant located at the DNPS, and 2,291 MW of onsite and offsite solar installations with battery storage (assuming a 25 percent capacity factor). In this alternative, the NGCC plant is phased out by 2045 and an additional eighteen 125 MW (gross) offsite solar energy installations and six 300 MW (gross) offsite wind energy installations. The surface water use and quality impacts for the combination NGCC plant would be less than those described for the NGCC alternative discussed in Section 3.5.6.1 due to its smaller generating capacity.

The construction of the solar fields, wind turbines, and transmission lines would require water for dust suppression, equipment washing, and sanitary systems. No water is required for operation of wind or solar installations beyond a small amount for periodic washing of the solar panels. Water demands during construction and operation of the onsite portion of the replacement power alternatives would be sourced from the Illinois or Kankakee or Des Plaines Rivers, while offsite needs could be met by trucked-in water or on site or nearby surface or groundwater resources. As mentioned in the analysis in Section 3.5.6.1 for the NGCC alternative, surface water is not used for potable or sanitary purposes, so workforce size of this alternative is not a factor. Based on the above analysis, the NRC staff concludes that the overall impacts on surface water resources from construction and operations of the renewable and natural gas combination alternative would likely be SMALL.

3.5.7.2 Groundwater Resources

The groundwater resources assumptions and implications related to construction and operations described in Section 3.5.5.2 as common to all replacement power alternatives also apply to this alternative. As with the natural gas alternative, some dewatering may be required during construction of the NGCC plant, but the effects on groundwater would be temporary and localized to the construction area. The NRC staff anticipate that no dewatering would be required for constructing or operating the renewable generation facilities. The existing DNPS groundwater supply wells would be used to support the NGCC plant operations, but groundwater would not be used for cooling (CEG 2024-TN11347). Some groundwater could be used during construction and operation of the renewable energy generation facilities for potable, sanitary, and cleaning purposes, but no water use for cooling would be required. The NRC staff expects that construction practices and plant operations on the DNPS site would be managed to avoid impacts to the Goose Lake Prairie Nature Preserve designated Class III Special Resource Groundwater. Similarly, the staff considers that offsite renewable generation facilities would be sited, constructed, and operated to avoid impacts to any sole source aquifers or other protected or at-risk groundwater resources. The NRC staff did not identify any impacts on groundwater resources for this alternative beyond those discussed above as being common to all replacement power alternatives. Therefore, the NRC staff concludes that the impacts on groundwater resources from construction and operations under the natural gas and renewables alternative would be SMALL.

3.6 <u>Terrestrial Resources</u>

This section describes the terrestrial resources of the DNPS site and the surrounding landscape based on the NRC's SEIS for the initial LR of DNPS (NRC 2004-TN7247), the NRC staff's independent review of CEG's ER (CEG 2024-TN11347), environmental site audit, public scoping meeting and other publicly available information. Following this description, the NRC staff analyzes potential impacts on terrestrial resources from the proposed action (SLR) and alternatives to the proposed action.

3.6.1 Ecoregion

The DNPS lies within the Central Corn Belt Plains (EPA Level III Ecoregion 54) (EPA 2013-TN9981). This ecoregion consists of extensive prairie communities intermixed with oak-hickory forests that were native to the glaciated plains, with natural vegetation gradually replaced by agricultural types (EPA 2013-TN8737). Topography consists of level till, lakes, and outwash plains with scattered sand sheets and dunes (Woods et al. 2006-TN10788). Land cover consists primarily of agriculture, including crops and livestock farming. Two EPA Level IV ecoregions occur within 6 mi (10 km) of the DNPS: (54a) Illinois/Indiana Prairies and (54d) Sand Area (EPA 2013-TN10909). The primary pre-settlement vegetation of Illinois/Indiana Prairies consists of tall-grass prairies and wetlands (marshes, ponds, wet prairies) in poorly drained areas. For the Sand Area, pre-settlement vegetation was mixed oak savanna, scrub oak forests, and dry prairie with stabilized low dunes and sand sheets.

The USACE defines wetlands as areas either inundated or saturated by surface or groundwater at a frequency and duration sufficient to support (and that under normal circumstances do support) a prevalence of vegetation typically adapted for life in saturated soil conditions (TN10912). CEG's ER (CEG 2024-TN11347) characterizes the National Wetlands Inventory features within a 6 mi (10 km) radius of DNPS as follows:

- freshwater emergent wetlands—3,050 ac (1,234 ha)
- freshwater forested/shrub wetlands—2,161 ac (875 ha)
- freshwater ponds—1,153 ac (467 ha)
- lakes—6,629 ac (2,683 ha)
- riverine—waters 1,051 ac (425 ha)

3.6.2 Dresden Nuclear Power Station Site

The DNPS site consists of about 2,459 ac (995 ha) of land along the Illinois, Des Plaines and Kankakee Rivers in Grundy and Will counties, Illinois (CEG 2024-TN11347). About 48 percent of the DNPS site consists of open water, 35 percent of the site is vegetated, and the remaining 16 percent is developed land cover (CEG 2024-TN11347). The DNPS cooling lake is the predominant open water feature within the site and approximately 2.8 mi (4.5 km) of the site occurs along the Illinois and Kankakee Rivers' shoreline. Grasslands/herbaceous and wetlands are the dominant vegetation types, covering about 22.3 percent and 8 percent of the site, respectively. Most of the wetlands are woody (5.4 percent) with a minor type of emergent herbaceous wetlands (2.6 percent). Agricultural types cover approximately 4 percent of the site: hay/pasture (3.6 percent) and cultivated crops (0.3 percent). Other minor vegetation land cover types that collectively account for less than 2 percent of the site are deciduous forest, barren land, and shrub/scrub. Developed land cover consists of the power station and supporting facilities, paved and gravel parking lots and roads, and areas of maintained vegetation. Because these facilities are mostly located on previously cultivated areas, existing vegetation in the industrial area around the plant is mainly early successional grasses and forbs.

The descriptions presented in CEG's ER characterize the terrestrial habitats within the site boundary (CEG 2024-TN11347: Section 3.7.2.6). Habitat descriptions of the associated tree, shrub, and herbaceous strata are incorporated here by reference:

1. Dry prairie/old field
2. Bottomland deciduous forest
3. Wetlands

According to National Wetland Inventory data, the DNPS site boundaries contain a total of 1,308 ac (529 ha) of wetlands, lakes, ponds, and riverine waters (CEG 2024-TN11347). Table 3-10 summarizes the area and percentage of wetlands and surface water features on the DNPS site. Figure 3-8 shows the location of National Wetland Inventory wetlands on a map of the DNPS site.

Table 3-10 Wetlands and Surface Water Features on Dresden Nuclear Power Station Site

Wetland or Water Feature	Acres	Percent of Onsite Wetland Habitat
Lacustrine	1,154.0	88.2
Freshwater emergent wetlands	87.5	6.7
Freshwater pond	3.9	0.3
Freshwater/forested wetlands	3.5	0.3
Riverine	58.9	4.5
Total	**1,308.0**	**100.0**

Source: CEG 2024-TN11347.

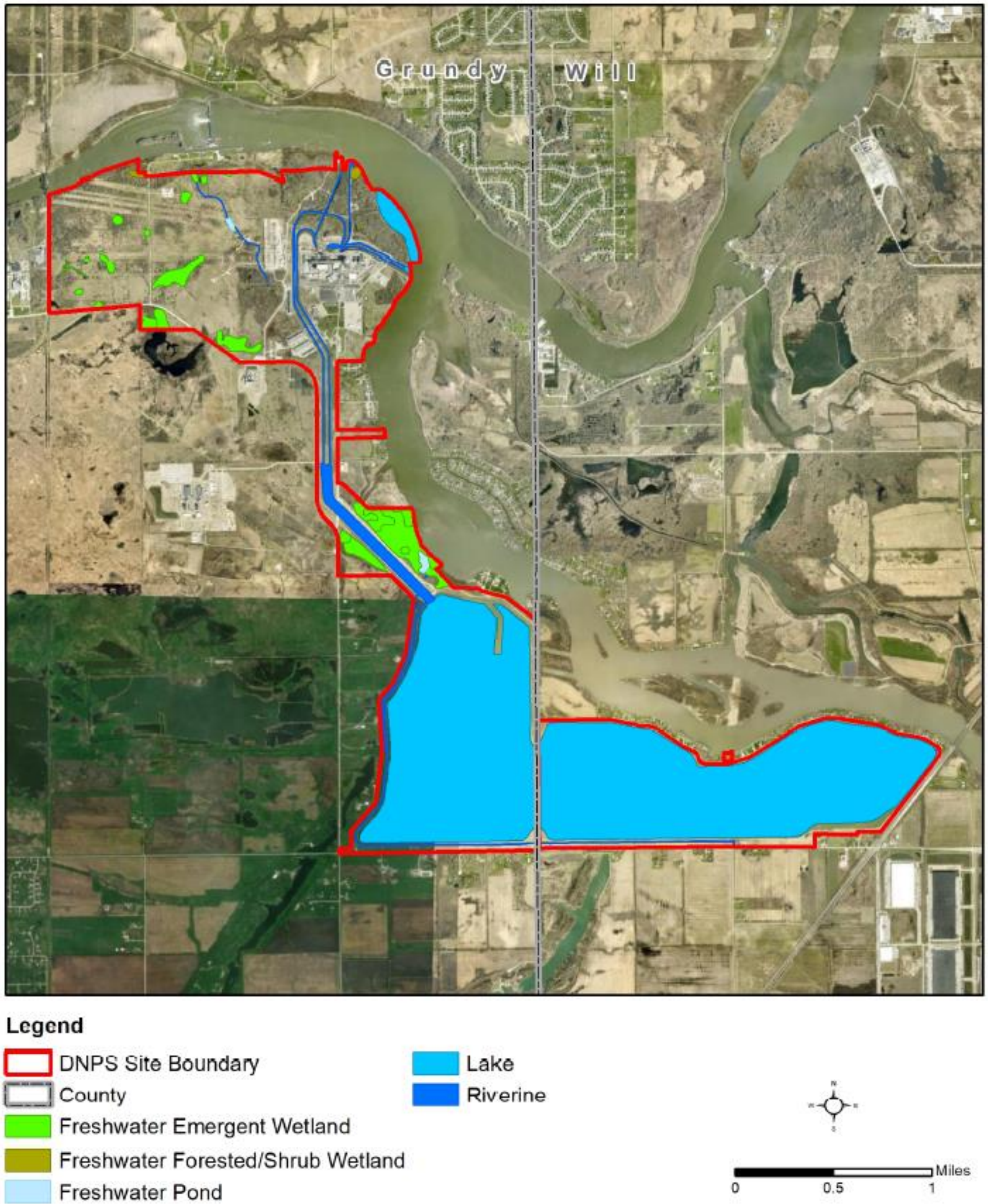

Figure 3-8 Wetlands on the Dresden Nuclear Power Station (DNPS) Site as Documented by the National Wetlands Inventory. Source: CEG 2024-TN11347.

Wildlife species occurring on the DNPS site consist of those species typically found in Illinois croplands, developed areas, and riparian areas. Table 3.7-4 in CEG's ER presents a list of the terrestrial wildlife species likely to occur within the vicinity of the DNPS site (CEG 2024-TN11347); this list includes 48 mammals, 40 birds, 18 amphibians, and 29 reptiles. Common animals include white-tailed deer (*Odocoileus virginianus*), opossum (*Didelphis virginiana*), grey squirrel (*Sciurus carolinensis*), raccoon (*Procyon lotor*), eastern red bat (*Lasiurus borealis*), hoary bat (*Aeorestes cinereus*), big brown bat (*Eptesicus fuscus*), little brown bat (*Myotis lucifugus*), American toad (*Anaxyrus americanus*), green frog (*Rana clamitans*), painted turtle (*Chrysemys picta*), racer (*Coluber constrictor*), eastern hognose snake (*Heterodon platirhinos*), and common gartersnake (*Thamnophis sirtalis*).

Birds on the DNPS site include a mix of resident bird species that may breed or overwinter, be onsite seasonal residents, or species that stop briefly during migration (CEG 2024-TN11347). The DNPS site is located within the Mississippi flyway, an important bird migration route which extends from the Mississippi, Missouri, and lower Ohio Rivers to Canada (FWS 2024-TN10908). 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, mountains or large bodies of water are major barriers. Many species of migratory birds likely use the DNPS site and vicinity during the spring and fall migrations.

CEG has partnered with the Wildlife Habitat Council (WHC) to promote sustainability, wildlife preservation, biodiversity, and environmental education. On the DNPS site, 436 ac (176 ha) are supported for conservation projects focused on birds, bats, grasslands, landscaped areas, and education. DNPS conservation program has been WHC-certified since 2013 and currently holds a Gold Certification (CEG 2024-TN11347).

Through this partnership, CEG installed six bat boxes on site in 2022 to provide safe roosting habitat targeted for little brown bats (*Myotis lucifugus*) and big brown bats (*Eptesicus fuscus*) (CEG 2025-TN11341). These boxes are also suitable for use by northern long-eared bats, Indiana bats, and tricolored bats. The bat boxes are situated to provide bats access to nearby foraging and water resources.

3.6.3 Important Species and Habitats

3.6.3.1 Federally Listed Species

For a discussion of terrestrial species and habitats that are federally protected under the ESA (TN1010), see Section 3.8.

3.6.3.2 State-Listed Species

CEG (CEG 2024-TN11347) provided a list of 109 species known to occur in Grundy, Kendall, or Will Counties that are designated as threatened or endangered by the State of Illinois. Table 3-11 lists 55 of these species that are terrestrial, State-listed (but not also federally listed), and have potential habitat on site or within 6 mi (10 km) of DNPS.

Table 3-11 State-Listed Species (That Are Not Also Federally Listed), Potentially Occurring in the Vicinity of Dresden Nuclear Power Station

Common Name	Scientific Name	Class	State Legal Status
Short-eared owl[a,b]	*Asio flammeus*	Bird	Endangered
Chuck-will's widow[a,b]	*Antrostomus carolinensis*	Bird	Threatened
Upland sandpiper[a,b]	*Bartramia longicauda*	Bird	Endangered
American bittern[a,b]	*Botaurus lentiginosus*	Bird	Endangered
Northern harrier[a,b]	*Circus hudsonius*	Bird	Endangered
Common gallinule[a]	*Gallinula galeata*	Bird	Endangered
Least bittern[b]	*Ixobrychus exilis*	Bird	Threatened
Loggerhead shrike[a]	*Lanius ludovicianus*	Bird	Threatened
Osprey[a,b]	*Pandion haliaetus*	Bird	Endangered
Black-crowned night-heron[a,b]	*Nycticorax nycticorax*	Bird	Endangered
King rail[a,b]	*Rallus elegans*	Bird	Endangered
Cerulean warbler[a]	*Setophaga cerulea*	Bird	Threatened
Yellow-headed blackbird[a]	*Xanthocephalus xanthocephalus*	Bird	Endangered
Red-veined prairie leafhopper[a]	*Aflexia rubranura*	Insect	Threatened
Eryngium stem borer[a]	*Papaipema eryngi*	Insect	Endangered
Regal fritillary[a, b]	*Speyeria idalia*	Insect	Threatened
Gray wolf[a]	*Canis lupus*	Mammal	Endangered
Franklin's ground squirrel[a]	*Poliocitellus franklinii*	Mammal	Threatened
Blanding's turtle[a,b]	*Emydoidea blandingii*	Reptile	Endangered
River cooter[a]	*Pseudemys concinna*	Reptile	Endangered
Spotted turtle[a]	*Clemmys guttata*	Reptile	Endangered
Forked aster[b]	*Aster furcatus*	Plant	Threatened
American slough grass[a]	*Beckmannia syzigachne*	Plant	Endangered
Oklahoma grass pink orchid[a]	*Calopogon oklahomensis*	Plant	Endangered
Eastern straw sedge[a]	*Carex straminea*	Plant	Endangered
Brome sedge[a]	*Carex bromoides*	Plant	Threatened
Little green sedge[a]	*Carex viridula*	Plant	Threatened
Spotted coral-root orchid[a]	*Corallorhiza maculata*	Plant	Endangered
Narrow-leaved sundew[b]	*Drosera intermedia*	Plant	Threatened
Cluster fescue[a,b]	*Festuca paradoxa*	Plant	Threatened
Queen-of-the-prairie[a,b]	*Filipendula rubra*	Plant	Threatened
Northern cranesbill[a]	*Geranium bicknellii*	Plant	Endangered
Hedge hyssop[b]	*Gratiola quartermaniae*	Plant	Endangered
Shore St. John's wort[a,b]	*Hypericum adpressum*	Plant	Endangered
Quillwort[b]	*Isoetes butleri*	Plant	Endangered
Butternut[a]	*Juglans cinerea*	Plant	Endangered

Table 3-11 State-Listed Species (That Are Not Also Federally Listed), Potentially Occurring in the Vicinity of Dresden Nuclear Power Station (Continued)

Common Name	Scientific Name	Class	State Legal Status
Hairy woodrush[(a)]	*Luzula acuminata*	Plant	Endangered
False mallow[(a,b)]	*Malvastrum hispidum*	Plant	Endangered
Slender sandwort[(a,b)]	*Minuartia patula*	Plant	Threatened
Yellow monkey flower[(a)]	*Mimulus glabratus*	Plant	Endangered
Hairy umbrellawort[(a,b)]	*Mirabilis hirsuta*	Plant	Endangered
Large-flowered beard tongue[(b)]	*Penstemon grandiflorus*	Plant	Endangered
Tubercled orchid[(a,b)]	*Platanthera flava*	Plant	Threatened
Red pine[(a)]	*Pinus resinosa*	Plant	Endangered
Grass-leaved pondweed[(a)]	*Potamogeton gramineus*	Plant	Threatened
Blue sage[(a)]	*Salvia azurea*	Plant	Threatened
American burnet[(b)]	*Sanguisorba canadensis*	Plant	Endangered
Bulrush[(a)]	*Scirpus hattorianus*	Plant	Endangered
Carolina whipgrass[(a)]	*Scleria pauciflora*	Plant	Endangered
Buffalo clover[(b)]	*Trifolium reflexum*	Plant	Threatened
Rock elm[(a)]	*Ulmus thomasii*	Plant	Endangered
Royal catchfly[(a, b)]	*Silene regia*	Plant	Endangered
American brooklime[(a)]	*Veronica americana*	Plant	Endangered
Marsh speedwell[(a)]	*Veronica scutellata*	Plant	Threatened
Primrose violet[(a)]	*Viola primulifolia*	Plant	Threatened

(a) Species with potential habitat on the Dresden Nuclear Power Station (DNPS) site.
(b) Species known within 6 mi of the DNPS site.
Sources: CEG 2024-TN11347; iNaturalist 2025-TN11718; IDNR 2020-TN10910.

For species listed in Table 3-11, CEG's ER contains species occurrence information by the counties intersecting the 6 mi (10 km) radius of DNPS site (CEG 2024-TN11347: Section 3.6.1.4), which the NRC staff incorporates here by reference, as well as research grade records from iNaturalist (iNaturalist 2025-TN11718). Of the 55 State-protected terrestrial species that are not also federally listed, 13 are birds, 3 are insects, 3 are reptiles, 2 are mammals, and 34 are plants (CEG 2024-TN11347).

Of the 48 State-listed terrestrial species with potential habitat on site (Table 3-11), only ospreys (*Pandion haliaetus*) are known to occur on the DNPS site. CEG has installed seven osprey platforms by the Illinois and Kankakee Rivers (CEG 2025-TN11341). Osprey is State-listed as threatened (IDNR 2020-TN10910). Species information is compiled from Cornell (AAB 2024-TN10911). The widespread decrease observed in osprey population numbers in the early 1950s to 1970s was mainly from the use of the pesticide DDT. Osprey feed almost exclusively on fish. Nests are built in open areas, on tall trees, snags, cliffs, or human-built structures. There were two sightings of osprey and two nests at DNPS in the spring of 2013, but no sightings or nesting activities have been recorded since. CEG has no plans to remove the nest.

Potential habitat occurs within emergent wetlands on site for Blanding's turtle (*Emydoidea blandingii*) and marsh speedwell (*Veronica scutellata*), a perennial wildflower. Marshes are also potential habitat and foraging ground for the migrant or summer resident bird species including the American bittern (*Botaurus lentiginosus),* black-crowned night-heron (*Nycticorax nycticorax*), king rail (*Rallus elegans*), common gallinule (*Gallinula galeata*), and yellow-headed blackbird (*Xanthocephalus xanthocephalus*). Northern harriers (*Circus hudsonius*), a medium-sized hawk, inhabit and hunt in marshes and fields (IDNR 2025-TN11757).

Edges and open area of emergent wetlands are potential habitat for the spotted turtle (*Clemmys guttata*), brome sedge (*Carex bromoides*), Carolina whipgrass (*Scleria pauciflora*), shore St. John's wort (*Hypericum adpressum*), and primrose violet (*Viola primulifolia*).

Potential habitat occurs within the Kankakee and Des Plaines Rivers, cooling lakes, and ponds on site for river cooter (*Pseudemys concinna*), grass-leaved pondweed (*Potamogeton gramineus*), eastern straw sedge (*Carex straminea*), little green sedge (*Carex viridula*), and American brooklime (*Veronica americana*).

Ditches serve as potential habitat on site for American slough grass (*Beckmannia syzigachne*). Yellow monkey flower (*Minuartia patula*) and bulrush (*Scirpus hattorianus*) are found in ditches, shorelines of ponds and rivers, and disturbed moist areas.

Roadsides provide potential habitat on site for blue sage (*Salvia azurea*) and royal catchfly (*Silene regia*). The royal catchfly also inhabits openings within upland forests (IW 2020-TN11812).

Potential habitat occurs within the forests on site for gray wolf (*Canis lupus*), butternut (*Juglans cinerea*), rock elm (*Ulmus thomasii*), and red pine (*Pinus resinosa*). Moist woodlands serve as potential habitat onsite for the tubercled orchid (*Platanthera flava*). Spotted coral-root orchid (*Corallorhiza maculata*) could occur within the onsite forests and along paths (INHS Undated-TN11759). Openings in forests provides potential habitat for hairy woodrush (*Luzula acuminata*) and northern cranesbill (*Geranium bicknellii*). Forests are also potential habitat and foraging ground for the migrant or summer resident bird species Chuck-will's widow (*Antrostomus carolinensis*) and cerulean warbler (Setophaga cerulea).

There are approximately 420 ac (170 ha) of grassland habitat on site (CEG 2025-TN11341). These old prairie remnants and grasslands on site can be suitable habitat for the red-veined prairie leafhopper (*Aflexia rubranura*), Franklin's ground squirrel (*Poliocitellus franklinii*), Oklahoma grass pink orchid (*Calopogon oklahomensis*), cluster fescue (*Festuca paradoxa*), false mallow (*Malvastrum hispidum*), slender sandwort (*Minuartia patula*), hairy umbrellawort (*Mirabilis hirsute*), and large-flowered beard tongue (*Penstemon grandifloras*). Grasslands are potential habitat for the migrant and summer resident upland sandpiper (*Bartramia longicauda*) (IDNR 2020-TN11762). The migrant and winter resident short-eared owl (*Asio flammeus*) roost in grassy fields and hunt in nearby fields and marshes (IDNR 2025-TN11763). Grasslands and open areas, particularly near transmission lines or near edges of forests, provide potential habitat for the migrating and summer and winter resident loggerhead shrike (*Lanius ludovicianus*) (IDNR 2020-TN11765).

Eryngium stem borer (*Papaipema eryngi*), regal fritillary (*Speyeria idalia*), and Queen-of-the-prairie (*Filipendula rubra*) primarily inhabit grasslands but are also associated with wetlands and other wet areas (NatureServe 2025-TN11766; IDNR 2025-TN11767; IW 2020-TN11812). DNPS has emergent wetlands within the grasslands onsite.

3.6.3.3 Species Protected under the Bald and Golden Eagle Protection Act

The Bald and Golden Eagle Protection Act (TN1447) extends regulatory protections to the bald eagle and golden eagle. 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.

CEG summarizes eagle occurrences and nesting in the vicinity of and on the DNPS site (CEG 2024-TN11347). No bald eagles or golden eagles have been documented at the site or operating station; however, there is a potential for bald eagles to breed within the vicinity of DNPS (FWS 2025-TN11768). In addition, bald eagles were observed as close as 0.25 mi (0.4 km) from the site boundaries (iNaturalist 2025-TN11718). Although golden eagles are known occasionally to winter within Illinois (IDNR 2025-TN11769), they are not known to nest within the State. Furthermore, U.S. Fish and Wildlife Service (FWS) did not list golden eagles as breeding on the DNPS site in its Information for Planning and Consultation (IPaC) report (FWS 2025-TN11768).

CEG follows a corporate Avian and Wildlife Management Plan. From 2014–2024, CEG reported two avian mortalities and one injury with unknown causes. There were no eagle mortalities or injuries at the DNPS site between 2014 and 2023 (CEG 2025-TN11341).

3.6.3.4 Species Protected under the Migratory Bird Treaty Act

The Migratory Bird Treaty Act of 1918, as amended (MBTA) (TN3331) makes it illegal for anyone to take, possess, import, export, transport, sell, purchase, barter, or offer for sale, purchase, or barter, any migratory bird, or the parts, nests, or eggs of such a bird except under the terms of a valid permit issued pursuant to Federal regulations. FWS designates certain migratory bird species as Birds of Conservation Concern (FWS 2021-TN8740), to represent their highest conservation priorities for those birds that are not already designated as federally threatened or endangered.

In its independent review, the NRC staff determined that 71 bird species have the potential to occur on the site based on the list of species known to occur in Grundy, Kendall, and Will Counties (CEG 2024-TN11347), the FWS IPaC report (FWS 2025-TN11768), and the State-listed species with potential to occur in the vicinity of DNPS (Table 3-11). Of these 71 bird species, 65 are protected by the MBTA (TN5490). All 13 State-listed birds that have the potential to occur on site (Table 3-10) are also protected by the MBTA, as are eagles and Birds of Conservation Concern species. Whooping cranes are addressed in Section 3.8.

The FWS IPaC report identified 2 eagle species (discussed above) and 21 Birds of Conservation Concern species with the potential to occur on the DNPS site: American golden-plover (*Pluvialis dominica*), bald eagle, black-billed cuckoo (*Coccyzus erythropthalmus*), bobolink (*Dolichonyx oryzivorus*), cerulean warbler (*Dendroica cerulea*), chimney swift (*Chaetura pelagica*), eastern whip-poor-will (*Antrostomus vociferus*), golden eagle, grasshopper sparrow (*Ammodramus savannarum*), Henslow’s sparrow (*Amillimetersodramus henslowii*), Kentucky warbler (*Oporornis formosus*), king rail (*Rallus elegans*), lesser yellowlegs (*Tringa flavipes*), pectoral sandpiper (*Calidris melanotos*), prairie loggerhead shrike (*Necturus maculosus*), prothonotary warbler (*Protonotaria citrea*), red-headed woodpecker (*Melanerpes erythrocephalus*), ruddy turnstone (*Arenaria interpres morinella*), rusty blackbird (*Euphagus carolinus*), semipalmated sandpiper (*Calidris pusilla*), short-billed dowitcher (*Limnodromus griseus*), upland sandpiper (*Bartramia longicauda*), and wood thrush (*Hylocichla mustelina*).

If injured or dead avian species are found on site, onsite environmental personnel and personnel from FWS, the State Game Commission, the Illinois Department of Natural Resources conservation warden, or a trained wildlife professional are notified, as applicable (CEG 2025-TN11341: RCI TER-10). For injured wildlife or avian species, records are kept of pertinent details of the responding wildlife professional. For bird nests on equipment or structures, personnel will determine if the nest is active and what species it belongs to. If the nest is non-active and it belongs to a non-protected species, nest removal may occur, and a deterrent may be placed.

Tall structures and buildings can pose a collision hazard to migratory birds. CEG has eight structures and buildings on site that are 100 ft (30 m) tall or more (CEG 2025-TN11341). This includes a 418 ft (127 m) meteorological tower with two sets of red lights on the structure: a solid lighting regime at the top and blinking lights in the middle. In addition, there is the Unit 1 chimney (300 ft [91 m] tall), Units 2 and 3 chimney (310 ft [94 m] tall), Units 2 and 3 turbine building stack (159 ft [48 m] tall), Unit 1 reactor building (151 ft [48 ft] tall), Units 2 and 3 reactor building (142 ft [43 m] tall), Units 2 and 3 turbine building (106 ft [32 m] tall), and the heating boiler stack (101 ft [31 m] tall). CEG has documented two bird deaths and one injury in three incidents from 2013–2024 (CEG 2025-TN11341).

3.6.3.5 Invasive Species

Invasive species are defined as a nonnative organism whose introduction causes or is likely to cause economic or environmental harm, or harm to human, animal, or plant health (81 FR 88609-TN8375). Executive Order 13112 directs Federal agencies not to 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 are taken (64 FR 6183-TN4477). The Illinois Department of Agriculture lists eight noxious weeds under the Illinois Noxious Weed Law (IL Admin. Code 8-220-TN11781), in addition to 112 species listed on the federal noxious weed list (USDA 2010-TN11782). The Illinois Department of Natural Resources lists 26 species as exotic weeds under the Illinois Exotic Weeds Act (UIUC 2015-TN11850) and 85 species and 5 genera as injurious species under the Illinois Injurious Species Rule (IL Admin. Code 17-805-TN11815). These exotic weeds are not native to North America and degrade natural communities, reduce the value of fish and wildlife habitat, or threaten an Illinois endangered or threatened species (UIUC 2015-TN11850).

DNPS has an Invasive Plant Management Plan as part of its WHC partnership. On site there are approximately 7 ac [3 ha] of active invasive species prevention and monitoring, which primarily occurs along the banks of the cooling lake and water canals (CEG 2025-TN11341). Management of invasive species includes mechanical removal and herbicide application. The management technique depends on the density of the invasive species population, species present, and environment (CEG 2024-TN11347). Herbicide application, other than for the purpose of invasive plant management, would primarily be confined to areas that are maintained by mowing within the industrial-use and other developed portions of the site, such as perimeters of parking lots, roads, and walkways. All herbicides will be applied by trained and licensed applicators, who apply chemicals according to label instructions, EPA guidelines, and applicable regulations.

Within its ER, CEG lists the terrestrial and aquatic invasive species observed on site and within Grundy, Kendall, and Will Counties (CEG 2024-TN11347). The aquatic species, parrotfeater, Eurasian watermilfoil, curlyleaf pondweed, zebra mussel, Asian clam, silver carp, round goby, rusty crayfish, common carp, threadfin shad, goldfish, grass carp, red shiner, western mosquitofish, white perch, and redear sunfish are covered Section 3.7.1. The remaining invasive plant species have the potential to occur within the site and are addressed here as terrestrial species, with full species biology and occurrence information incorporated by reference from CEG's ER (CEG 2024-TN11347: Section 3.7.5). The following invasive terrestrial species are reported to occur within 6 mi (10 km) of DNPS, as documented in research records from iNaturalist and CEG's ER (iNaturalist 2025-TN11718; CEG 2024-TN11347):

- Purple loosestrife (*Lythrum salicaria*), reed canary grass (*Phalaris arundinacea*), common reed (*Phragmites australis*), Japanese stiltgrass (*Microstegium vimineum*), and foxtail (*Setaria* spp.) occur within the wetlands and drainage canals on site. Lesser celandine (*Ranunculus ficaria*) occurs within 6 mi (10 km) of DNPS. The floodplain woodlands and streambanks offer potential habitat for lesser celandine (IW 2020-TN11812).

- Along the roadsides and access areas, Queen Ann's lace (*Daucus carota*), purple crown-vetch (*Securigera varia*), spotted knapweed (*Centaurea stoebe* ssp. *micranthos*), Canada thistle (*Cirsium arvense*), common teasel (*Dipsacus sylvestris*), and mugwort (*Artemisia vulgaris*) exist on site. Multiflora rose (*Rosa multiflora*), cutleaf teasel (*Dipsacus laciniatus*), and Japanese knotweed (*Reynoutria japonica*) were found within 6 mi (10 km) of DNPS and can potentially thrive along roads on site (IW 2020-TN11812).

- Disturbed forests and recently cleared areas on site offer potential habitat for garlic mustard (*Alliaria petiolata*). Garlic mustard is found within 6 mi (10 km) of DNPS, and seeds can be transported through animal dispersal (IDNR Undated-TN11806). Forests provide potential habitat for wintercreeper (*Euonymous fortuneii*) that could be transported on site by birds (UIUC 2025-TN11802).

- Along the drainage canals, amur honeysuckle (*Lonicera maackii*), sweet breath of spring (*Lonicera fragrantissima*), Japanese honeysuckle (*Lonicera japonica*), Morrow's honeysuckle (*Lonicera morrowii*), Tatarian honeysuckle (*Lonicera tatarica*), glossy buckthorn (*Frangula alnus*), tree-of-heaven (*Ailanthus altissima*), black locust (*Robinia pseudoacacia*) and autumn olive (*Elaeagnus umbellata*) occur on site.

- Within the old fields and grasslands, Johnsongrass (*Sorghum halepense*), common teasel, Canada thistle and musk thistle (*Carduus nutans*) occur on site. Callery pear (*Pyrus calleryana*) and common buckthorn (*Rhamnus cathartica*) occur within 6 mi (10 km) of DNPS, and birds could bring the seeds on site (UIUC 2025-TN11803; MortonArb 2025-TN11804). Old fields on site can be potential habitat for bull thistle (*Cirsium vulgare*), Chinese bushclover (*Lespedeza cuneata*), and perennial sowthistle (*Sonchus arvensis glabrescens*) (IW 2020-TN11812). There are records of bull thistle within 6 mi (10 km) of DNPS and wind dispersal could carry seeds on site (IW 2020-TN11812).

3.6.3.6 Important Habitats

Important habitats include any wildlife sanctuaries, refuges, preserves, or habitats identified by State or Federal agencies as unique, rare, or of priority for protection; wetlands and floodplains; and land areas identified as critical habitat for species listed by FWS as threatened or endangered. Important habitats on and around DNPS include wetlands discussed in Sections 3.6.1 and 3.6.2. Critical habitat for federally protected species occurs within the DNPS site (Section 3.8).

In addition, nearby Federal lands provide important terrestrial habitats (CEG 2024-TN11347). Midewin National Tallgrass Prairie contains a diverse array of species typical of tallgrass prairies in the region, including the bison (USDA 2025-TN11805).

In addition, nearby State lands provide important terrestrial habitats (CEG 2024-TN11347). State lands such as Goose Lake Prairie State Natural Area, the Heidecke Lake State Fish and Wildlife Area, the Des Plaines Conservation Area, and Grant Creek Prairie Nature Preserve also provide important habitats. Goose Lake Prairie State Natural Area contains the largest remnant of prairie in Illinois, which provides nesting habitat for endangered and threatened birds (CEG 2024-TN11347; IDNR 2025-TN11853). Heidecke Lake State Fish and Wildlife Area converted the former Midwest Generation Collins Generating Station cooling reservoir to a hunting and fishing recreational lake. IDNR stocks the lake, conducts fish surveys to evaluate populations, and performs habitat enhancement projects. Des Plaines Conservation Area is on the Illinois Natural Areas Inventory for its high-quality natural communities, including the Des Plaines dolomites prairies (IDNR 2025-TN11808). The dolomite prairies make up 50 percent of the natural community in the state and supports exceptional plant diversity with multiple state endangered and threatened species residing there. Grant Creek Prairie contains high quality wet prairie and mesic prairie communities with 110 different native prairie plant species (IDNR 2025-TN11809).

3.6.4 Proposed Action

As described in the LR GEIS (NRC 2024-TN10161) and cited in Table 3-1 of this SEIS, the impacts of all Category 1 (generic) terrestrial resources would be SMALL. Table 3-2 identifies two Category 2 issues that require plant-specific analysis for each proposed LR to determine whether impacts would be SMALL, MODERATE, or LARGE. These issues are (1) non-cooling impacts and (2) water use conflicts with terrestrial resources (plants with once-through cooling systems or cooling ponds using makeup water from a river). The sections below analyze these issues in detail.

<u>Water use conflicts with terrestrial resources (plants with cooling ponds or cooling towers using makeup water from a river)</u>

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. The NRC staff describes how this issue has been addressed historically and then provides a plant-specific evaluation for the DNPS SLR term.

In the 1996 LR GEIS (NRC 1996-TN288), the NRC staff evaluated water use conflicts as a surface water quality issue and included all ecological impacts within this surface water quality issue. The NRC staff rated water use conflicts as SMALL. The 2013 LR GEIS (NRC 2013-TN2654) separated surface water quality issues from ecological water use conflicts. For terrestrial resources, the NRC created a new issue of water use conflicts for plants with cooling ponds or cooling towers using makeup water from a river, reasoning that riparian communities could be impacted by reduced flows if the makeup water is from a river. For the Wolf Creek Generating Station in Coffey County, Kansas, which withdraws makeup water from a small river with especially low flow during drought conditions, the NRC staff concluded that the water use conflict impacts on terrestrial resources were SMALL to MODERATE. For other plants, the NRC staff concluded that the impact of water use conflicts with riparian communities is a plant-specific issue and that the range of impacts at plants with cooling ponds or cooling towers using make up water from a river could not be determined generically. The 2024 LR GEIS (NRC 2024-TN10161) determined that water use conflicts with terrestrial resources would be SMALL at most nuclear power plants with cooling ponds or cooling towers that withdraw makeup from a river, but determined that a plant-specific review was required because impacts may be MODERATE at some plants.

In the SEIS for the initial LR of DNPS (NRC 2004-TN7247), the NRC staff reviewed the available information, including the rate of evaporative water loss associated with the plant's operations, maintenance of minimum flow conditions of the Illinois River (which the Des Plaines and Kankakee Rivers ultimately discharge into), and past operation information and concluded impacts were SMALL for DNPS' initial LR. In this SEIS, the NRC staff analyzes surface water resource use conflicts in Section 3.5.3.1 and water use conflicts regarding aquatic resources in Section 3.7.5.3. In the following discussion, the NRC staff analyzes this plant-specific issue for the SLR term in the context of terrestrial resources.

DNPS utilizes a cooling water system with three modes: closed, direct open, and indirect open, as described in Section 3.5.1.2. Flow is occasionally conducted through the four MDCTs to reduce discharge water temperatures to meet the thermal discharge temperature limits outlined in the NPDES permit standards (CEG 2024-TN11347). In the two primarily used operational modes, water consumption is relatively small and is less than 2 percent of median flow and less than 3.5 percent of low flows. Illinois regulations for surface water use set no limit on surface water withdrawals for DNPS (or any other user) and only require that annual water withdrawals are reported to the State (CEG 2024-TN11347).

In the NRC staff's analysis of surface water conflicts (Section 3.5.3.1), the staff estimated that less than 2 percent of the median Illinois River flows are permanently removed by DNPS in an average year. In Section 3.5.3.1, the NRC staff concluded that surface water use conflicts would be SMALL due to low percentage of water consumption compared to historical flows of the river.

Terrestrial riparian communities that could be impacted by diminished water availability include the terrestrial resources associated with wetlands and surface water habitats on site (Table 3-10 and Figure 3-8). On site there are approximately 1,308 ac (529 ha) of wetlands, which mostly consist of lacustrine wetlands (88 percent of onsite wetlands). Most of the lacustrine wetlands' acreage is the DNPS cooling pond. There are 599 ac (24 ha) of riverine wetlands on site, which mostly consist of the cooling channels. Overall, these artificial wetlands would not be impacted by diminished water availability.

The proposed SLR for DNPS would continue current operating conditions and environmental stressors rather than introduce wholly new impacts. Therefore, the impacts of current operations and SLR on terrestrial resources would be similar. For the reasons explained above, water use conflicts with terrestrial resources from SLR either would not occur or would be so minor that the effects on terrestrial resources would be undetectable. The NRC staff concludes that water use conflicts with terrestrial resources during the DNPS SLR term would be SMALL.

<u>Non-cooling system impacts on terrestrial resources</u>

According to the LR GEIS (NRC 2024-TN10161), 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 the LR period on and near a plant site. The NRC staff based its analysis in this section on information derived from CEG's ER (CEG 2024-TN11347) unless otherwise cited. CEG has not identified any refurbishment activities during the proposed SLR term (CEG 2024-TN11347). No further analysis of potential impacts from refurbishment activities is therefore necessary.

In its ER (CEG 2024-TN11347), CEG states that it will conduct ongoing operational and maintenance activities at DNPS throughout the SLR term, including landscape maintenance activities and stormwater management. The NRC staff expects that physical disturbances would be limited to paved or disturbed areas or to areas of mowed grass or early successional vegetation and not encroach into wetlands or into the remaining areas of forest. The NRC staff concludes that the anticipated activities would have minimal effects on terrestrial resources, based on information presented in CEG's ER and the NRC staff's independent analysis.

CEG's ER (2024-TN11347) states that it has administrative controls in place at DNPS to minimize environmental impacts through BMPs and appropriate local, State, and/or federal permits, as needed. CEG's ER (2024-TN11347) further states that DNPS implements a Biodiversity and Habitat Corporate Policy that reduces vegetation management costs while enhancing biodiversity by practicing integrated vegetation management in an environmentally sensitive, socially responsible, and financially viable manner. Management of invasive species includes mechanical removal and herbicide application, depending on the density of the species population, species present, and environment (CEG 2025-TN11341). The NRC staff concludes that continued adherence to environmental management practices and BMPs already established for DNPS would continue to protect terrestrial resources during the proposed SLR term.

Operational noise from the DNPS facilities extends into the remaining natural areas on the site. However, DNPS has exposed these habitats to similar operational noise levels since it began operation in 1991. The NRC staff therefore expects that wildlife in the affected habitats have long ago acclimated to the noise and human activity of DNPS operations and adjusted their behavior patterns accordingly. Extending the same level of operational noise levels during the SLR term is therefore unlikely to noticeably change the patterns of wildlife movement and habitat use.

Based on its independent review, the NRC staff concludes that the landscape maintenance activities, stormwater management, elevated noise levels, and other ongoing operations and maintenance activities that CEG might undertake during the SLR term would primarily be confined to already disturbed areas of the DNPS site. These activities would neither have noticeable effects on terrestrial resources nor would they destabilize any important attribute of the terrestrial resources on or in the vicinity of the site. The NRC staff expects that CEG would continue to comply with the applicable requirements of Federal and State regulatory programs and obtain any needed permits. Accordingly, the NRC staff concludes that non-cooling system impacts on terrestrial resources during the SLR term would be SMALL.

3.6.5 No-Action Alternative

Under the no-action alternative, the NRC would not issue renewed licenses, and DNPS would shut down on or before the expiration of the current facility operating licenses. Much of the operational noise and human activity at DNPS would cease, reducing disturbance to wildlife in forest cover and other natural vegetation on and near the site. However, some continued maintenance of the DNPS site would still be necessary; thus, at least some human activity, noise, and herbicide application would continue at the site, with possible impacts resembling, but perhaps of a lower magnitude than, those described for the proposed action. Shutdown itself is unlikely to noticeably alter terrestrial resources. Reduced human activity and frequency of operational noise may constitute minor beneficial effects on wildlife utilizing nearby natural habitats. The NRC staff therefore concludes that the impacts of the no-action alternative on terrestrial resources would be SMALL.

3.6.6 Replacement Power Alternatives: Common Impacts

The analysis of terrestrial resource impacts focuses on the amount of land area that would be affected by the construction and operation of a replacement power-generating facility or facilities, as well as the species that use terrestrial habitats.

Under all the replacement power alternatives that the NRC staff considered, additional land would likely be temporarily disturbed for construction and laydown areas. If not already previously disturbed, the licensee could mitigate the impact by later revegetating temporarily disturbed land. All replacement power alternatives would also involve construction on developed or undeveloped lands outside the vicinity of the DNPS site with indeterminate loss of offsite forest, grasslands, desert, or wetlands.

Natural gas would utilize existing cooling towers at the DNPS site. All the power replacement alternatives located off site assume the construction and maintenance of new transmission line corridors.

Construction would require the permanent commitment of land chosen for industrial use at the site(s) and supporting infrastructure. Material laydown areas and onsite concrete batch plants could also result in temporary land use changes. Invasive plants may colonize the newly created corridors.

Construction and operation of new power-generating facilities would have impacts associated with the amount of land committed for the permanent use of the replacement power facilities, as well as the effects on the terrestrial resources from emissions, wastes, and noise (NRC 2024-TN10161). Terrestrial biota can interact with plant buildings, structures, powerlines, and vehicles (NRC 2024-TN10161). In a review of bird mortality literature, Loss et al. (TN9396) estimated that the median annual collision mortality for birds is 23.2–29.6 birds/km of powerline. Biological, environmental, location, and design factors influence the likelihood of collisions (APLIC 2012-TN6779; Bevanger 1994-TN9619). To minimize these impacts, the operator would develop and adhere to environmental management practices and BMPs to protect terrestrial resources.

The NRC staff assumes that the applicant would conduct required ecological surveys and develop any needed mitigation plans for any protected terrestrial species. The applicant would also have to conduct wetland delineations of affected lands and apply for permits for any wetland fill from the USACE and the State of Illinois. The NRC staff expects that any Federal or State permits authorizing wetland impacts would require mitigation. Wetland losses of this magnitude can typically be mitigated through various forms of compensatory wetland mitigation, such as mitigation banks.

The MBTA makes it illegal to take any migratory bird (or parts, nests, or eggs), except under a valid permit issued under Federal regulations. The utility may need to commission avian impact studies and obtain a Federal migratory bird special purpose utility permit for take of MBTA protected bird species in order to collect, transport, and temporarily possess migratory birds found on utility property or to handle active nests (FWS Undated-TN9282).

3.6.7 Natural Gas Alternative

Impacts on terrestrial habitats and biota from the construction and operation of a natural gas facility depend largely on the amount of land required and the location of the land, which are described in Chapter 2. The LR GEIS (NRC 2024-TN10161) concludes that many of the impacts on terrestrial resources from the operation of fossil-fuel energy alternatives would be similar to those from the continued operation of a nuclear power plant. These similar impacts include cooling tower drift, noise, bird collisions with plant structures and transmission lines, the impacts connected with herbicide application and landscape management, and the potential water use conflicts connected with cooling water withdrawals. However, some impacts particular to a natural gas plant would be from air emissions of GHGs such as nitrogen oxide, carbon dioxide, and methane. Such GHGs can lead to consequences like climate change.

Because the natural gas facility would use existing DNPS transmission lines, the NRC staff expects no increased potential in wildlife injury from transmission lines. Based on the above, the NRC staff concludes that the impacts on terrestrial resources from construction and operation of a natural gas alternative would be SMALL.

3.6.8 Renewable and Natural Gas Combination Alternative

<u>Natural Gas Facility</u>

Effects of the natural gas portion of this alternative would be similar to impacts described in Section 3.6.7 for the natural gas only alternative, because the natural gas component of the combination alternative would be sited at the same location (DNPS site) and would use the same infrastructure. Therefore, the NRC staff concludes that the impacts on terrestrial resources from construction and operation of a natural gas facility would be SMALL.

<u>Solar Component</u>

Impacts on terrestrial habitats and biota from the construction and operation of solar photovoltaic (PV) plants depend largely on the amount of land required and the location of the land. If the land chosen for the solar plants were previously cleared and used for industrial activity, the impacts on terrestrial resources would be less significant than if the lands were forest, grasslands, wetlands, or desert containing important species and habitats. Vegetation clearing and tree removal would displace wildlife to nearby habitats, but some species would return at the end of construction when temporarily disturbed land is restored.

Once in operation, solar plants pose special hazards to birds through collisions with PV equipment and transmission lines, electrocution by substation and distribution lines, and predation when injured and stunned on the ground after collision (Hathcock 2019-TN8470). Another less understood cause of bird collisions is known as the lake effect theory. Birds, especially migrating waterfowl and shorebirds, perceive the horizontally polarized light of PV solar panels as bodies of water and are injured or killed when they attempt to land on the panels as if they were water (Horvath et al. 2009-TN897). Water-seeking insects can also collide with the panels for the same reasons. In large enough numbers, such insect deaths may affect food webs. The Multiagency Avian-Solar Collaborative Working Group is a collection of Federal and State agencies identifying information needs and best practices for reducing the impacts of solar energy on avian populations. Collaboration with government agencies on best practices in the construction and siting of solar installations can mitigate their impacts on birds.

The NRC staff concludes that the construction and operational impacts on terrestrial resources from the solar portion of this alternative would be MODERATE to LARGE based on the significant loss of wildlife habitats and vegetation from the large amount of land required for facilities and transmission corridors (based on estimated land disturbance acreages presented in Table 2-1), as well as from the increased mortality risk to birds from collisions with solar PVs and new transmission lines.

<u>Wind Component</u>

Impacts on terrestrial habitats and biota from the construction and operation of wind farms as part of the renewable and natural gas combination alternative would depend largely on the amount of land required, the location of the land, and whether the facility is onshore or offshore. If the lands chosen for the plants were previously cleared and used for industrial activity, the impacts on terrestrial resources would be less significant than if the lands were forest, grasslands, wetlands, or desert containing important species and habitats. Vegetation clearing and tree removal would displace wildlife to nearby habitats, though some species would return at the end of construction when temporarily disturbed land is restored.

The operation of wind farms would likely cause the injury and/or death of bats and birds that collide with wind turbines (Allison et al. 2019-TN8847). Species composition of deaths would vary regionally. Bat collision mortality appears to be largest for migratory tree-roosting species and lowest in areas with the greatest grassland cover around the wind farm (Thompson et al. 2017-TN8746). Most of the observed bird deaths at onshore wind farms are small songbirds (57 percent of deaths) or diurnal raptors (9 percent) (Allison et al. 2019-TN8847). Based on this information, the NRC staff concludes that the impacts on terrestrial resources from the wind component of the renewable and natural gas combination alternative would be LARGE because construction would result in significant loss of vegetation and wildlife habitat (based on estimated land disturbance acreages presented in Table 2-1) and operation would negatively impact bird and bat populations.

3.7 <u>Aquatic Resources</u>

This section describes aquatic resources at and around the DNPS site. These include the freshwater environments of the Kankakee, Des Plaines, and Illinois Rivers, as well as Dresden Pool and Dresden Cooling Lake. The NRC staff analysis related to potential environmental impacts on aquatic resources from the proposed action (i.e., SLR) and alternatives to the proposed action follows this description.

3.7.1 Dresden Freshwater Environment

3.7.1.1 Kankakee River

The Kankakee River is the primary source of cooling water for DNPS. The river flows for a total of 59 mi (95 km) in Illinois with 12 larger tributary streams and drains 27.6 percent of the Upper Illinois River Basin (CEG 2024-TN11347). The Kankakee River flows from South Bend, Indiana to the confluence with the Des Plaines River near DNPS, where they combine to form the Illinois River (IDNR 2023-TN11786). The Kankakee River is a clear, shallow stream with gravel-rubble riffles, sand-bottom pools, and swampy marsh areas along the upper portion. A large pool near the headwaters of the Illinois River is known as the Dresden Pool. The southeastern portion of the Kankakee River on the DNPS site is characterized by riverine and lower perennial systems (FWS 2025-TN11851). The northeastern portion of the Kankakee River on the DNPS site near the intake and discharge canals is characterized by lacustrine and limnetic systems (FWS 2025-TN11851). The average annual flow of the Kankakee River near Wilmington, Illinois based on the last 89 years of data is 5,480 cfs (155 m^3/s) with a low of 680 cfs (19 m^3/s) and high of 25,000 cfs (708 m^3/s) (USGS 2025-TN11827). Based upon the last 30 years of data, the average river gage height was 2.86 ft (0.87 m), with a low of 0.9 ft (0.27 m) and high of 7.61 ft (2.32 m) (USGS 2025-TN11827).

3.7.1.2 Des Plaines River

The Des Plaines River is the secondary source of cooling water for DNPS. When the water withdrawn by DNPS exceeds the flow of the Kankakee River, water is withdrawn from the Des Plaines River. The Des Plaines River flows southwards for 105 mi (169 km) in Illinois where it eventually meets at the confluence of the Kankakee and Illinois Rivers near DNPS. It drains 13.3 percent of the Upper Illinois River Basin (CEG 2024-TN11347). The northeastern portion of the Des Plaines River near the DNPS intake and discharge canals is characterized by lacustrine and limnetic systems (FWS 2025-TN11851). The average width of the river is 40 to 100 ft (12 to 30 m) (IDNR 2023-TN11788). The average annual flow of the Des Plaines River at Route 53 in Joliet, Illinois based on data from the last 19 years is 2,540 cfs (71.9 m^3/s) with a low of 1,000 cfs (28 m^3/s) and high of 9,370 cfs (265 m^3/s) (USGS 2025-TN11833). The average gage height of the river at the same USGS monitoring station based on the last 18 years of data is 539 ft (164 m) with a low of 538.6 ft (164 m) and high of 539.15 ft (164 m) (USGS 2025-TN11836).

3.7.1.3 Illinois River

The Illinois River is the receiving body of water of the DNPS cooling water system discharge. The Illinois River forms at the confluence of the Kankakee and Des Plaines Rivers where the DNPS is located. The river flows 272 mi (438 km) to the southwest from DNPS, where it eventually joins with the Mississippi River. Several pools of water are formed along the river due to the five dams that were installed to regulate the depth of the river for navigational purposes (IDNR 2023-TN11789). The portion of the Illinois River near DNPS is characterized by lacustrine and limnetic systems with a palustrine system near the DNPS discharge (FWS 2025-TN11851). The average annual flow of the Illinois River near Morris, Illinois based on data from the last eight years is 7,590 cfs (214 m^3/s) with a low of 3,030 cfs (86 m^3/s) and high of 17,100 cfs (484 m^3/s) (USGS 2025-TN11840). The average gage height of the river at the same USGS monitoring station based on the last 8 years of data is 5.8 ft (1.8 m) with a low of 5.1 ft (1.6 m) and high of 8.3 ft (2.5 m) (USGS 2025-TN11841).

3.7.1.4 Dresden Pool

Approximately 2 mi (3 km) downstream of the confluence of the Kankakee and Des Plaines Rivers at DNPS is the Dresden Pool. The Dresden Pool is located on the Illinois River and formed as a result of the Dresden Island Lock and Dam, which was completed in 1933 (CEG 2024-TN11347). The Dresden Pool is characterized by lacustrine and limnetic systems with areas near the shore containing emergent and forested shrub wetlands (FWS 2025-TN11851).

3.7.1.5 Dresden Cooling Lake

Located on the southeastern portion of the licensed area, the Dresden Cooling Lake (1,142 ac [462 ha]) was created by constructing an impervious earth-fill dike that sits on top of an abandoned coal mine. CEG maintains a permit from the IDNR for operation and maintenance of the cooling lake dike and associated structures. The cooling lake is isolated from the municipal and industrial source of water, the Cambrian-Ordovician aquifer. The average depth of the cooling lake is 8 ft (2.4 m) with an average volume of 9,136 ac-ft (1,126-ha-m). The purpose of the cooling lake is to reduce thermal impact from dual-unit operation. On the southeastern portion of the cooling lake, three siphon discharge structures, operated by Will County Emergency Services, were installed to aid with melting ice dams during winter months. More information about Outfall 004, the cooling lake siphon discharge, is discussed in Section 3.7.5.2 (CEG 2024-TN11347).

3.7.2 Dresden Aquatic Biological Communities

The trophic structure of the DNPS aquatic environment includes primary producers (plankton, macrophytes, and periphyton), primary consumers (zooplankton and benthic macroinvertebrates), and bottom feeding, planktivorous, and piscivorous fish that serve as secondary and tertiary consumers. Primary producers are organisms that capture solar energy and synthesize organic compounds from inorganic chemicals. They form the trophic structure's foundation by producing the organic nutrients and energy used by consumers. Primary producers in lake systems include phytoplankton, aquatic macrophytes, and periphyton. Of the three, phytoplankton are the major producers in all but very shallow lakes. Figure 3-9 illustrates the trophic structure of the DNPS aquatic environment.

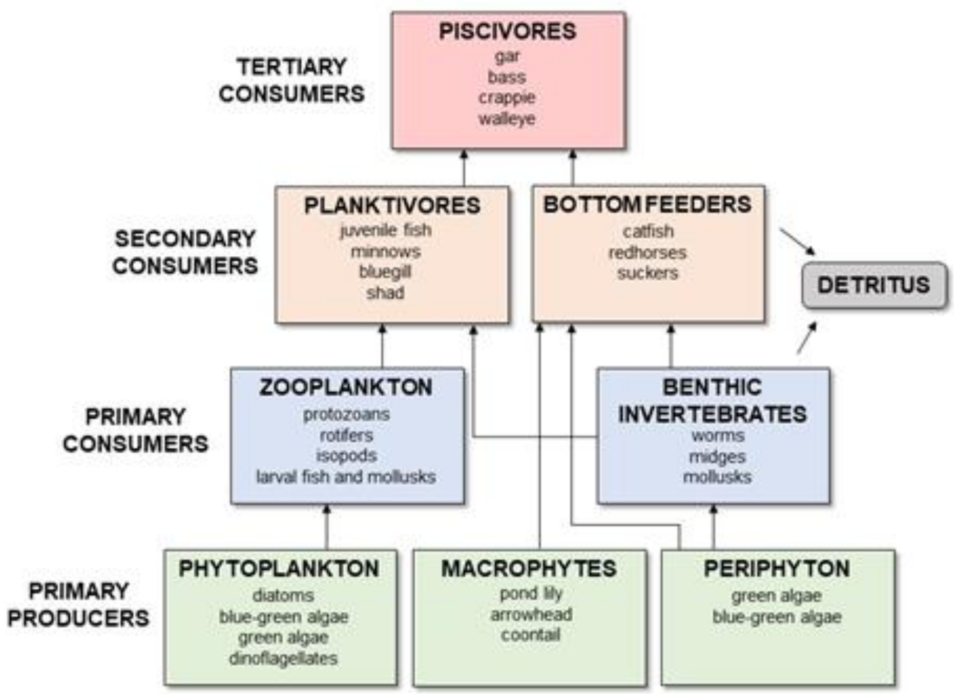

Figure 3-9 Trophic Structure of Dresden Nuclear Power Station Aquatic Environment

3.7.2.1 Primary Producers

This section characterizes important DNPS aquatic environment primary producers, which include phytoplankton, periphyton, and macrophytes.

Phytoplankton 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. Common phytoplankton and peripyton found in the DNPS freshwater environment include Euglenophyta (*Euglena* sp.*, Trachelomonas* sp.*, Strombomonas* sp.), Chlorophyta (*Scenedesmus* sp.), and Chrysophyta (*Cyclotella atomus, Cyclotella meneghiniana, Cyclotella pseudostilligera, Stephanodiscus minutula, Stephonodiscus subtilis, Microsiphona potamous, and Nitzschia* sp.) (CEG 2024-TN11347).

Macrophytes

Aquatic macrophytes are large plants, both emergent and submerged, that inhabit shallow water areas. Macrophytes 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. Common submerged macrophytes found in the DNPS freshwater environment include American elodea (*Elodea canadensis*), water star grass (*Heteranthera dubia*), water milfoil (*Myriophyllum* sp.), curlyleaf pondweed (*Potamogeton crispus*), sago pondweed *(Potamogeton pectinatus*), flatstem pondweed (*Potamogeton foliosus*), common arrowhead (*Sagittaria latifolia*) and water celery (*Vallisneria americana*) (CEG 2024-TN11347). Common emergent macrophytes found in the DNPS freshwater environment include water willow (*Justicia americana*), needle rush *(Eleocharis acicularis*), purple loosestrife (*Lythrum slicaria*), reed grass (*Pharagmites communis*), common arrowhead (*Sagittaria latifolia*), river bulrush (*Scirpus fluviatilis*), softstem bulrush (*Scirpus validus*), and narrowleaf cattail (*Typha angustifolia*) (CEG 2024-TN11347). CEG's contracted biologists, EA Engineering, Science, and Technology, Inc. (EA Engineering), have observed an increase in macrophyte production throughout the Dresden Pool since the mid-2000s. Appendix E discusses this finding further.

3.7.2.2 Primary Consumers

This section summarizes important DNPS aquatic environment primary consumers, which include zooplankton and benthos.

Zooplankton

Zooplankton are animals that either spend their entire lives as plankton (e.g., holoplankton) or exist as plankton for a short time during development (e.g., meroplankton). Zooplankton include rotifers, isopods, protozoans, marine gastropods, polychaetes, small crustaceans, and the eggs and larval stages of insects and other aquatic animals. Zooplankton biological community information at DNPS is limited to samplings taken from 1972 through 1975, and in 1981 during indirect open-cycle operation (CEG 2024-TN11347). Findings from these samplings conclude that zooplankton abundance is higher, and diversity is lower, in the Des Plaines River compared to the Kankakee River. The results of these differences in zooplankton communities relates to the contrast of hydrology and morphology of the two rivers as discussed in Section 3.7.1.

Common zooplankton found in the DNPS freshwater environment include *Cladocera*, *Cyclopoida*, and *Rotifera* (CEG 2024-TN11347; Sass et al. 2014-TN11854).

<u>Benthos (insects, mussels, crayfish, snails)</u>

Benthic invertebrates inhabit the bottom of rivers and mainly consume periphyton. They include certain zooplankton and macroinvertebrates such as insects, mussels, crayfish, snails, clams, and polychaetes. Benthic invertebrates are primary consumers and are important indicators of the health of an aquatic system.

In 1999, 2001–2008, 2011, 2013, and 2014, CEG's contractor (EA Engineering) conducted several samplings in order to characterize the benthic communities associated with the DNPS freshwater environment as described in Section 3.7.1. Appendix E discusses the findings of the most recent surveys (2011, 2013, and 2014). Findings in the recent samplings support the findings discussed in the SEIS for the initial LR of DNPS (NRC 2004-TN7247). Both downstream of the Dresden Lock and Dam as well as in the Dresden Pool, benthic communities are considered poor. The Dresden Pool contains more pollution tolerant benthic taxa compared to downstream of the Dresden Lock and Dam. These taxa include *Nanocladius distinctus*, *Dicrotendipes simpsoni*, and *Glyptotendipes* (CEG 2025-TN11341: RAI AQU-06, EA Engineering 2015). Other common benthic invertebrates found in the DNPS freshwater environment include Oligochaeta (aquatic worms), Hirudinea (leeches), Amphipoda (amphipods), Ephemeroptera (mayflies), Odonata (dragonflies and damselflies), Caleoptera (beetles), Gastropoda (gastropods), and Pelecypoda (mussels, clams, and other bivalves). Table 3.7-2 of CEG's ER provides a full list of benthic species located at DNPS (CEG 2024-TN11347).

Illinois' freshwater rivers and lakes were once home to as many as 80 mussel species. However, recent surveys by IDNR have revealed declines in mussel populations (IDNR 2025-TN11796). Since the 1970s, researchers have identified only 59 freshwater mussel species in the State of Illinois. Eleven of these species exist in only one river system or population. The decline of freshwater mussels results in part from siltation, pollution, habitat loss, stream channelization (such as the Kankakee River alteration in the late 1800s and early 1900s), and competition from invasive species (IDNR 2025-TN11796).

As part of CEG's 2015 CWA 316(a) demonstration, EA Engineering conducted a freshwater mussel survey to characterize the unionid mussel assemblage in the Illinois River near the discharge structure. Appendix E contains additional information regarding this study. A total of 3,349 individuals representing 25 species were collected. The primary mussels collected were threeridge (*Amblema plicata*), Mucket (*Actinonaias ligamentina*), and pink heelsplitter (*Potamilus alatus*). Two state protected species, the purple wartyback (*Cyclonaias tuberculata)* and black sandshell (*Ligumia recta*), were collected in the survey (CEG 2025-TN11341: RAI AQU-06, EA Engineering 2015). This is similar to sampling funded by IDNR and conducted in the 1990s just downstream of DNPS at Illinois River mile 271. Those surveys identified 15 species, including the 4 primary mussels collected by CEG, but neither State-protected species (Sietman et al. 2001-TN11856). A more recent survey conducted in the Kankakee River upstream of DNPS identified 24 freshwater mussel species, with the mucket as the primary species found at the site closest to DNPS (5 mi [8 km] upstream) (Price et al. 2012-TN11872). In 2017, eight sheepnose mussels were relocated under FWS guidance in an area immediately downstream of the Interstate 55 bridge along the Kankakee River near the DNPS (FWS 2022-TN11810).

3.7.2.3 Secondary and Tertiary Consumers

This section characterizes important aquatic environment secondary and tertiary consumers, which include ichthyoplankton, juvenile, and adult fish.

Ichthyoplankton

Ichthyoplankton are the eggs and larvae of fish. CEG completed two entrainment abundance characterizations studies from 2005–2007 and 2017–2018 (Appendix E) that included looking at types and abundance of ichthyoplankton in the DNPS freshwater environment during indirect open-cycle operation (CEG 2025-TN11341: EA 2007, EA Engineering 2019). In the 2005–2007 entrainment study, 98 percent of all eggs collected were freshwater drum. Additional species included gizzard shad and sunfish species. In the 2017–2018 entrainment study, shad taxa and freshwater drum composed of 85.6 to 97.4 percent of the total catch (CEG 2025-TN11341: EA Engineering 2007, EA Engineering 2019).

Juvenile and Adult Fish

A long-term Illinois River fish population monitoring program jointly conducted by researchers from the Illinois Natural History Survey and IDNR has been sampling sites in the river's six reaches since 1957 (McClelland et al. 2012-TN11855). The electrofishing sampling included two sites within the Dresden Reach or Dresden Pool where DNPS is located. This area was historically nearly devoid of native fish species due to its close proximity to the Chicago wastewater diversion, which caused poor water quality. Since the 1980s, Dresden Pool has seen a decrease in invasive carp and goldfish and an increase in largemouth bass and other native species (McClelland et al. 2012-TN11855).

CEG's long term aquatic monitoring program includes fish community surveys to monitor fish populations from the confluence of the Des Plaines, Kankakee, and Illinois Rivers to downstream of the Dresden Pool and Dresden Lock and Dam since 1971. Table 3-12 lists the species known to occur in the vicinity of DNPS. The three most recent CEG-sponsored surveys, conducted in 2011, 2013, and 2014, are summarized in Appendix E. Since the publishing of the SEIS for the initial LR of DNPS (NRC 2004-TN7247), from 2005—2014, a total of 73 species were identified. Gizzard shad (20 percent), bluegill (17 percent), and bluntnose minnow (13 percent) account for approximately 50 percent of total catch (CEG 2024-TN11347). There are two known hybrid species located in the vicinity of DNPS, which include the carp x goldfish hybrid and the *Lepomis* hybrid.

Table 3-12 Common Fish Species in the Vicinity of Dresden Nuclear Power Station, Grundy County and Will County, Illinois

Common Name	Scientific Name	Special Status[(a)]
banded darter	*Etheostoma zonale*	-
banded killfish	*Fundulus diaphanous*	-
bigmouth buffalo	*Ictiobus cyprinellus*	-
black buffalo	*Ictiobus niger*	-
black bullhead	*Ameiurus melas*	-
black crappie	*Pomoxis nigromaculatus*	-
blackside darter	*Percina maculata*	-
blackstripe topminnow	*Fundulus notatus*	-

Table 3-12 Common Fish Species in the Vicinity of Dresden Nuclear Power Station, Grundy County and Will County, Illinois (Continued)

Common Name	Scientific Name	Special Status[(a)]
bluegill	*Lepomis macrochirus*	-
bluntnose minnow	*Pimephales notatus*	-
brook silverside	*Labidesthes sicculus*	-
bullhead minnow	*Pimephales vigilax*	-
central stoneroller	*Campostoma anomalum*	-
channel catfish	*Ictalurus punctatus*	-
common carp	*Cyprinus carpio*	invasive
creek chub	*Semotilus atromaculatus*	-
emerald shiner	*Notropis atherinoides*	-
fathead minnow	*Pimephales promelas*	-
flathead catfish	*Pylodictis olivaris*	-
freshwater drum	*Aplodinotus grunniens*	-
ghost shiner	*Notropis buchanani*	-
gizzard shad	*Dorosoma cepedianum*	-
golden redhorse	*Moxostoma erythrurum*	-
golden shiner	*Notemigonus crysoleucas*	-
goldfish	*Carassius auratus*	invasive
grass carp	*Ctenopharyngodon idella*	invasive
grass pickerel	*Esoxamericanus vermiculatus*	-
greater redhorse	*Moxostoma valenciennesi*	SE
green sunfish	*Lepomis cyanellus*	-
hornyhead chub	*Nocomis biguttatus*	-
johnny darter	*Etheostoma nigrum*	-
largemouth bass	*Micropterus salmoides*	-
logperch	*Percina caprodes*	-
longnose gar	*Lepisosteus osseus*	-
mimic shiner	*Notropis volucellus*	-
northern hog sucker	*Hypentelium nigricans*	-
northern pike	*Esox lucius*	-
northern sunfish	*Lepomis peltastes*	-
orange-spotted sunfish	*Lepomis humilis*	-
pallid shiner	*Hybopsis amnis*	SE
pirate perch	*Aphredoderus sayanus*	-
pumpkinseed	*Lepomis gibbosus*	-
quillback	*Carpiodes cyprinus*	-
rainbow darter	*Etheostoma caeruleum*	-
red shiner	*Cyprinella lutrensis*	invasive
redear sunfish	*Lepomis microlophus*	invasive
redfin shiner	*Lythrurus umbratilis*	-
river carpsucker	*Carpiodes carpio*	-
river redhorse	*Moxostoma carinatum*	ST

Table 3-12 Common Fish Species in the Vicinity of Dresden Nuclear Power Station, Grundy County and Will County, Illinois (Continued)

Common Name	Scientific Name	Special Status[(a)]
rock bass	*Ambloplites rupestris*	-
rosyface shiner	*Notropis rubellus*	-
round goby	*Neogobius melanostomus*	invasive
sand shiner	*Notropis stramineus*	-
sauger	*Sander canadensis*	-
shoal chub	*Macrhybopsis hyostoma*	-
shorthead redhorse	*Moxostoma macrolepidotum*	-
silver carp	*Hypophthalmichthys molitrix*	invasive
silver redhorse	*Moxostoma anisurum*	-
skipjack herring	*Alosa chrysochloris*	-
slenderhead darter	*Percina phoxocephala*	-
smallmouth bass	*Micropterus dolomieu*	-
smallmouth buffalo	*Ictiobus bubalus*	-
spotfin shiner	*Cyprinella spiloptera*	-
spottail shiner	*Notropis hudsonius*	-
spotted sucker	*Minytrema melanops*	-
striped shiner	*Luxilus chrysocephalus*	-
suckermouth minnow	*Phenacobius mirabilis*	-
tadpole madtom	*Noturus gyrinus*	-
threadfin shad	*Dorosoma petenense*	invasive
trout-perch	*Percopsis omiscomaycus*	-
walleye	*Sander vitreus*	-
warmouth	*Lepomis gulosus*	-
western mosquitofish	*Gambusia affinis*	invasive
white bass	*Morone chrysops*	-
white crappie	*Pomoxis annularis*	-
white perch	*Morone americana*	invasive
white sucker	*Catostomus commersonii*	-
yellow bass	*Morone mississippiensis*	-
yellow bullhead	*Ameiurus natalis*	-
yellow perch	*Perca flavescens*	-

invasive = not native and may cause damage to the environment or humans; SE = State-endangered;
ST = State-threatened.
(a) "-" no special status
Sources: CEG 2024-TN11347; INHD 2024-TN10792.

3.7.3 Important Species and Fisheries

This section summarizes important fisheries and State-protected and other special status species near DNPS.

3.7.3.1 Commercially Important Fisheries

There are no commercially important fisheries located near DNPS. Thus, commercially important fisheries are not discussed further.

3.7.3.2 Recreationally Important Fisheries

The Dresden Pool (Illinois River), Kankakee River, and Des Plaines River are all recreationally important fisheries near DNPS. Recreational sport fishing occurs in all three rivers. The Dresden Pool is known for its excellent largemouth bass and smallmouth bass fishing. To supplement the population, IDNR stocks smallmouth bass in the Illinois River annually (IDNR 2023-TN11813). The portion of the Kankakee River closest to DNPS is known for its walleye and channel catfish fishing. IDNR stocks the Kankakee River with 90,000 fingerlings per year, establishing it as an excellent walleye recreational fishing area (IDNR 2023-TN11786). Additionally, the Des Plaines River is frequented for canoe and kayak recreational fishing. Northern pike is the top recreational fish in the Des Plaines River, with a catch rate of four fish per hour throughout the entire river (IDNR 2023-TN11788).

3.7.3.3 State-Protected and Other Special Status Species

The IDNR has regulatory authority for fish and wildlife in Illinois, including endangered species. The Illinois Endangered Species Protection Act (520 ILCS § 10-TN10800) authorized the creation of a Board, the Illinois Endangered Species Protection Board, whose mission is to protect those species of plants and animals native to Illinois which are in danger of being lost from the wild in Illinois. In addition to protecting federally listed endangered or threatened species, the Illinois Endangered Species Protection Board also develops an “Illinois List,” or list of animals and plants for listing at the State of Illinois level as endangered or threatened. The Illinois Endangered Species Protection Board last updated their State-listed species list in June 2024; Table 3-13 lists species that could occur in Grundy and Will Counties in the vicinity of DNPS (INHD 2024-TN10792).

An analysis of federally protected aquatic species in the DNPS action area is discussed in Section 3.8. Table 3-13 lists the aquatic species listed as State-threatened or State-endangered in Grundy and Will counties, Illinois. Four state-protected aquatic species have been documented at DNPS, which include the river redhorse, greater redhorse, purple wartyback, the pallid shiner, western sand darter, and sheepnose (CEG 2024-TN11347).

Table 3-13 Illinois List of Aquatic Species Listed as State Threatened or Endangered in Grundy County and Will County, Illinois

Common Name	Scientific Name	State Status	Type	Last Observed
bigeye shiner	*Notropis boops*	SE	fish	1968[(a)], 1983[(b)]
blackchin shiner	*Notropis heterodon*	ST	fish	2021[(b)], 2014[(b)]
blacknose shiner	*Notropis heterolepis*	SE	fish	2014[(a,b)]
greater redhorse	*Moxostoma valenciennesi*	SE	fish	2010[(a)]
ironcolor shiner	*Notropis chalybaeus*	ST	fish	1986[(a,b)]
mudpuppy	*Necturus maculosus*	ST	amphibian	2019[(b)]
Ozark minnow	*Notropis nubilus*	ST	fish	2016[(a)]
pallid shiner	*Hybopsis amnis*	SE	fish	2023[(a)], 2022[(b)]
purple wartyback	*Cyclonaias tuberculata*	ST	mollusk	2023[(a,b)]
rainbow	*Villosa iris*	SE	mollusk	2022[(a,b)]
river redhorse	*Moxostoma carinatum*	ST	fish	2018[(a)], 2023[(b)]
salamander mussel	*Simpsonaias ambigua*	SE	mollusk	2021[(b)]
scaleshell	*Leptodea leptodon*	SE	mollusk	2013[(b)]
sheepnose	*Plethobasus cyphyus*	SE	mollusk	2023[(b)]
snuffbox	*Epioblasma triquetra*	SE	fish	1988[(b)]
spike	*Eurynia dilatata*	ST	mollusk	2023[(a,b)]
starhead topminnow	*Fundulus dispar*	ST	fish	1989[(a,b)]
weed shiner	*Notropis texanus*	SE	fish	2013[(b)]
Western sand darter	*Ammocrypta clara*	SE	fish	2020[(b)]

SE = State-endangered; ST = State-threatened.
(a) Grundy County
(b) Will County
Source: INHD 2024-TN10792.

3.7.3.4 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 are animals, plants or other organisms that are inadvertently introduced to a new area beyond their natural range. They often take away space and resources from the native species (IDNR 2025-TN11183). Higher temperatures and changes in growing seasons will attract novel species to Illinois (IDNR 2025-TN11183). Records of both invasive aquatic plants and invasive aquatic wildlife exist for the DNPS site. Invasive aquatic plants include parrotfeather (*Myriophyllum aquaticum*), Eurasian watermilfoil (*Myriophyllum spicatum*), and curlyleaf pondweed (*Potamogeton crispus*). Invasive aquatic wildlife includes zebra mussel (*Dreissena polymorpha*), Asian clam (*Corbicula fluminea*), silver carp (*Hypophthalmichthys molitrix*), round goby (*Neogobius melanostomus*), rusty crayfish (*Faxonius rusticus*), common carp (*Cyprinus carpio*), threadfin shad (*Dorosoma petenense*), goldfish (*Carassius auratus*), grass carp (*Ctenopharyngodon idella*), red shiner (*Cyprinella lutrensis*), western mosquitofish (*Gambusia affinis*), white perch (*Morone americana*), and redear sunfish (*Lepomis microlophus*) (CEG 2024-TN11347).

3.7.4 Aquatic Studies, Monitoring, and Assessments

CEG or its contractors, such as EA Engineering, conducted many ecological and monitoring studies at the DNPS site. These include aquatic characterization studies, impingement studies, entrainment studies, a mussel survey, and CWA 316(a) and CWA 316(b) demonstration reports. Appendix E describes these studies and summarizes each of their objectives, methods, and respective findings.

3.7.5 Proposed Action

As described in the LR GEIS (NRC 2024-TN10161) and as cited in Table 3-1 of this SEIS, the impacts of all Category 1 (generic) aquatic resources issues would be SMALL. Table 3-2 identifies three Category 2 issues that are applicable to DNPS and that require site-specific analysis for the proposed SLR to determine whether impacts would be SMALL, MODERATE, or LARGE. These issues are (1) impingement mortality and entrainment of aquatic organisms (plants with once-through cooling systems or cooling ponds), (2) effects of thermal effluents on aquatic organisms (plants with once-through cooling systems or cooling ponds), and (3) water use conflicts with aquatic resources (plants with once-through cooling systems or cooling ponds). The sections below analyze these issues in detail.

3.7.5.1 Impingement Mortality and Entrainment of Aquatic Organisms (Plants with Once-Through Cooling Systems or Cooling Ponds)

For plants with once-through cooling systems or cooling ponds such as DNPS, the NRC staff determined in the LR GEIS that impingement and entrainment of aquatic organisms is a Category 2 issue that requires site-specific evaluation (NRC 2024-TN10161). Section 4.6.1.2 of the LR GEIS (NRC 2024-TN10161) provides a description and background information for this Category 2 issue, which is incorporated here by reference.

<u>DNPS Cooling Water Intake System</u>

The DNPS cooling water intake system impinges and entrains aquatic organisms as it withdraws water from the Kankakee River. Section 2.1.3 and Section 3.5.1.2 describe the cooling and auxiliary water systems in detail. This section summarizes features of these systems relevant to the impingement and entrainment analysis.

The DNPS cooling water intake system is a flexible system that can operate in four modes: indirect open-cycle, direct open-cycle (i.e., once-through), closed-cycle with makeup water/blowdown, and closed-cycle. MDCTs operate as needed. CEG chooses the mode in which to operate based on water temperature and time requirements specified in DNPS NPDES Permit No. IL0002224. Table 3-14 summarizes these modes and the conditions under which CEG is required to operate in each mode. Features relevant to the impingement and entrainment analysis are summarized below.

Table 3-14 Dresden Nuclear Power Station Cooling Modes

Mode	Description	NPDES Permit Conditions[a]
Indirect Open-Cycle (Typical Summer Operation)	Operates for 3.5 months annually from June 15 through September 30 Water withdrawn from Kankakee River, routes through cooling lake, and discharges to Illinois River	Water quality standards for temperature must be met at every point outside of the mixing zone from December through March 60°F and from April through November 90°F
Direct Open-Cycle (Lake Bypass)	Operates when both units are shut down; rare Cooling water bypasses the Cooling Lake and discharges into the Illinois River	Same as description
Closed-Cycle with Makeup / Dilution Flow (Typical Winter Operation)	Operates for 8.5 months annually from October 1 through June 14 Most water is diverted back to intake canal Approximately 50,000 gpm diverted to Illinois River	Water quality standards for temperature must be met at every point outside of the mixing zone from December through March 60°F and from April through November 90°F
Closed-Cycle (Required for Outfall 004 Siphon Operation)	Operates only during Outfall 004 siphon operations two times up to 14 days, each Up to 67,324.7 gpm of heated effluent discharged to Kankakee River	Authorized when siphon operations are required by Will County Emergency Management Agency Discharge temperature, measured prior to entry into the Kankakee, may not exceed 77°F Flow may not exceed 50 cfm Maximum amount of heat added to Kankakee must be less than 0.5 billion Btus per hour

NPDES = National Pollutant Discharge Elimination System.
(a) Conditions for operating each cooling mode are derived from the NPDES permit, as cited below.
Source: CEG 2024-TN11347.

In indirect open-cycle, direct open-cycle, and closed-cycle with makeup/dilution flow cycle, DNPS withdraws water from the Kankakee River via a 2,400 ft (732 m) long, 56 ft (17 m) wide, 13 ft (4 m) deep intake canal. Water that enters the canal passes through a floating log boom to deflect large debris prior to entering the six-intake bay screenhouse (CEG 2025-TN11341).

Water then passes through a bar rack that prevents large debris from entering the intake structure; a motorized rake removes the large debris from the bar rack, deposits it into a trash hopper, and prevents it from re-entering the river. The trash racks are made of steel bars that are 0.50 in. (1.27 cm) by 3 in. (7.62 cm) wide and are spaced 2.5 in. (6.35 cm) apart at the center. Immediately following the trash racks, the water enters 12 bays where the stop logs and vertical travelling screens are located (CEG 2024-TN11347).

Traveling screens with mesh openings of 0.375 in^2 (2.4 cm^2) and a width of 10 ft (3.05 m) are located approximately 32 ft (9.75 m) behind the bar racks. The screens rotate at either 2.3 or 10 ft per minute. Spray wash water is applied with the rear spray wash system at 100 $lb/in.^2$, which automatically rotates the screens once a pressure differential of 6 in. (15.24 cm) is reached. Debris from the travelling screens then travels through a trough to a collection basket which is then emptied (CEG 2024-TN11347).

Organisms small enough to pass through the traveling screen mesh, such as fish eggs, larvae, and other zooplankton, are entrained into the cooling water system. Entrained organisms pass through the entire cooling system, enter the discharge channel, and can either become stranded in the discharge channel or pass through it and re-enter the aquatic environment. During this process, entrained organisms are subject to mechanical, thermal, and toxic stresses.

<u>Clean Water Act Section 316(b) Requirements for Existing Facilities</u>

Under the CWA Section 316(b) regulations, the location, design, construction, and capacity of cooling water intake structures of regulated facilities must reflect the best technology available (BTA) for minimizing impingement and entrainment mortality. Section 4.6.1.2 of the LR GEIS (NRC 2024-TN10161) provides a description of the allowable alternatives to comply with this regulation and is incorporated here by reference.

<u>Analysis Approach</u>

Section 4.6.7 of NUREG-1555 Supplement 1, Revision 2 (NRC 2024-TN10251), describes the NRC staff’s analysis approach regarding effects of thermal effluent on aquatic organisms and is incorporated here by reference.

<u>Baseline Condition of the Resource</u>

For the purposes of this analysis, the NRC staff assumes that the baseline condition of the resource is the riverine community as it occurs today, which is described in Section 3.7.1. While species richness, evenness, and diversity within the community may change or shift between now and the beginning of the proposed SLR term, the NRC staff finds the present aquatic community to be a reasonable surrogate in the absence of fishery and species-specific projections.

<u>Impingement Mortality and Entrainment Best Technology Available</u>

The IEPA has not made an impingement mortality or entrainment BTA determination for DNPS. The current NPDES permit (IL0002224) was issued on September 2, 2016, with an expiration date of August 31, 2021, and was administratively extended upon the IEPA receiving CEG’s NPDES renewal application dated March 1, 2021. As part of the NPDES renewal application, CEG submitted an updated CWA Section 316(b) report for compliance for impingement and entrainment mortality BTA.

The IEPA could determine that DNPS operations meet one of the impingement mortality and entrainment mortality compliance alternatives listed previously in this section without CEG needing to modify or upgrade any components of the cooling water intake system. When the IEPA makes the impingement and entrainment mortality BTA determinations, it may also impose additional requirements to reduce or mitigate the effects of impingement mortality at DNPS. Such requirements would be incorporated as conditions of a future renewed NPDES permit.

The NRC staff assumes that any additional requirements that the IEPA imposes would minimize the impacts of impingement and entrainment mortality over the course of the proposed SLR term in accordance with CWA Section 316(b) requirements. However, because the IEPA has not made BTA determinations at this time, the NRC staff also considers other lines of evidence below, including the hydraulic zone of influence and results of impingement mortality studies, to more fully evaluate the magnitude of impact that impingement would represent during the proposed SLR period.

Engineered Designs and Operational Controls

In the 2014 final CWA Section 316(b) rule, the EPA indicates that two basic approaches can reduce impingement mortality and entrainment: (1) flow reduction and (2) including technologies into the cooling water intake design that gently exclude organisms or collect and return organisms without harm to the water body. The EPA also notes that two additional approaches can reduce impingement and entrainment but that these technologies may not be available to all facilities. The two additional approaches are: relocating the facility's intake to a less biologically rich area in a water body and reducing the intake velocity. The DNPS cooling water intake structure incorporates several of these approaches.

Flow Reduction

Reducing the amount of water that is withdrawn for cooling purposes from a water body reduces the number of aquatic organisms that are drawn through the intake structure and subject to impingement or entrainment. Some nuclear power plants have conditions established in NPDES permits or other agreements that require the plant to reduce the volume of water withdrawn under certain conditions or at certain times of the year. For instance, reducing the volume of water withdrawn from a waterbody during peak spawning periods can significantly reduce entrainment. DNPS operates in a closed-cycle with makeup/dilution flow for 8.5 months annually, which reduces flow by approximately 93.2 percent from October 1 through June 14 (CEG 2024-TN11347).

Technologies That Exclude or Collect and Return Organisms

Several of the DNPS cooling water intake system's technologies help exclude organisms from becoming impinged or entrained. As described in Section 3.7.5.1, these include a curtain wall, bar racks, and traveling screens. The EPA indicates that, ideally, traveling screens would be used with a fish-handling and return system (79 FR 48300-TN4488). While the DNPS intake does not contain a fish return system, some fish should be able to exit the Dresden Cooling Pond via the spillway located adjacent to the lift station between the cold canal and the north end of the lake (CEG 2024-TN11347, CEG 2025-TN11342).

Location of the Facility's Intake

Location of the intake system is another design factor that can affect impingement and entrainment because locating intake systems in areas with high biological productivity or sensitive biota can negatively affect aquatic life. The location of the DNPS intake lies at the confluence of the Kankakee River and the Des Plaines River to form the Illinois River. Approximately 2 mi (3 km) downstream of DNPS is the Dresden Lock and Dam, which is a 22 ft (6.7 m) high dam that creates the lentic and low flowing Dresden Pool (CEG 2025-TN11342). Given the location of the intake at the confluence of three rivers, there is a naturally higher risk of affecting aquatic resources due to the varying biotic and abiotic characteristics of each river. Therefore, the location of the facility's intake could adversely affect smaller, slower fish, early life stages, and less mobile organisms and life stages.

Intake Velocity

Water velocity associated with the intake structure greatly influences the rate of impingement and entrainment. The higher the approach velocity, through-screen velocity, or both, the greater the number of organisms that will be impinged or entrained. Most fish can escape impingement by swimming away from a cooling water intake structure if the approach velocity is 0.5 feet per second (fps) (0.15 m/s) or less (TN4488). The approach velocity at DNPS ranges from 0.8 fps (0.24 m/s) upstream of the screenhouse to 5.1 fps (1.55 m/s) within the intake canal. The velocity approaching the bar racks is 0.5 fps (0.15 m/s) through the bar racks. As water travels through the traveling screens, its velocity increases from approximately 1.62 fps (0.49 m/s) to 1.80 fps (0.55 m/s) due to the reduced cross-sectional area (Exelon 2021-TN11343). Nonetheless, the through screen velocity, which exceeds EPA recommendations, could adversely affect smaller, slower fish, early life stages, and less mobile organisms and life stages.

<u>Impingement Studies</u>

From 2017 to 2018 and from 2005 to 2007, EA Engineering conducted impingement studies at DNPS in connection with CWA Section 316(b) requirements. Appendix E describes the methodology, major findings, and conclusions of these studies. In summary, the studies found that the cooling water intake system rarely impinged adult fish. In the 2017 to 2018 study, most impinged fish were small, young-of-the-year juveniles, primarily gizzard shad (*Dorosoma cepedianum*, 49.67 percent of fish collected), threadfin shad (*Dorosoma petenense*, 28.90 percent of fish collected), and channel catfish (*Ictalurus punctatus* 9.29 percent of fish collected) (CEG 2025-TN11341). In the 2005 to 2007 study, researchers also collected a relatively small number of impinged shellfish, predominantly giant floater (*Pyganodon grandis,* 80.4 percent of shellfish collected) (CEG 2025-TN11341). These impingement studies, as well the related analyses, indicate that the impacts of impingement have neither destabilized nor noticeably altered any significant attribute of the aquatic environment during the DNPS current operating license term.

<u>Entrainment Studies</u>

From 2017 to 2018 and from 2005 to 2007, EA Engineering conducted entrainment studies at DNPS in connection with CWA Section 316(b) requirements. Appendix E describes the methodology, major findings, and conclusions of these studies. In summary, the studies found that the majority of ichthyoplankton entrained at DNPS consisted of forage fish with high fecundity and low ecological value such as freshwater drum (*Aplodinotus grunniens*), gizzard shad (*Dorosoma cepedianum*), and threadfin shad (*Dorosoma petenense*). These entrainment studies, as well the related analysis, indicate that the impact of entrainment have neither destabilized nor noticeably altered any significant attribute of the aquatic environment during the current DNPS operating license term.

<u>Impingement Mortality and Entrainment Conclusion</u>

The NRC staff reviewed CWA Section 316(b) BTA requirements, engineered designs and operational controls, and the results of impingement and entrainment studies conducted at DNPS. These sources of information indicate that impingement at DNPS is limited and that entrainment results in a small number of adult equivalent losses. Impingement primarily affects small juveniles of gizzard shad, threadfin shad, and freshwater drum, while entrainment primarily affects the eggs and larvae of the same species. The available information indicates that impingement and entrainment is not destabilizing or noticeably altering any important attributes of the aquatic environment during the current DNPS operating license term.

The proposed SLR would continue current operating conditions and environmental stressors rather than introduce entirely new impacts. Therefore, the impacts of current operations and SLR on aquatic resources would be similar and DNPS would be required to abide by any additional restrictions to reduce impingement and entrainment when the new NPDES permit is issued. For the reasons described above, the NRC staff finds that the impacts of impingement mortality and entrainment of aquatic organisms resulting from the proposed SLR of DNPS would be SMALL.

3.7.5.2 Effects of Thermal Effluents on Aquatic Organisms (Plants with Once-Through Cooling Systems or Cooling Ponds)

For plants with once-through cooling systems or cooling ponds such as DNPS, the NRC staff determined in the LR GEIS thermal impacts on aquatic organisms is a Category 2 issue that requires site-specific evaluation (NRC 2024-TN10161). Section 4.6.1.2.4 of the LR GEIS discusses thermal impacts in detail and is therefore incorporated by reference.

<u>DNPS Effluent Discharge</u>

DNPS discharges heated effluent to the Illinois River through the main discharge and to the Kankakee River through Outfall 004. Outfall 004 is discussed separately later in this section. As described in Section 2.2.3.1 of CEG's ER and Appendix D of the 2015 Dresden Nuclear Station 316(a) Demonstration, once the water passes the intake and routes through the DNPS heat exchangers, it is discharged to the hot canal where it travels 2 mi (3 km) to the six-lift pump, 167,000 gpm (632,164 Lpm) capacity lift station. The lift station transfers effluent from the hot canal to the cooling lake by raising approximately 1,000,000 gpm (380,000 Lpm) of effluent 22 ft (6.7 m) to the cooling lake. MDCTs are utilized as needed to ensure discharge effluent meets the requirements of the NPDES permit (IL0002224). The hot canal has three MDCTs with a total of 24 cells while the cold canal has one MDCT with 12 cells (CEG 2024-TN11347). When DNPS operates in indirect open-cycle, water flows from the hot canal to the cooling lake, then to the cold canal which then enters the flow-regulating gates near the Units 2 and 3 crib house intake. The maximum design flow for indirect open-cycle is 1,548 mgd (5,860 MLd) (CEG 2024-TN11347; IPCB 2016-TN11816). During closed-cycle, water is redirected at the flow regulating gates back to the intake for reuse. Only a small amount of water is diverted as blowdown to the main discharge.

<u>Clean Water Act Section 316(a) Requirements for Point Source Discharges</u>

Section 4.6.1.2 of the LR GEIS provides an overview of CWA Section 316(a) and its applicability to environmental reviews (NRC 2024-TN10161).

<u>Analysis Approach</u>

Section 4.6.8 of NUREG-1555 Supplement 1, Revision 2 (NRC 2024-TN10251), describes the NRC staff's analysis approach regarding effects of thermal effluents on aquatic organisms and is therefore incorporated by reference.

<u>Baseline Condition of the Resource</u>

For the purposes of this analysis, the NRC staff assumes that the baseline condition of the resource is the riverine community as it occurs today, which is described in Section 3.7.1. While species richness, evenness, and diversity within the community may change or shift between now and when the proposed SLR term would begin, the NRC staff finds the present aquatic community to be a reasonable surrogate in the absence of fishery and species-specific projections.

CWA 316(a) Thermal Variance and NPDES Permit Provisions

The IEPA and Illinois Pollution Control Board (IPCB) regulate thermal discharge temperatures at DNPS through NPDES Permit No. IL0002224. Pursuant to 35 Ill. Adm. Code 302.102 (IL. Administrative Code 35-302-TN11843), water quality standards for temperature must be met at every point outside of the mixing zone from October 1 through June 14. Temperatures must not exceed 90°F (32°C) from April through November and must not exceed 60°F (32.2°C) December through March (CEG 2024-TN11347). Water temperatures of all affected freshwater environs shall not be increased by more than 3°F (1.67°C) and shall not exceed the maximum limits during more than one percent of the hours in the 12-month period ending with any month.

On March 3, 2016, the IPCB approved alternate thermal effluent limits (ATLs) for DNPS to discharge into the Illinois River. The IPCB found, “the monthly temperature standards set forth in 35 Ill. Adm. Code 302.211(e) shall apply to discharges from DNPS provided that during the period of June 15 through September 30, the temperature of the DNPS discharge shall not exceed 90°F (32°C) more than 10 percent of the time in the period and will never exceed 95°F (35°C) provided (1) discharges above 93°F (34°C) are allowed only when DNPS intake temperature is above 90°F (32.2°C), and (2) any single episode of such discharges does not exceed 24 hrs in duration” (IPCB 2016-TN11816).

Thermal Studies

In 2015, Exelon submitted the DNPS CWA 316(a) demonstration report to the IEPA and IPCB to approve ATLs. As part of the demonstration, a biothermal assessment and thermal plume mapping were conducted to provide evidence that the proposed ATLs were sufficient according to CWA 316(a) standards. Appendix E describes the methodology, major findings, and conclusions of the studies associated with this demonstration report.

Outfall 004

Outfall 004, the cooling lake siphon discharge, is located on the southeastern portion of the Dresden Cooling Lake. This discharge aids in melting ice dams that form in the Kankakee River during winter, which can flood nearby residential properties. The outfall is operated by DNPS in association with the Will County Emergency Management Agency and regulated by IEPA under the NPDES permit (IL0002224). The siphon system contains three 3 ft (1 m) diameter pipes that run along the bottom of the Kankakee River stretching across the width of the river and containing holes that release thermal effluent from the cooling lake. The siphon draws water from the cooling lake at a rate of 50 cfs (1.4 m^3/s) per pipe, totaling 150 cfs (4.2 m^3/s) if all pipes are operational. Relative to the average streamflow of the Kankakee River, the discharge from Outfall 004 accounts for approximately 3 percent of the flow (CEG 2025-TN11341). For the siphon to operate, the plant cooling system must be in closed-cycle mode. The maximum amount of thermal effluent allowed to be discharged into the Kankakee River is 0.5 billion Btu per hour. Additionally, the NPDES permit (IL0002224) limits the cooling lake temperature to a maximum of 77°F (25°C) prior to discharge to the Kankakee River. Due to the thermal and temperature limits, the siphons operate in the following manner: (1) if the cooling lake temperature is ≤ 47.5°F (8.6°C) all three pipes may run; (2) if the cooling lake temperature is 47.5°F (8.6°C) ≤ 54.5°F (12.5°C) two pipes may run; and (3) if the cooling lake temperature is

54.5°F (12.5°C) ≤ 77°F (25°C) only one pipe may run. Finally, the siphons are only allowed to operate two times per year for a total of 14 days per event. All runs must be complete by March 15 to avoid interference with fish spawning (CEG 2025-TN11342). Table 3-15 provides information pertaining to operation of the siphon discharge.

Table 3-15 Historical Siphon Run Thermal Effluent Data from Outfall 004 into the Kankakee River, Illinois

Year	Total Days (# Runs)	Mean Upstream River (°F)	Cooling Lake °F min (max)	50 m Downstream °F min (max)	50 m Downstream (∆°F)[(a)]	750 m Downstream (∆°F)[(a)]	1250 m Downstream (∆°F)[(a)]
2024	14 (1)	32.9°F	56.0°F (80.0°F)	32.0°F (36.0°F)	N/A	N/A	N/A
2023	-	-	-	-	-	-	
2022	8 (1)	32.8°F	61.0°F (76.0°F)	31.8°F (32.8°F)	-0.29°F	-0.73°F	-0.93°F
2021	11 (2)	32.8°F	63.0°F (80.8°F)	30.8°F (34.0°F)	-0.86°F	-0.93°F	-0.84°F
2020	-	-	-	-	-	-	-
2019	14 (1)	32°F	50.4°F (77.0°F)	30.6°F (33.0°F)	0.10°F	0.90°F	0.32°F
2018	17 (2)	34.1°F	68.2°F (76.8°F)	32.0°F (37.6°F)	-0.62°F	-0.81°F	-0.73°F
2017	-	-	-	-	-	-	-
2016	5 (1)	32.6°F	68.0°F (74.6°F)	N/A	N/A	N/A	N/A
2015	22 (2)	32.5°F	63.2°F (81.2°F)	32.4°F (34.6°F)	0.88°F	1.20°F	0.61°F
2014	41 (3)	33.1°F	64.8°F (82.2°F)	30.8°F (36.0°F)	0.00°F	0.94°F	0.66°F

N/A = missing data prevented an average from being calculated.
"-" denotes no data in table cell since siphon was not utilized in that year.
[(a)] Calculated mean change in temperature where positive values indicate increases in temperature and negative values indicate decreases in temperature.
Source: Outfall 004 Siphon Reports (CEG 2025-TN11342).

Currently, the DNPS NPDES permit provides the provisions pertaining to Outfall 004, though the outfall responsibility is planned to shift from CEG to Will County. The NPDES permit includes a special condition for Outfall 004 that states, "[t]his facility meets the allowed mixing criteria for thermal discharges pursuant to 35 Ill. Adm. Code 302.102," and "[t]here shall be no abnormal temperature changes that may adversely affect aquatic life unless caused by natural conditions," (CEG 2024-TN11347). 35 Ill. Adm. Code 302.102 (TN11843) contains several provisions pertaining to Illinois water quality standards. Section 35 Ill. Adm. Code 302.102(b)(4) states that, "Mixing is not allowed in waters containing mussel beds; endangered species habitat; fish spawning areas; areas of important aquatic life habitat; or any other natural features vital to the well-being of aquatic life in a matter that maintaining aquatic life in the body of water was a whole would be adversely affected." Section 3.8.2.1 discusses newly proposed critical habitat for the sheepnose mussel. There are no records of biological or thermal studies pertaining to Outfall 004 related to aquatic life. Additionally, all years where siphon operations were conducted when the cooling lake temperature was above 77°F (25°C), CEG requested a bypass from the IEPA which was granted. Outfall 004 operation is subject to review by the IEPA during the NPDES permit (IL0002224) renewal submitted by CEG in 2019 (CEG 2024-TN11347). Special Condition 15 of the NPDES permit (IL0002224) outlines the path forward to relinquishing CEG's responsibility of Outfall 004 to Will County Emergency Management Agency (CEG 2024-TN11347).

<u>Thermal Impacts Conclusion</u>

Because IEPA has granted CEG multiple, sequential NPDES permits with temperature limits that are designed to be protective of aquatic life under CWA Section 316(a) and Illinois regulations, the NRC staff finds that the adverse impacts on the aquatic environment associated with thermal effluents are minimized. Because characteristics of the thermal effluent would remain the same under the proposed action, the NRC staff anticipate similar effects during the proposed SLR term. Further, IEPA will continue to review the CWA Section 316(a) variance with each successive NPDES permit renewal and may require additional mitigation or monitoring in a future renewed NPDES permit if it deems such actions to be appropriate to assure the protection and propagation of a balanced, indigenous population of shellfish, fish, and wildlife in the Kankakee and Illinois Rivers. The NRC staff assumes that any additional requirements that IEPA imposes would further reduce the impacts of the DNPS thermal effluent over the course of the proposed SLR term. For these reasons, the NRC staff finds that thermal impacts during the proposed SLR period are sufficient to alter noticeably, but not to destabilize important attributes of the aquatic environment and would, therefore, result in SMALL impacts on aquatic organisms.

3.7.5.3 Water Use Conflicts with Aquatic 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 aquatic resources is diminished from demand for agricultural, municipal, or industrial use or decreased water availability due to droughts, or a combination of these factors.

DNPS withdraws water from the intake structure located on the Kankakee River and discharges to the Illinois River. Water use conflicts with aquatic resources, as described in the LR GEIS (NRC 2024-TN10161), generally analyzes consumptive losses of water due to evaporation, MDCTs and cooling lakes, but because DNPS is located at the confluence of the Kankakee River and Des Plaines River, the water withdrawn from the plant is never returned to the Kankakee's aquatic environment. Therefore, the impacts from the total water withdrawal from DNPS on the aquatic environment is analyzed further. As described in Section 3.7.1, DNPS withdraws approximately 544 MGD (842 cfs) of water from the Kankakee River. DNPS operates in indirect open-cycle from June 15 through September 30 annually and primarily withdraws water from the Kankakee River for site operations. The Kankakee River experiences the lowest average monthly flows during the summer months of July through September, with a mean monthly discharge, over 90 years of water data, of 3,770 cfs (July), 2,070 cfs (August), and 2,030 cfs (September) (USGS 2025-TN11818). Given that the intake is located near the confluence of the Des Plaines River and Kankakee River, the average combined monthly summer flows (July through September) are calculated as part of this analysis.

Seventeen miles upstream from DNPS, USGS gauge No. 05537980 located at Route 53 at Joliet, Illinois provides 20 years of flow data for the Des Plaines River. The average flow during summer months (July through September) over the last 20 years is 3,940 cfs (112 m^3/s) (USGS 2025-TN11819). Five miles upstream from DNPS, USGS gauge No. 05527500 near Wilmington, Illinois provides 90 years of flow data for the Kankakee River. The average flow during summer months (July through September) over the last 90 years is 2,623 cfs (74 m^3/s)

(USGS 2025-TN11818). Therefore, assuming the Des Plaines River and Kankakee River contribute equally to the intake withdrawal at DNPS, the average summer month flow is 6,563 cfs (186 m^3/s). As a result of DNPS operation in indirect open-cycle in summer months, DNPS could consume approximately 13 percent of the combined Kankakee River and Des Plaines River flow at the localized area between the DNPS intake and Kankakee River confluence during low flow periods. Most of this water is then returned to the Illinois River through the DNPS discharge minus the consumptive losses described in Section 3.5.3.1. Freshwater mussels are particularly sensitive to changes in flow conditions. At low flows, mussels may be subjected to low dissolved oxygen levels and increased water temperatures, especially during periods of drought. Mussels are filter feeders and feeding and clearance rates tend to increase with increasing flow, so low flows may impact mussel survival if food delivery is decreased. Depth plays an important role in maintaining suitable wetted habitat for mussels during low flows, although studies examining the influence of water depth on mussel mortality, presence, and abundance have generated mixed results (Cushway et al. 2024-TN11821).

The most recently available freshwater mussel survey near DNPS is a study that EnviroScience conducted immediately upstream on the Kankakee River for the Godley Public Water District Water Withdrawal Project in 2018 (HAI 2020-TN11867). Researchers found a diverse mussel assemblage that included 4,938 living mussels comprising of 24 species. The federally listed sheepnose (*Plethobasus cyphyus*), State-threatened black sandshell (*Ligumia recta*), State-threatened purple wartyback (*Cycloniaias tuberculata),* and State-threatened spike (*Elliptio dilatate*) were found as part of this survey (HAI 2020-TN11867). The FWS additionally states in its sheepnose status report that eight sheepnose mussels were relocated in 2017 to an area just downstream of the Interstate 55 bridge, approximately 4,133 ft (1,260 m) from DNPS, where suitable habitat exists (FWS 2022-TN11810). The FWS has designated the Kankakee River as at moderate risk for alterations to hydrological regimes (FWS 2022-TN11810). Additionally, as of December 13, 2024, the Kankakee River became proposed critical habitat for the sheepnose mussel (89 FR 101100-TN11378). Section 3.8.2.1 describes this proposed critical habitat in detail. One physical and biological feature (PBF) required for the proposed critical habitat is, “adequate flows, or a hydrological flow regime necessary to maintain benthic habitats where the species are found and to maintain stream connectivity” (89 FR 101100-TN11378). Freshwater mussel communities are highly susceptible to flow modifications as reduced flow or change in flow can lead to siltation and burial of mussel beds, habitat alteration, reduced suspended food availability, and disrupt movement (Nakamura et al. 2023-TN11852). Therefore, any flow modifications in the Kankakee River have the potential to affect all freshwater mussels present in areas experiencing reduced flow. Additionally, because mussels are less mobile than fish, individuals would not be able to as readily leave or avoid areas of low flow, when they occur.

During low summer flow conditions, DNPS can withdraw up to 13 percent of the combined summer month flow of the Kankakee River and Des Plaines River near the confluence. The most recent low flow event was on September 20, 2024, while DNPS was operating in indirect open-cycle, where the flow of the Kankakee River measured at USGS monitoring station No. 05527500 was 695 cfs (19.7 m^3/s) (USGS 2025-TN11857).

During times of extreme summer low flow, a water use conflict could occur between the DNPS make-up water withdrawal requirements and the hydrological regime required for local freshwater mussels. Such conflicts would be rare and are not expected to persist for long periods of time. Due to the proximity of the DNPS intake to the confluence of the Kankakee River, during Kankakee River low flow, intake water could be supplemented by water from the Des Plaines River, potentially reducing water use conflicts within the Kankakee River. The NRC staff concludes that water use conflicts could occur from the proposed SLR during extreme low flow conditions that could noticeably alter the quality and quantity of habitat (i.e., freshwater flow and hydrological regime) available to mussels inhabiting the Kankakee River in the immediate vicinity of DNPS. These conditions would be rare and short-term and, therefore, the NRC staff does not expect that such events would destabilize any important attributes of the freshwater mussel community, aquatic biota that rely on freshwater mussels, or other related components of the aquatic environment. For these reasons, the NRC staff concludes that under normal conditions the impacts of water use conflicts on aquatic resources during the proposed SLR term would be SMALL. However, in extreme summer low flow events, these impacts would increase to MODERATE in a localized area near the DNPS intake on the Kankakee River to the confluence. Therefore, the NRC staff concludes that the impacts of water use conflicts on aquatic resources during the proposed SLR term would be SMALL to MODERATE.

3.7.6 No-Action Alternative

If DNPS were to cease operating, impacts on the aquatic environment would decrease or stop following reactor shutdown. Some withdrawal of water from the Kankakee River would continue during the shutdown period to provide cooling to spent fuel in the spent fuel pool until that fuel could be transferred to dry storage. The amount of water withdrawn for these purposes would be a small fraction of water withdrawals during operations, would decrease over time, and would likely end within the first several years following shutdown. The reduced demand for cooling water would substantially decrease the effects of impingement, entrainment, and thermal effluent on aquatic organisms, and these effects would entirely cease following the transfer of spent fuel to dry storage. Depending on the time of year that the plant shuts down, a fish kill from cold shock could happen when the plant stops producing power and heated effluent, but this would be a one-time event that would not negatively impact the sustainability of local fish populations. The NRC staff concludes that the impacts of the no-action alternative on aquatic resources would be SMALL.

3.7.7 Replacement Power Alternatives: Common Impacts

Construction impacts for many components of either replacement power alternative would be both qualitatively and quantitatively similar. Construction could result in aquatic habitat loss, alteration, or fragmentation; disturbance and displacement of aquatic organisms; mortality of aquatic organisms; and increase in human access. Dredging and other in-water work could directly remove or alter the aquatic environment and disturb or kill aquatic organisms. Because construction effects would be short term, associated habitat degradation would be relatively localized and temporary. Aquatic habitat alteration and loss could be minimized by siting components of the alternatives farther from waterbodies and away from drainages and other aquatic features.

Water quality permits required through Federal and State regulations would control, reduce, or mitigate potential effects on the aquatic environment. Through such permits, the permitting agencies could include conditions requiring CEG to follow BMPs or to take certain mitigation measures if adverse impacts are anticipated. Notably, the EPA final rule under Phase I of the CWA Section 316(b) regulations applies to new facilities and sets standards to limit intake capacity and velocity to minimize impacts on fish and other aquatic organisms in the source water (TN254: 40 CFR 125.84). Any new replacement power alternative subject to this rule would be required to comply with the associated technology standards.

With respect to operation of a new replacement power alternative, operational impacts for either alternative would be qualitatively similar but would vary in intensity, based on each alternative's water use and consumption. Non-nuclear facilities generally consume less water during operations.

3.7.8 Natural Gas Alternative

The types of impacts that the aquatic environment would experience from this alternative involving the construction and installation of a new NGCC power plant are characterized in Section 3.7.7, which discusses impacts common to all replacement power alternatives.

The NRC staff finds that the impacts of construction on aquatic resources would be SMALL because construction effects would be of limited duration and the new plant would use some of the existing site infrastructure and buildings. Required Federal and State water quality permits would likely include conditions requiring BMPs and mitigation strategies to minimize environmental effects.

With respect to operations, Federal and State water quality permits would control and mitigate many of the potential effects on the aquatic environment, including water withdrawal and discharge, such that the associated effects would be unlikely to destabilize or noticeably alter any important attribute of the aquatic environment. Therefore, the NRC staff finds that the impacts of operation on aquatic resources would be SMALL.

Based on the above, the NRC staff concludes that the impacts on aquatic resources from construction and operation of a natural gas alternative would be SMALL.

3.7.9 Renewable and Natural Gas Combination Alternative

The impacts of construction of new wind, solar, and natural gas of this alternative are discussed in Section 3.7.7, which discusses impacts common to all replacement power alternatives. These effects would be SMALL to MODERATE, depending on the site(s) selected, the aquatic habitats present, and the extent to which construction would degrade, modify, or permanently alter those habitats.

The operation of the solar PV component would have no discernable effects on the aquatic environment. The operation of the wind turbines could produce leaks of hydraulic fluid, antifreeze, and grease, but the impacts would be SMALL since these leaks occur in relatively small amounts and are managed by State permitting authorities (e.g., spill response and prevention plans). Impacts of operating a NGCC plant would be SMALL (Section 3.7.8) because the water withdrawals and discharges would be regulated under the CWA and applicable State regulations to ensure that impacts to the aquatic environmental are minimal.

The NRC staff concludes that the impacts on aquatic resources for the renewable and natural gas combination alternative would be SMALL to MODERATE during construction and SMALL during operation. Impacts from the alternative would be managed and regulated by Federal and State water quality permits.

3.8 Federally Protected Ecological Resources

The NRC staff must consider the effects of its actions on ecological resources protected under several Federal statutes and must consult with the 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:

- ESA (TN1010)
- MSA (TN9966)
- National Marine Sanctuaries Act (NMSA) (TN4482)

There are no federally listed species or designated critical habitat within or in the vicinity of DNPS that are protected by the ESA under NMFS ESA jurisdiction. There are no coastal or marine waters near DNPS that may provide essential fish habitat (EFH) under the MSA. There are no coastal or marine waters or Great Lakes near DNPS that may contain designated sanctuaries or their resources under the NMSA. Therefore, this SEIS does not discuss species protected by the ESA under NMFS jurisdiction, EFH, or national marine sanctuaries or their resources.

This section describes the species and habitats that are federally protected by the ESA under FWS jurisdiction and analyzes how the proposed SLR and alternatives may affect these resources.

3.8.1 Endangered Species Act: Federally Listed Species and Critical Habitats

Congress enacted the ESA in 1973 to protect and recover imperiled species and the ecosystems upon which they depend. The ESA provides a program for the conservation of endangered and threatened plants and animals (collectively, listed species) and the habitats in which they are found. The FWS and the NMFS are the lead Federal agencies for implementing the ESA, and these agencies are charged with identifying species that warrant listing. The following sections describe the DNPS action area and the species and habitats that may occur in the action area under FWS' jurisdictions.

3.8.1.1 Endangered Species Act: Action Area

The implementing regulations for Section 7(a)(2) of the ESA define "action area" as all areas affected directly or indirectly by the Federal action and not merely the immediate area involved in the action (TN4312: 50 CFR 402.02). 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.

For the purposes of assessing the potential impacts of DNPS SLR on federally listed species, the NRC staff considers the action area to consist of the following:

DNPS Site: The terrestrial region of the action area occupies approximately 1,280 ac (518 ha) of the total 2,477 ac (1,002 ha) DNPS site boundary owned by CEG (CEG 2024-TN11347). The site is primarily located within Grundy County, Illinois, with a small portion of the cooling lake and site boundary extending into western Will County, Illinois. The area is part of the central lowland physiographic regions. The terrestrial area is composed primarily of grassland/herbaceous land cover (554 ac [224 ha]), developed areas (401 ac [162 ha]), and woody wetland areas (134 ac [54 ha]), while the remaining 191 ac (77 ha) is composed of hay/pasture, emergent herbaceous wetlands, deciduous forest, cultivated crops, barren land, and shrub/scrub areas, listed from largest to smallest area in acreage (CEG 2024-TN11347).

Section 3.2 and Section 3.6 describe the developed and natural features of the site and the characteristic vegetation and habitats.

Dresden Cooling Lake: The aquatic region of the action area encompasses the entirety of the 1,197 ac (484 ha) Dresden Cooling Lake and associated intake and outfall canals, the area of the Illinois River that experiences increased temperatures from discharge of heated effluent, the area of the Kankakee River influenced by the intake system (Section 3.7), and the area of the Kankakee River that experiences increased temperatures from the discharge of heated effluent during the winter months from Outfall 004 (Section 3.5.1.3 and Section 3.7.5.2).

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 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 the proposed SLR. The following sections discuss listed species and critical habitats under FWS jurisdiction.

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

The NRC staff identified 18 federally listed, proposed, and candidate species that may occur in the action area and one federally proposed critical habitat in the action area. The NRC staff reviewed CEG's ER (CEG 2024-TN11347), the FWS' Information for Planning and Conservation database (FWS 2025-TN11768), 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. Table 3-16 lists the relevant species and 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, as well as information on relevant critical habitats.

In 2004, the NRC staff evaluated the effects of DNPS operation on federally listed species as part of the NRC staff's environmental review for the initial DNPS LR term. The NRC staff prepared a biological assessment that evaluated 10 federally listed, proposed, and candidate species (NRC 2004-TN7247). The NRC staff concluded that continued operation would have *no effect* on decurrent false aster (*Boltonia decurrens*), leafy prairie-clover (*Dalea foliosa*), lakeside daisy (*Tetraneuris herbacea*), and Hine's emerald dragonfly (*Somatochlora hineana*). The NRC staff concluded that continued operation *may affect but is not likely to adversely affect* (NLAA) the Mead's milkweed (*Ascleplas meadil*), prairie bush clover (*Lespedeza leptostachya*), eastern prairie fringed orchid (*Platanthera leucophaea*), eastern massasauga (*Sistrurus catenatus*), bald eagle (*Haliaeetus leucocephalus*), and Indiana bat (*Myotis sodalis*). Effects to these species were expected to consist of occasional habitat disturbances associated with plant operation and maintenance as well as continued transmission line maintenance. The FWS concurred with the NRC staff's conclusions in a letter dated March 11, 2004 (NRC 2004-TN7247).

The NRC staff identified no new information during its review of the proposed SLR to indicate occurrences of the decurrent false aster, leafy prairie clover, or lakeside daisy, or of suitable habitat for these species within the action area.

The NRC staff have reevaluated the impacts to the Hine's emerald dragonfly, Mead's milkweed, prairie bush clover, eastern prairie fringed orchid, eastern massasauga rattlesnake, and Indiana bat under the proposed SLR term. With respect to the bald eagle, the FWS delisted this species in 2007 due to recovery. The bald eagle remains federally protected under the Bald and Golden Eagle Protection Act, which is discussed in Section 3.6.3.3.

The NRC staff have not evaluated the northern long-eared bat, tricolored bat, whooping crane, salamander mussel, sheepnose mussel, scaleshell mussel, rusty patched bumble bee, western regal fritillary, or monarch butterfly during any previous environmental reviews related to DNPS because the FWS had not listed, proposed, or identified these species as candidates for listing until more recently. Accordingly, the NRC staff addresses these species in this SEIS and evaluates the potential effects of SLR on these species.

The habitat and likelihood of occurrence of the identified species are briefly described in Table 3-16. The FWS maintains a database, Environmental Conservation Online System (ECOS), that can provide further information about the species.

Table 3-16 Occurrences of Federally Listed, Proposed, and Candidate Species and Critical Habitats Under U.S. Fish and Wildlife Service Jurisdiction in the Dresden Nuclear Power Station Subsequent License Renewal Action Area

Species or Critical Habitat	Federal Status[(a)]	Habitat	Type and Likelihood of Occurrence in Action Area
northern long-eared bat (*Myotis septentrionalis*)	FE	In non-hibernating seasons, northern long-eared bats typically roost individually or in colonies underneath bark or in cavities or crevices of both live trees and snags. Males and nonreproductive females may also roost in cooler locations, including caves and mines. Individuals may use caves and mines during fall swarming (FWS 2022-TN11245.	Seasonal and occasional. The action area falls within the general range of the species but does not contain caves, mines, or other features suitable for hibernating. Therefore, bats would not be present in the winter inactive season. The action area's forested areas contain suitable habitat to support foraging, mating, and sheltering. No surveys have been conducted to determine the species' presence within the forested areas of the site. However, six bat boxes have been installed on site and emergence surveys of the boxes have been conducted annually during the spring, summer, and fall since 2022. No bats have been observed during these emergence surveys (CEG 2025-TN11341). The NRC staff conservatively assumes that the northern long-eared bat could occur within the action area in the spring, summer, and fall. If present during these seasons, individuals would only occur occasionally and in low numbers.

Table 3-16 Occurrences of Federally Listed, Proposed, and Candidate Species and Critical Habitats Under U.S. Fish and Wildlife Service Jurisdiction in the Dresden Nuclear Power Station Subsequent License Renewal Action Area (Continued)

Species or Critical Habitat	Federal Status[a]	Habitat	Type and Likelihood of Occurrence in Action Area
tricolored bat (*Perimyotis subflavus*)	FPE	In non-hibernating seasons, tricolored bats primarily roost among live and dead leaf clusters of live or recently dead deciduous hardwood trees. Additionally, species may roost during summer among pine needles, within artificial roosts like barns, beneath porch roofs, bridges, and concrete bunkers.	Seasonal and occasional. Same as northern long-eared bat above.
Indiana bat (*Myotis sodalis*)	FE	In non-hibernating seasons, Indiana bats typically roost underneath the bark of dead or dying trees within forested areas. Indiana bats primarily forage in forested habitats with open understory, forest edges, and riparian areas. In hibernating seasons, Indiana bats will occupy caves or cave-like locations, including abandoned mines, that have stable ambient temperatures between 50°F and 32°F.	Seasonal and occasional. Same as northern long-eared bat above.
whooping crane (*Grus americana*)	EXPN	Coastal marshes and estuaries, inland marshes, lakes, open ponds, shallow bays, salt marsh and sand or tidal flats, upland swales, wet meadows and rivers, pastures and agricultural fields.	Seasonal and occasional. The action area falls within the general migration range of this species. Portions of Illinois may be used for stopover habitat during migration season. The species has not been identified at the DNPS site. However, the cooling lake, rivers, ponds and wetlands within the action area could provide suitable habitat. Therefore, the NRC staff conservatively assumes the species could be present. If present, individuals would only occur occasionally and in low numbers.

Table 3-16 Occurrences of Federally Listed, Proposed, and Candidate Species and Critical Habitats Under U.S. Fish and Wildlife Service Jurisdiction in the Dresden Nuclear Power Station Subsequent License Renewal Action Area (Continued)

Species or Critical Habitat	Federal Status[(a)]	Habitat	Type and Likelihood of Occurrence in Action Area
eastern massasauga rattlesnake (*Sistrurus catenatus)*	FT	Active season habitat includes high, dry habitats, open canopy wetlands and adjacent upland areas. Inactive season hibernacula habitat requires the presence of a near surface water table that is not inundated for long periods (FWS 2016-TN10881).	Potentially present. The species has not been identified at the DNPS site. However, the wetlands and surrounding upland areas within undeveloped portions of the site could provide suitable habitat for the species and the NRC staff conservatively assumes the species could be present.
salamander mussel (*Simpsonaias ambigua*)	FPE	Habitat includes clear, flowing water, flat rocks and bedrock as substrate. Historical distribution includes small streams, large rivers, and Lake Erie. For reproduction, the salamander mussel uses a non-fish host, the mudpuppy (*Necturus maculosus*) (FWS 2023-TN11246).	Potentially present. The species was not identified during the freshwater mussel survey conducted in 2014 and the mudpuppy has not been observed in any surveys or entrainment and impingement studies conducted at the DNPS site (CEG 2024-TN11347 Appendix E). However, potentially suitable habitat for the species is present within the action area and the NRC staff conservatively assumes the species could be present.
sheepnose mussel (*Plethobasus cyphyus*)	FE	Habitat includes small- to medium-sized creeks, to large rivers. The species prefers shallow shoal habitats with moderate to swift currents over mixtures of coarse sand, gravel and clay. The species can be found in a wide range of depths from a few inches to over 20 ft (FWS 2022-TN11810).	Likely present. There is a stable population of the species within the Kankakee River. The portions of the Kankakee River within the action area provide potentially suitable habitat for the species. In 2017, eight sheepnose mussels were relocated under FWS guidance to an area immediately downstream of the Interstate 55 bridge within the Kankakee River near the DNPS site and Outfall 004 (FWS 2022-TN11810). The species was not identified during the freshwater mussel survey conducted by CEG in 2014. However, this survey was limited to the Illinois River. The NRC staff assumes the species is likely present within the action area.
sheepnose mussel critical habitat	FPD	Four physical and biological features of the critical	Present. The portion of the Kankakee River within the action

Table 3-16 Occurrences of Federally Listed, Proposed, and Candidate Species and Critical Habitats Under U.S. Fish and Wildlife Service Jurisdiction in the Dresden Nuclear Power Station Subsequent License Renewal Action Area (Continued)

Species or Critical Habitat	Federal Status[(a)]	Habitat	Type and Likelihood of Occurrence in Action Area
		habitat have been identified: (1) flow regime; (2) habitat connectivity; (3) water and sediment quality; and (4) presence of host fish (89 FR 101100-TN11378).	area overlaps with the proposed designated critical habitat unit. The site could possess the four PBFs. Though a habitat survey to assess the presence of the four PBFs has not been conducted, the NRC staff concludes that the area likely meets the criteria of the proposed critical habitat.
scaleshell mussel (*Leptodea leptodon*)	FE	Medium to large rivers with low to medium gradients. The species primarily occupies riffles and runs with gravel or mud substrate and moderate currents (FWS 2010-TN11829).	Unlikely to be present. This species is considered rare with only sporadic occurrences within its range. It was considered extirpated from Illinois until a single live individual was identified in the Illinois River during a 2013 survey by an Illinois Natural History Survey biologist (FWS 2021-TN11838). The individual was found during exceptional conditions 13 mi downriver of the DNPS site with the Dresden Island Lock and Dam located in between the sighting and the action area. The species was not identified during the freshwater mussel survey conducted in 2014. The likelihood of the species being present within the action area is extremely low.
Mead’s milkweed (*Asclepias meadii*)	FT	Primarily found in upland tallgrass prairies, glad/barren habitats, and vegetative communities adapted for drought and fire (FWS 2003-TN11842).	Potentially present. This species has been reintroduced within Will County, including five reintroduction sites within the vicinity of DNPS (FWS 2022-TN11834). Habitat fragmentation poses a barrier to pollinator dispersal, resulting in low likelihood of successful natural population range expansion (FWS 2003-TN11842, FWS 2022-TN11834). Individuals of the milkweed family have been known to occur on the DNPS site (CEG 2025-TN11341) and potentially suitable habitat for the species

Table 3-16 Occurrences of Federally Listed, Proposed, and Candidate Species and Critical Habitats Under U.S. Fish and Wildlife Service Jurisdiction in the Dresden Nuclear Power Station Subsequent License Renewal Action Area (Continued)

Species or Critical Habitat	Federal Status[(a)]	Habitat	Type and Likelihood of Occurrence in Action Area
			may exist within undeveloped portions of the site. The NRC staff conservatively assumes the species could be present within the action area.
decurrent false aster (*Boltonia decurrens*)	FT	Alluvial prairie and marshland of the Illinois River flood plain. The species relies on periodic flooding and is most common in lowland areas.	Not present. This species is known to occur along the Illinois River downstream of the DNPS site, but the known species range does not extend into Grundy or Will Counties. The action area does not contain suitable habitat for this species due to the presence of levees and dams that prevent the flooding disturbance required by the species.
eastern prairie fringed orchid (*Platanthera leucophaea*)	FT	Moist or moderately moist prairie and wetland habitats. The species requires full sun and predominately occurs in grass and sedge dominated plant communities (FWS 1999-TN11869).	Potentially present. The species is known to occur in Grundy, Kendall, and Will Counties. No targeted surveys have been conducted to identify this species on the DNPS site. Potentially suitable habitat for the species exists within undeveloped portions of the site. The NRC staff conservatively assumes the species could be present within the action area.
lakeside daisy (*Tetraneuris herbacea*)	FT	Alvar habitat consisting of flat limestone or dolostone bedrock with thin to no soil and full sunlight.	Not present. The species is known to inhabit two sites in Will County. However, bedrock at the site ranges from 12 to 31 ft below ground surface and is not exposed at the surface. The NRC staff concludes there is no suitable habitat to support this species on site.
leafy prairie clover (*Dalea foliosa*)	FT	Mesic to wet-mesic dolomite prairie with shallow, silt to silty clay loam soils over exposed dolomite bedrock at surface elevations typically between 550 and 700 ft.	Not present. Bedrock at the site ranges from 12 to 31 ft below ground surface and is not exposed at the surface. Ground surface elevation at DNPS is approximately 517 ft mean sea level. The species has not been identified at the DNPS site, and

Table 3-16 Occurrences of Federally Listed, Proposed, and Candidate Species and Critical Habitats Under U.S. Fish and Wildlife Service Jurisdiction in the Dresden Nuclear Power Station Subsequent License Renewal Action Area (Continued)

Species or Critical Habitat	Federal Status[(a)]	Habitat	Type and Likelihood of Occurrence in Action Area
			the action area does not contain suitable habitat for the species.
prairie bush clover (*Lespedeza leptostachya*)	FT	Gently sloping, north-facing prairies.	Not present. The current range of this species is over 50 mi from the DNPS site. This species was previously known to inhabit Cook, DuPage, Lee, McHenry, Ogle, and Winnebago Counties in Illinois. However, the closest sites in Cook and DuPage Counties are now considered extirpated. The species' current range does not intersect with the DNPS site, and the species has not been identified on site.
Hine's emerald dragonfly (*Somatochlora hineana*)	FE	Calcareous spring fed wetlands, wet meadows, and marshes overlaying near surface dolomite or limestone bedrock within Illinois, Michigan, Missouri, Wisconsin (FWS 2001-TN11858).	Potentially present. This species has designated critical habitat in Will County and is known to occupy Will County. The closest known occurrence of the species was recorded in 2023 at a new location in Channahon, Will County, located along the Des Plaines River upstream from DNPS (FWS 2001-TN11858). The wetland portions of the site may provide suitable habitat for the species, though there is preferentially suitable habitat nearby offsite that the species would be more likely to occupy. No surveys have been conducted to determine the species' presence on site and the NRC staff conservatively assumes the Hine's emerald dragonfly could occur within the action area.
monarch butterfly (*Danaus plexippus*)	FPT	Prairies, meadows, grasslands and along roadsides across most of North America, especially in areas containing milkweed (FWS 2024-TN11177).	Seasonal and occasional. Monarchs occur in Illinois from April through October. The species is known to breed within Illinois. Migrating monarchs may use the action area as breeding or stopover habitat. No surveys have been conducted to determine the species' presence. However,

Table 3-16 Occurrences of Federally Listed, Proposed, and Candidate Species and Critical Habitats Under U.S. Fish and Wildlife Service Jurisdiction in the Dresden Nuclear Power Station Subsequent License Renewal Action Area (Continued)

Species or Critical Habitat	Federal Status(a)	Habitat	Type and Likelihood of Occurrence in Action Area
			milkweed is known to occur on site (CEG 2025-TN11341). Therefore, the NRC staff conservatively assumes that the monarch butterfly could occur within the action area from April through October.
western regal fritillary (*Argynnis idalia occidentalis*)	FPT	Prairies, meadows, and grasslands, especially in areas containing violets (*Viola* spp.) and nectar food sources. Habitats in the Midwest are primarily small, isolated patches that typically exist as conservation preserves (89 FR 63888-TN10907).	Potentially present. The species is known to occur within the northern half of Illinois. The adults are active from May through September and overwinter in the larval stage. No targeted surveys have been conducted to identify this species on site and CEG has not identified violets on site (CEG 2025-TN11341). Potentially suitable habitat for the species exists within undeveloped portions of the site and the NRC staff conservatively assumes the species could be present.
rusty patch bumblebee (*Bombus affinis*)	FE	Prairies, woodlands, marshes, gardens. Requires areas that support food requirements including nectar and pollen from flowers and other floral resources. Nesting habitat includes abandoned rodent nests and similar cavities (FWS 2016-TN11192).	Potentially present. The species was observed in 2018 within 5 mi of the DNPS site and the action area is listed as a "low potential zone" by the FWS (ESRI 2024-TN11879). No targeted surveys have been conducted to identify this species on site. The habitat for the species exists within undeveloped portions of the site and the NRC staff conservatively assumes the species could be present.

CEG = Constellation Energy Generation, LLC; DNPS = Dresden Nuclear Power Station. EXPN = experimental population, non-essential; FE = federally endangered; FPD = proposed for Federal designation; FPE = proposed for Federal listing as endangered; FPT = proposed for Federal listing as threatened; FT = federally threatened; FWS = U.S. Fish and Wildlife Service; NRC = U.S. Nuclear Regulatory Commission; PBF = physical and biological features.

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

Proposed Designated Critical Habitat of the Sheepnose Mussel

Critical habitat represents the habitat that contains the PBFs essential to conservation of the listed species and that may require special management considerations or protections (78 FR 53058-TN7602). The proposed designated critical habitat for the sheepnose mussel includes 51 river mi (82 river km) of the Kankakee River from the confluence with West Creek to its confluence with the Illinois River, designated as the SHNO 2 critical habitat unit (89 FR 101100-TN11378). The unit includes the river channel up to the ordinary high-water mark. Accordingly, the entirety of the Kankakee River within the DNPS action area is designated critical habitat. The characteristics of the river are described in more detail in Section 3.5.1 and Section 3.7.

In the proposed rule designating critical habitat for the sheepnose mussel (89 FR 101100-TN11378), FWS identifies four PBFs essential to the conservation of the sheepnose: (1) flow regime; (2) habitat connectivity; (3) water and sediment quality; and (4) presence of host fish.

3.8.2 Proposed Action

The following sections address the plant-specific environmental impacts of the proposed DNPS SLR on the environmental issues that relate to federally protected ecological resources.

No federally listed species or critical habitats protected by the ESA under NMFS jurisdiction, EFH protected by the MSA, or sanctuary resources protected by the NMSA occur within the action area. Therefore, the NRC staff concludes that the proposed action would have no effect on federally listed species or habitats under NMFS' jurisdiction, EFH, and sanctuary resources.

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

In Section 3.8.1, the NRC staff determined that the northern long-eared bat, tricolored bat, Indiana bat, whooping crane, eastern massasauga rattlesnake, salamander mussel, sheepnose mussel, scaleshell mussel, Mead's milkweed, eastern prairie fringed orchid, Hine's emerald dragonfly, monarch butterfly, western regal fritillary, and rusty patch bumblebee have the potential to occur in the action area. Additionally, the action area intersects with critical habitat that the FWS has proposed for Federal designation for the sheepnose mussel.

In the following sections, the NRC staff analyzes the potential impacts of the proposed DNPS SLR on these species and critical habitat. Table 3-17 summarizes the NRC staff's ESA effect determinations for federally listed, proposed, and candidate species that resulted from the NRC staff's analysis.

In Section 3.8.1.2, the NRC staff describes several additional federally listed species. The NRC staff determined that these species do not occur in the action area; therefore, the NRC staff does not address these species any further because SLR would have no effect on them. Table 3-17 identifies these species and the NRC's staff's "no effect" findings.

Table 3-17 Effect Determinations for Federally Listed Species Under U.S. Fish and Wildlife Service Jurisdiction

Species	Federal Status[(a)]	Potentially Present in the Action Area?	Effect Determination[(b)]
northern long-eared bat	FE	Yes	NLAA
Indiana bat	FE	Yes	NLAA
tricolored bat	FPE	Yes	NLAA
whooping crane	EXPN	Yes	NLAA
eastern massasauga rattlesnake	FT	Yes	NLAA
salamander mussel	FPE	Yes	NLAA
sheepnose mussel	FE	Yes	NLAA
sheepnose mussel critical habitat	FPD	Yes	NLAA
scaleshell mussel	FE	Yes	NLAA
Mead's milkweed	FT	Yes	NLAA
decurrent false aster	FT	No	NE
eastern prairie fringed orchid	FT	Yes	NLAA
lakeside daisy	FT	No	NE
leafy prairie clover	FT	No	NE
prairie bush clover	FT	No	NE
Hine's emerald dragonfly	FE	Yes	NLAA
monarch butterfly	FPT	Yes	NLAA
western regal fritillary	FPT	Yes	NLAA
rusty patched bumble bee	FE	Yes	NLAA

EXPN = experimental population, non-essential; FPD = federally proposed designated (critical habitat); FE = federally endangered; FPE = proposed for Federal listing as endangered; FPT = proposed for Federal listing as threatened; FT = federally threatened; NE = no effect; NLAA = may affect but is not likely to adversely affect.

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

(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).

Indiana Bat, Northern Long-Eared Bat, and Tricolored Bat

In Section 3.8.1.2, the NRC staff concludes that Indiana, northern long-eared, and tricolored bats may occur in the action area's forests in spring, summer, and fall. If present, bats would occur rarely and in low abundance.

The potential stressors that these bats could experience from the operation of a nuclear power plant (generically) are as follows: (1) mortality or injury from collisions with nuclear power plant structures and vehicles; (2) habitat loss, degradation, disturbance, or fragmentation, and associated effects; and (3) behavioral changes resulting from refurbishment or other site activities.

Mortality or Injury from Collisions with Plant Structures and Vehicles

Listed bats can be vulnerable to mortality or injury from collisions with plant structures and vehicles. The impacts associated with the proposed SLR would be similar to those described on pages 3-62 through 3-63 in Section 3.6.3.1 of the LR GEIS (NRC 2024-TN10161), which is incorporated by reference.

The tallest structures on the DNPS site are the chimneys for Unit 1, 300 ft (91.4 m) above ground level; the chimneys for Units 2 and 3, 310 ft (94.5 m) above ground level; and the meteorological tower, 405 ft (123.4 m) above ground level (CEG 2025-TN11341). The turbine buildings, reactor buildings, and heating boiler stack are also prominent features at DNPS, with above ground level heights equal to or exceeding 100 ft (30 m). To date, CEG has reported no incidents of injury or mortality of any species of bat at DNPS associated with site buildings or structures. Accordingly, the NRC staff finds the likelihood of future Indiana, northern long-eared, or tricolored bat collisions with site buildings or structures to be extremely unlikely and, therefore, is not considered further.

Vehicle collision risk for bats varies depending on factors including time of year, location of roads and travel pathways in relation to roosting and foraging areas, the characteristics of individuals' flight, traffic volume, and whether young bats are dispersing. Although collision has been documented for several species of bats, the Indiana Bat Draft Recovery Plan (FWS 2007-TN934) indicates that bat species do not seem to be particularly susceptible to vehicle collisions. However, the FWS also finds it difficult to determine whether roads pose a greater risk for bats colliding with vehicles or a greater likelihood of decreasing risk of collision by deterring bat activity (FWS 2016-TN7400). In most cases, the FWS expects that roads of increasing size decrease the likelihood of bats crossing the roads and, therefore, reduce collision risk (FWS 2016-TN7400).

During the proposed DNPS SLR term, vehicular traffic from truck deliveries, site maintenance activities, and personnel commuting to and from the site would continue as they have during the current licensing period. Vehicle use would occur primarily in areas that bats would be less likely to frequent, such as along established county and State roads or within industrial-use areas of the DNPS site. Additionally, most vehicle activity would occur during daylight hours when bats are less active. There have been no documented bat incidents, including mortality or injury from collisions with plant structures and vehicles, at DNPS (CEG 2025-TN11341). Accordingly, the NRC staff finds the likelihood of future bat collisions with vehicles to be extremely unlikely and, therefore, is not considered further.

Habitat Loss, Degradation, Disturbance, or Fragmentation, and Associated Effects

As previously discussed in Table 3-16, the DNPS action area includes a forested habitat that federally protected bats may rarely to occasionally inhabit in spring, summer, and fall. In its species status assessment for the tricolored bat (2021-TN8589), the FWS stated that forest removal may result in the following impacts to tricolored bats: loss of suitable roosting or foraging habitat, longer flights between suitable roosting and foraging habitats because of forest habitat fragmentation, fragmentation of maternity colonies due to loss/fragmentation of travel corridors, and direct mortality or injury during tree removal.

The proposed action would not involve forest removal or management and would generally not disturb the existing forested habitat on the site. Other vegetation maintenance on the site over the course of the proposed SLR term would be of grassy, mowed areas between buildings and along walkways within the industrial portion of the site (CEG 2025-TN11341). CEG does not propose any construction, land clearing, or other ground-disturbing activities within the action area. Negative impacts on bats could result if roost trees are removed. Bats could also be directly injured during tree clearing. However, CEG states that tree removal is not expected to occur during the SLR term (CEG 2025-TN11341).

The NRC staff finds that infrequent to rare hazardous tree removal in forested areas during the proposed SLR term would not measurably affect any potential bat habitat in the action area. The continued preservation of the existing forested and natural areas on the site during the SLR term would benefit bats if present within or near the action area.

As part of the WHC conservation program described in Section 3.6.2, CEG installed bat boxes at DNPS. Emergence surveys of the bat boxes are conducted every spring, summer, and fall since the installation of the boxes in 2022. No bats have been observed during these emergence surveys (CEG 2025-TN11341). CEG has consulted with WHC on measures to improve bat box utilization and bat habitat on site. The continued efforts to provide roosting habitat for bats on site during the SLR term would benefit bats if they were present within or near the action area.

Behavioral Changes Resulting from Refurbishment or Other Site Activities

Construction or refurbishment and other site activities, including site maintenance and infrastructure repairs, could prompt behavioral changes in bats. Noise, vibration, and general human disturbance are stressors that may disrupt normal feeding, sheltering, and breeding activities (FWS 2016-TN7400). At low noise levels or farther distances, bats initially may be startled but would likely habituate to the low background noise levels. At closer range and louder noise levels, particularly if accompanied by physical vibrations from heavy machinery, many bats would likely be startled to the point of fleeing from their daytime roosts. Fleeing individuals could experience increased susceptibility to predation and would expend increased levels of energy, which could result in decreased reproductive fitness (FWS 2016-TN7400: Table 4-1). Increased noise may affect foraging success. Schaub et al. (2008-TN8867) found that the foraging success of the greater mouse-eared bat (*Myotis myotis*) diminished in areas with noise mimicking the traffic sounds that would be experienced within 49 ft (15 m) of a highway.

Within the DNPS action area, noise, vibration, and other human disturbances could dissuade bats from using the action area’s forested habitat during migration, which could also reduce the fitness of migrating bats. However, bats that use the action area have likely become habituated to such disturbances because DNPS has been consistently operating for several decades. According to the FWS, bats that are repeatedly exposed to predictable, loud noises may habituate to such stimuli over time (2010-TN8537). For instance, Indiana bats have been documented as roosting within approximately 1,000 ft (300 m) of a busy State route adjacent to Fort Drum Military Installation and immediately adjacent to housing areas and construction activities on the installation (U.S. Army 2014-TN8512). Indiana, northern long-eared, and tricolored bats would likely respond similarly.

Continued operation of DNPS during the SLR term would not include major construction or refurbishment and would involve no other maintenance or infrastructure repair activities besides routine activities already performed on the site. Levels and intensity of noise, lighting, and human activity associated with continued day-to-day activities and site maintenance during the SLR term would be similar to ongoing conditions since DNPS began operating, and such activity would only occur on the developed, industrial-use portions of the site. While these disturbances could cause behavioral changes in migrating or summer roosting bats, such as the expenditure of additional energy to find alternative suitable roosts, the NRC staff assumes that Indiana, northern long-eared, and tricolored bats, if present in the action area, have already acclimated to regular site disturbances. Thus, continued disturbances during the SLR term would not cause behavioral changes in bats to a degree that would be able to be meaningfully measured, detected, or evaluated or that would reach the scale where a take might occur.

Summary of Effects

The potential stressors evaluated in this section are unlikely to result in effects on Indiana, northern long-eared, and tricolored bats that could be meaningfully measured, detected, or evaluated, and such stressors are otherwise unlikely to occur for the following reasons:

- Bat collisions with nuclear power plant structures in the United States are rare, and none have been reported at DNPS. Vehicle collisions attributable to the proposed action are also unlikely, and none have been reported at DNPS.
- The proposed action would not involve any construction, land clearing, or other ground-disturbing activities.
- Continued preservation of the existing forested areas as well as the improvement of bat habitat through the installation of bat boxes on the site would continue to provide roosting habitat for any present bat species.
- Bats, if present in the action area, have likely already acclimated to the noise, vibration, and general human disturbances associated with site maintenance, infrastructure repairs, and other site activities. During the SLR term, such disturbances and activities would continue at current rates and would be limited to the industrial-use portions of the site.

Conclusion for the Indiana Bat

All potential effects on the Indiana bat resulting from the proposed action would be insignificant or discountable. Therefore, the NRC staff concludes that the proposed action *may affect but is not likely to adversely affect* the Indiana bat. Following the issuance of the draft SEIS, the NRC staff will seek the FWS' concurrence with this finding.

Conclusion for the Northern Long-eared Bat

All potential effects on the northern long-eared bat resulting from the proposed action would be insignificant or discountable. Therefore, the NRC staff concludes that the proposed action *may affect but is not likely to adversely affect* the northern long-eared bat. Following the issuance of the draft SEIS, the NRC staff will seek the FWS' concurrence with this finding.

Conclusion for the Tricolored Bat

All potential effects on the tricolored bat resulting from the proposed action would be insignificant or discountable. Therefore, the NRC staff concludes that the proposed action *may affect but is not likely to adversely affect* the tricolored bat. Because the tricolored bat is proposed for Federal listing as endangered, the ESA does not require the NRC to consult with or receive concurrence from the FWS regarding this species, as long as the continued existence of the species is not jeopardized.

<u>Whooping Crane</u>

In Section 3.8.1.2, the NRC staff concludes that whooping cranes may occur in the action area. If present, whooping cranes would occur occasionally and for short periods of time. CEG does not report any known occurrences of whooping cranes on site (CEG 2025-TN11341).

The primary human drivers affecting the whooping crane habitat include activities that cause a loss of wetlands or the degradation of wetland and riverine habitats (FWS 2023-TN8854). CEG proposes no construction or ground disturbance during the SLR term that would impact wetland or riparian habitats. All plant operations would continue to occur within already developed land at the DNPS site. CEG would continue to comply with its NPDES permit, and no activities during the SLR term would alter the river flow in a manner that could result in the degradation of the riverine habitat for whooping cranes.

During the proposed DNPS SLR term, vehicular traffic from truck deliveries, site maintenance activities, and personnel commuting to and from the site would continue throughout the SLR period as they have during the current licensing period. Vehicle use would occur primarily in areas that whooping cranes would be less likely to frequent, such as along established county and State roads or within industrial-use areas of the DNPS site. Accordingly, the NRC staff finds the likelihood of future whooping crane collisions with vehicles to be extremely unlikely and, therefore, is not considered further.

The risk of collisions with tall structures and in-scope transmission lines poses a threat to whooping cranes and other birds. As described in Section 3.6.3.4, CEG maintains an Avian Protection Plan to avoid and minimize bird mortality and injury incidents. From 2013 through 2024, CEG reports that there have been three incidents of bird mortality or injury on site, two of the incidents involved one individual bird and one incident from 2013 reported an unspecified number of individual birds (CEG 2025-TN11341). The NRC staff finds the historical collision risk to be low and the likelihood of future whooping crane collisions with buildings, infrastructure, or in-scope transmission lines to be extremely unlikely and, therefore, is not considered further.

Summary of Effects

The potential stressors evaluated in this section are unlikely to result in effects on whooping cranes that could be meaningfully measured, detected, or evaluated, and such stressors are otherwise unlikely to occur for the following reasons:

- The proposed action would not involve any habitat loss, land-disturbing activities, or any activities that would degrade existing natural areas or potential habitat for the species.
- Continued preservation of the existing natural areas on the site would benefit the species.
- Collisions with tall structures or in-scope transmission lines are unlikely. Vehicle collisions attributable to the proposed action are also unlikely, and none have been reported at DNPS.

Conclusion for the Whooping Crane

All potential effects on the whooping crane resulting from the proposed action would be insignificant. Therefore, the NRC staff concludes that the proposed action *may affect but is not likely to adversely affect* whooping cranes. The whooping crane is listed as a non-essential experimental population for the DNPS action area. FWS has determined a non-essential population is not necessary for the continued existence of the species. For the purposes of consultation, experimental populations are treated as a proposed species on private land and, therefore, the ESA does not require the NRC to consult with or receive concurrence from the FWS regarding this species as long as the continued existence of the species is not jeopardized. Therefore, the NRC staff conclude that Section 7 ESA obligations are fulfilled for this proposed action.

Eastern Massasauga Rattlesnake

In Section 3.8.1.2, the NRC staff concludes that potentially suitable habitat for the eastern massasauga rattlesnakes may occur in the action area. The eastern massasauga is a small, thick-bodied rattlesnake that occupies shallow wetlands and adjacent upland habitat in portions of Illinois, including Will County. The current range of the species resembles its historical range, but the range wide number of presumed extant populations have declined by 38 percent. Of these presumed extant populations, 40 percent of them are thought to be quasi-extirpated (FWS 2016-TN10881).

Eastern massasauga rattlesnakes hibernate in the winter and are active in spring, summer, and fall. Active season habitat use varies regionally and has been documented to include a wide variety of habitats, including old fields, bogs, fens, shrub swamps, wet meadows, marshes, sedge meadows, peatlands, forest edge, scrub shrub forest, floodplain forests, and coniferous forests. In the winter, the species occupies hibernacula, such as crayfish burrows (FWS 2016-TN10881).

The FWS published a Species Status Assessment in 2016 which identified the most prominent risk factors for the eastern massasauga rattlesnake as habitat loss, land management practices, road mortality, persecution, collection, predation, and disease (FWS 2016-TN10881). The proposed SLR term does not involve any activities that could impact the risk of persecution, collection, predation, or disease for the eastern massasauga rattlesnake.

The proposed DNPS SLR would not involve any activities that may cause habitat loss, including land disturbing activities, or any activities that would degrade existing natural areas or potential habitats for the eastern massasauga rattlesnake. Additionally, the continued efforts to preserve grasslands during the SLR term through CEGs partnership with WHC, as described in Section 3.6.2, would benefit eastern massasauga rattlesnakes, should the species be present.

Land management practices that pose a risk to the eastern massasauga rattlesnake include prescribed fires and mowing. The proposed SLR will not involve any prescribed fire activities. During the proposed SLR term, CEG does not plan to conduct any mowing activities within the natural grassland areas of the site. CEG does maintain areas within the developed portion of the site by mowing; however, these areas are unlikely to provide suitable habitat for the eastern massasauga rattlesnake.

During the proposed DNPS SLR term, vehicular traffic from truck deliveries, site maintenance activities, and personnel commuting to and from the site would continue as they have during the current licensing term. The species may utilize road surfaces for thermoregulation and may cross road surfaces to transit between suitable summer and winter habitat. The ability of the species to camouflage makes individuals difficult to see while driving. Construction of new roads or increases in vehicle traffic are not anticipated during the proposed SLR term. Vehicle use would occur primarily in areas where eastern massasauga rattlesnake would be unlikely to be present, such as along established county and State roads or within industrial-use areas of the DNPS site. Accordingly, the likelihood of mortality from vehicle collisions is considered to be discountable.

Summary of Effects

The potential stressors evaluated in this section are unlikely to result in effects on eastern massasauga rattlesnake that could be meaningfully measured, detected, or evaluated, and such stressors are otherwise unlikely to occur for the following reasons:

- The proposed action would not involve any habitat loss, land-disturbing activities, or any activities that would degrade existing natural areas or potential habitat for the species.
- All mowing land management practices would be restricted to developed portions of the site.
- Continued preservation of the existing natural areas on the site would benefit the species.
- Vehicle collisions attributable to the proposed action are unlikely and no increases in vehicle traffic are anticipated.

Conclusion for the Eastern Massasauga Rattlesnake

All potential effects on the eastern massasauga rattlesnake resulting from the proposed action would be discountable. Therefore, the NRC staff concludes that the proposed action *may affect but is not likely to adversely affect* eastern massasauga rattlesnakes. Following the issuance of the draft SEIS, the NRC staff will seek the FWS' concurrence with this finding.

<u>Salamander Mussel, Sheepnose Mussel, and Scaleshell Mussel</u>

In Section 3.8.1.2 the NRC staff concludes that salamander mussels, sheepnose mussels, and scaleshell mussels may occur in the action area. CEG conducted a mussel survey in 2014 of the discharge area of influence within the Illinois River. This survey did not identify any federally listed mussel species. Details regarding the 2014 mussel survey are provided in Appendix E. Another mussel survey was conducted in 2018 by EnviroScience immediately upstream on the Kankakee River for the Godley Public Water District Water Withdrawal Project. This survey identified 24 mussel species that were expected within the project area including the sheepnose mussel (HAI 2020-TN11867: Attachment 1). The salamander and scaleshell mussels were not identified during the survey.

The potential stressors that these mussels could experience from the proposed SLR are as follows: (1) water quality impacts; (2) changes in hydrological regime; (3) lack of habitat connectivity; and (4) host species vulnerability.

Water Quality

Appropriate water quality is critical to the survival, reproduction, and persistence of all life stages of freshwater mussels. Mussels in general need water temperatures below about 86°F (30°C), dissolved oxygen concentrations greater than 5 milligrams per liter (mg/L), and water quality concentrations below acute toxicity levels to mussels for contaminants including but not limited to total ammonia nitrogen, copper, chloride, and sulfate (FWS 2023-TN11246).

The proposed SLR has the potential to impact water quality through the continued discharge of thermal effluent into the Illinois River at the discharge canals and the continued occasional winter discharge of thermal effluent into the Kankakee River from Outfall 004 to melt ice dams. Mussels are susceptible to direct and indirect effects (through host fish species) from DNPS effluent due to temperature and current alterations and to chemical contaminants. Mussels in the Illinois River downstream of the discharge canal and in the Kankakee River downstream of

Outfall 004 may be impacted by an increase in temperature and contaminants. However, the discharged effluent is expected to rise to the surface of the water column and any mussels that may be present are expected to be either completely or partially buried in substrate, which would insulate them from the thermal impacts. Additionally, any mussels within the vicinity of these discharges are likely already acclimated to the thermal impacts.

As part of the CWA 316(a) demonstration to support CEG's NPDES Permit (IL0002224) renewal, EA Engineering, in conjunction with Lewis Environmental Consulting LLC., conducted an unionid mussel survey within the DNPS thermal plume in the Dresden Pool as well as downstream of the Dresden Island Lock and Dam to assess the impacts of thermal effects associated with DNPS operation. A total of 3,349 individuals representing 25 species were collected during this survey; however, no federally listed mussel species were identified. EA Engineering concluded the results indicate the presence of a diverse mussel assemblage upstream and downstream of the Dresden Island Lock and Dam. The largest concentration and highest densities of mussels occurred along the right descending bank opposite and downstream of the DNPS discharge canals within the typical path of the discharge plume. Appendix E further discusses the details regarding this mussel survey.

No mussel surveys have been conducted in the vicinity of Outfall 004. However, per CEG's NPDES Permit (IL0002224) conditions, the upstream and downstream temperature must be monitored while Outfall 004 is in use (Section 3.7.5.2 discusses effects of thermal effluents further). The change in temperature from upstream of Outfall 004 to downstream is typically less than 1°F (0.55°C) while the siphon is in use (Table 3-15). Mussels may be indirectly impacted through the heat shock of host fish species caused by thermal effluent discharge. Heat shock occurs when water temperature meets or exceeds the thermal tolerance of an aquatic species for some duration of the exposure (NRC 2024-TN10161). In most situations, fish can avoid areas that exceed their thermal tolerance limits, although some aquatic species or life stages lack such mobility.

The IEPA, not the NRC, regulates DNPS discharges through its Illinois NPDES permitting program. DNPS currently operates under an administrative extension of NPDES Permit No. IL0002224 while pending renewal review by the IEPA. A NPDES permit ensures that authorized discharges do not harm aquatic species and DNPS must have an Illinois NPDES permit to operate. Therefore, the proposed continued discharge of effluent from DNPS over the SLR term is not anticipated to exceed the above water quality thresholds that are required to support the health of mussel species.

Hydrological Regime

Appropriate flow and temperature are critical to delivering oxygen and nutrients for respiration and filtration, allowing glochidia to move to their host and encyst for reproduction, and for removing silt and other fine sediments from within rock structures and crevices preventing mussel suffocation and degradation of mussel habitat. Normal fluctuation in velocity is expected, but extreme changes can be detrimental. Extreme high flow, associated with flood conditions, can potentially dislodge mussels and destroy habitat. Extreme low flows, associated with drought or water withdrawal, can impact reproduction, feeding, respiration, and, potentially, dewatering and exposure and desiccation of the mussels.

The proposed SLR has the potential to impact the hydrological regime through continued withdrawal of water from the Kankakee River at the intake canal, the continued discharge thermal effluent into the Illinois River at the discharge canal, and the continued occasional winter discharge of thermal effluent into the Kankakee River from Outfall 004.

The proposed SLR will continue to withdraw water via the intake canal located on the shoreline of the Kankakee River. Under the current NPDES permit, CEG is allowed to withdraw water at no limit (Section 3.7.5.2). It should be noted that while the intake canal is located along the shoreline of the Kankakee River, it is close enough to the confluence with the Des Plaines River that during periods of low flow, a larger fraction of the of the withdrawal is sourced from the Des Plaines River (NRC 2004-TN7247). During low summer flow conditions, DNPS can withdraw up to 13 percent of the combined summer month flow of the Kankakee River and Des Plaines River near the confluence. The volume of the Kankakee River that DNPS withdraws is not of a quantity that is likely to cause mussel desiccation or exposure. During rare and extreme low flow events, the water withdrawn from the Kankakee River is expected to be supplemented by water from the Des Plaines River. Therefore, any hydrological impacts associated with these events would be rare and short-term. Section 3.7.5.3 provides details regarding the flow of the Kankakee River.

During the proposed SLR term, there would be continued discharge of thermal effluent into the Illinois River at the discharge canal. The maximum design flow for indirect open-cycle is 1,548 mgd (5,860 MLd) (CEG 2024-TN11347; IPCB 2016-TN11816). During closed-cycle, only a small amount of water is diverted as blowdown to the main discharge (Section 3.7.5.2 for additional information). The portion of the Illinois River in the path of the discharge plume supported the largest concentration and highest densities of mussels during the mussel survey conducted in 2014 (Appendix E discusses this survey in greater detail). DNPS has not proposed any changes to the current DNPS discharge operations during the proposed SLR term and mussel survey results indicate the presence of a diverse mussel population that is acclimated to the hydrological effects of the discharge plume.

The proposed SLR would involve the continued occasional operation of Outfall 004 as authorized per the NPDES permit (Outfall 004 is further discussed in Section 3.5.1.3 and Section 3.7.5.2). When in use, Outfall 004 would discharge effluent at a rate of 50 to 150 cfs (1.4 to 4.2 m^3/s) into the Kankakee River. Typically, the flow of discharge from Outfall 004 is gradually increased at the start of a cycle, starting at 50 cfs (1.4 m^3/s) and increasing from there. Relative to the annual average flow of the Kankakee River, the discharge from Outfall 004 accounts for approximately 3 percent of the total flow (USGS 2025-TN11703). The fluctuation in flow associated with the use of Outfall 004 would not reach a level that could dislodge mussels or destroy their habitat or that of their host fishes. Additionally, mussels in the Illinois River and Kankakee River would already be acclimated to the hydrological regimes associated with plant operations.

The impacts associated with the continued withdrawal of water from the Kankakee River at the intake canal, the continued discharge thermal effluent into the Illinois River at the discharge canal, and the continued occasional winter discharge thermal effluent into the Kankakee River from Outfall 004 are considered insignificant as they would not alter the hydrological regime in a way that could be meaningfully measured with regard to mussel reproduction, feeding, or respiration.

Habitat Connectivity

Artificial barriers affect freshwater mussels through direct effects (such as water temperature and flow changes and habitat alteration) and indirect effects (such as changes to food base and host availability). The proposed SLR would result in the continued discharge of thermal effluent into the Illinois River and the occasional discharge of thermal effluent into the Kankakee River via Outfall 004, as authorized per NPDES Permit No. IL0002224 (Section 3.7.5.2). The thermal plumes resulting from the release of thermal effluent could create barriers to fish passage for the host species of the sheepnose and scaleshell mussels. However, since both the salamander mussel and its host species, the mud puppy, are benthic dwelling, thermal plumes would not overlap in space with the mussel species or its host. Therefore, the proposed SLR does not involve any activities that would result in barriers to connectivity for the salamander mussel or its host species.

Host fish species of the sheepnose and scaleshell mussels would likely exhibit behavioral avoidance of the direct path of the thermal plume by moving deeper in the water column or by swimming around the plume. The thermal plume would not affect the host species' ability to carry out essential life functions (i.e., foraging, migrating, resting) in the action area. Cooling water discharges are regulated by the IEPA, under Section 316(a) of the CWA. Thermal effluent criteria and limitations are imposed through special conditions in the site NPDES permit. Under CWA Section 316(a), EPA or the States must establish thermal effluent limitations that assure the protection and propagation of the waterbody's balanced, indigenous population of shellfish, fish, and wildlife. Nonetheless, thermal discharges can affect habitat availability and fish behavior or migration. For instance, if a thermal plume extends across a river, it can affect fish migration by causing individuals to exert additional energy to avoid heated water, or it can block passage altogether. The DNPS 316(a) thermal effluent demonstration indicates that more than 75 percent of the cross-section within the thermal plume at the discharge canal would have water temperatures below the avoidance temperature of most fish species that were analyzed in the study, including the host fish species of the scaleshell mussel and one host fish species of the sheepnose mussel (CEG 2025-TN11342). Thermal effluent studies have not been conducted in association with the discharge at Outfall 004; however, any potential avoidance caused by this discharge would be temporary in nature and of short duration. The NRC finds that thermal effects on listed species to be insignificant.

Host Species Vulnerability

Like other unionids, salamander mussels, sheepnose mussels, and scaleshell mussels have unusual life cycles. After fertilization, the eggs live in special gill chambers of the females and develop into microscopic larvae called glochidia. Females brood the glochidia and expel them to complete development by attaching to the host's gills or fins. They drop off the hosts as newly transformed juveniles. Mussel host species are susceptible to many of the same threats that affect mussels including contaminants, habitat degradation and fragmentation, lack of water quality and quantity, known disease issues or die-offs, and potential overharvest and collection. Impacts to host species have an indirect effect on mussels through the reduction in the abundance and distribution of its host species.

Adult mussels are not directly susceptible to entrainment or impingement by power plants as they live in the river bottom, but larvae are indirectly susceptible if the host species is susceptible. Since both the salamander mussel and its host, the mudpuppy, are benthic dwelling species, they are not susceptible to impingement or entrainment and have not been reported in entrainment and impingement surveys (Appendix E). Therefore, the proposed SLR would not impact host species vulnerability through entrainment or impingement for the salamander mussel.

The sheepnose mussel has two known natural host species, the sauger (*Sander canadensis*) and mimic shiner (*Notropis volucellus*), but laboratory studies indicate that as many as 30 species may be suitable hosts. Hove et al. (TN11868) found that 11 fish species have a higher production of sheepnose juveniles: central stoneroller (*Campostoma anomalum*), whitetail shiner (*Cyprinella galactura*), spotfin shiner (*Cyprinella spiloptera*), blacktail shiner (*Cyprinella venusta*), common shiner (*Luxilus cornutus*), silver chub (*Macrhybopsis storeriana*), golden shiner (*Notemigonus crysoleucas*), Ozark minnow (*Notropis nubilus*), Topeka shiner (*Notropis topeka*), longnose dace (*Rhinichthys cataractae*), and creek chub (*Semotilus atromaculatus*). Importantly, interactions between these potential host species identified in laboratory studies and sheepnose may be rare and infrequent in nature due to habitat preferences.

Sheepnose larvae are indirectly susceptible to the impingement and entrainment of their host fish. Out of the 131,370 fish collected during the 2005 through 2007 impingement characterization study, only two host fish of the sheepnose mussel (one sauger and one mimic shiner) were collected (CEG 2025-TN11341: AECOM 2016). Impingement surveys were also conducted in 2017 and 2018. During these surveys, no sauger were collected and 11 mimic shiners were collected representing 0.08 percent of the total individuals impinged over the 2017 and 2018 surveys. In comparison, mimic shiner made up 30 percent of the individuals collected within Dresden Pool during the seven surveys between 2005 and 2014, indicating that mimic shiners are relatively abundant in the vicinity of DNPS but do not make up a large portion of impinged individuals. Additionally, of the 11 host species identified in laboratory studies, only the central stoneroller, spotfin shiner, golden shiner, and creek chub were collected during the impingement and entrainment surveys conducted by CEG. During the impingement surveys from 2005 through 2007, 38 spotfin shiners, 2 golden shiners, and 1 creek chub were collected, together representing 0.03 percent of the total individuals impinged during these surveys. During the impingement surveys from 2017 and 2018, 17 spotfin shiners, and 1 golden shiner were collected, together representing 0.14 percent of the total individuals impinged during these surveys. Two larvae/juvenile central stoneroller and one larvae/juvenile creek chub were collected in the entrainment surveys conducted in 2005 and 2006. See Appendix E for further information on these surveys.

Assuming that the results of past impingement and entrainment surveys reflect future conditions, the indirect effect of impingement and entrainment of sauger on sheepnose over the course of the SLR term is likely to be insignificant. Of the additional host species identified during laboratory studies, fathead minnow, creek chub, central stoneroller, and golden shiner appear in impingement collections in low numbers, but the expected infrequent interaction of these species with sheepnose and the uncertainty that these species are natural hosts indicate that the indirect effects of impingement on these possible host species are likely to be insignificant. Future studies may identify additional natural host species for sheepnose that might modify this conclusion.

The scaleshell mussel has one known host species, the freshwater drum (*Aplodinotus grunniens*). The freshwater drum is susceptible to impingement and was collected in moderate numbers during the 2005 through 2007 impingement surveys (5,342 individuals) and the 2017 and 2018 impingement surveys (57 individuals). In comparison to other species recorded during the impingement surveys, freshwater drum accounted for 4.47 percent of the relative abundance of fish collected during the 2005 through 2007 impingement surveys and 0.45 percent of the relative abundance of fish collected during the 2017 and 2018 impingement surveys. See Appendix E for further information on these surveys. The scaleshell mussel is considered very rare and the species was considered extirpated from all historical streams east of the Mississippi River until a single live specimen was discovered in the Illinois River in 2013 by an Illinois Natural History Survey biologist (FWS 2021-TN11838). Prior to this observation, the most recent record of this species in the Illinois River was pre-1887 in Peoria County, Illinois. Subsequent mussel surveys of the Illinois River since the 2013 observation have failed to find additional evidence of this species. Due to the rarity of the species and the moderately low frequency of host species impingement, the likelihood of indirect effects to the scaleshell mussel is discountable.

Summary of Effects

The potential stressors evaluated in this section are unlikely to result in effects on salamander mussels, sheepnose mussels, and scaleshell mussels that could be meaningfully measured, detected, or evaluated, and such stressors are otherwise unlikely to occur for the following reasons:

- The proposed action would not involve any habitat loss, or any in-water activities that would degrade existing potential habitat for mussels. Any activities that could impact mussels, such as dredging or activities that result in sedimentation, would require prior authorization and permitting.
- The continued discharge of thermal effluent into potential mussel habitat is regulated by the IEPA to ensure protection of aquatic species. DNPS currently operates under an administrative extension of NPDES Permit No. IL0002224 while pending renewal review by the IEPA. If mussels are present, they would already be acclimated to any thermal or hydrological effects.
- The proposed action would involve the discharge of thermal effluent that may impact habitat connectivity for the host species of the sheepnose and scaleshell mussels due to presence of thermal plumes. Salamander mussels will not be impacted as their host species is benthic dwelling.
- The continued operation of DNPS would result in ongoing risk of indirect impacts from the impingement of mussel host species. The host species of the salamander mussel, the mudpuppy, is benthic dwelling and is not susceptible to impingement or entrainment. The host species of the sheepnose mussel have been documented in impingement surveys in low numbers. The host species of the scaleshell mussel has been documented in impingement surveys in moderately low numbers and the species is considered very rare.

Conclusion for the Salamander Mussel

All potential effects on the salamander mussel resulting from the proposed action would be insignificant. Therefore, the NRC staff concludes that the proposed action *may affect but is not likely to adversely affect the* salamander mussel. Because the salamander mussel is proposed for Federal listing as endangered, the ESA does not require the NRC to consult with or receive concurrence from the FWS regarding this species as long as the continued existence of the species is not jeopardized.

Conclusion for the Sheepnose Mussel

All potential effects on the sheepnose mussel resulting from the proposed action would be insignificant. Therefore, the NRC staff concludes that the proposed action *may affect but is not likely to adversely affect* the sheepnose mussel. Following the issuance of the draft SEIS, the NRC staff will seek the FWS' concurrence with this finding.

Conclusion for the Scaleshell Mussel

The likelihood of the scaleshell mussel occurring within the action area is extremely low; however, the presence and susceptibility of the species host to impingement could impact the species, should individuals be present. The NRC staff concludes that the proposed action *may affect but is not likely to adversely affect* the scaleshell mussel. Following the issuance of the draft SEIS, the NRC staff will seek the FWS' concurrence with this finding.

<u>Sheepnose Mussel Critical Habitat</u>

In Section 3.8.1.2, the NRC staff concludes that the entirety of the Kankakee River within the DNPS action area is proposed designated critical habitat within the unit designated as SHNO 2. The anticipated impacts from the proposed SLR that may impact SHNO 2 are the continued withdrawal of water from the Kankakee River through the intake canal and the continued periodic operation of Outfall 004. No other impacts are anticipated that may impact the portion of SHNO 2 that overlaps with the action area.

The operation of Outfall 004 is authorized by the IEPA under CEG's NPDES Permit No. IL0002224 (Section 3.5.1.3 and Section 3.7.5.2). DNPS currently operates under an administrative extension of the NPDES permit while pending renewal review by the IEPA. The IEPA manages DNPS discharges and evaluates the potential effects of the discharge on the aquatic environment. The IEPA may impose additional requirements to reduce or mitigate the effects of thermal discharges on mussel species at DNPS. The potential impacts to the SHNO 2 associated with the use of Outfall 004 would be temporary in nature and of short duration.

The following information is obtained from the proposed rule issued by the FWS in 2024 designating critical habitat for the sheepnose mussel (89 FR 101100-TN11378). Threats to the conservation of the sheepnose mussel within SHNO 2 include degradation of water quality due to contaminants, sedimentation, and in-stream gravel mining. The proposed action would not involve any activities that could cause sedimentation or that involve in-stream gravel mining.

The FWS identifies four PBFs of the critical habitat that apply for all proposed critical habitat units (89 FR 101100-TN11378). In Table 3-18, the NRC staff presents the descriptions of each PBF and analyzes the potential effects of the proposed DNPS SLR on each of the four PBFs of the critical habitat.

Table 3-18 Effect Determinations for the Physical and Biological Features of the Proposed Sheepnose Mussel Critical Habitat

PBF	Determination[(a)]	Description	Analysis
PBF 1: Flow Regime	NLAA	Adequate flows, or a hydrological flow regime (magnitude, timing, frequency, duration, rate of change, and overall seasonality of discharge over time), necessary to maintain benthic habitats where the species are found and to maintain stream connectivity. Appropriate flow is necessary for delivering oxygen and nutrients for respiration and filtration. Normal fluctuation in flow velocity expected, but extreme changes can be detrimental. These extreme changes are typically associated with flood conditions that may dislodge mussels or destroy their habitat or the habitat of their host fishes. Extreme low flows are also detrimental to the species.	The proposed SLR will continue to withdraw water from the Kankakee River at the intake canal. CEG is allowed under the current NPDES permit to withdraw water from the Kankakee River at no limit (Section 3.7.5.2). It should be noted that while the intake canal is located along the shoreline of the Kankakee River, it is close enough to the confluence with the Des Plaines River that during periods of low flow a larger fraction of the of the withdrawal is sourced from the Des Plaines River (NRC 2004-TN7247). During low summer flow conditions, DNPS can withdraw up to 13 percent of the combined summer month flow of the Kankakee and Des Plaines Rivers near the confluence. The volume of the Kankakee River that DNPS withdraws is not of a quantity that is likely to cause mussel desiccation or exposure. During rare and extreme low flow events, the water withdrawn from the Kankakee River would be supplemented by water from the Des Plaines River. Therefore, any hydrological impacts associated with these events would be rare and short-term. Section 3.7.5.3 provides details regarding the measured flow of the Kankakee River. The proposed SLR would also involve the continued occasional operation of Outfall 004 as authorized per the NPDES permit. When in use, Outfall 004 would discharge effluent at a rate of 50 to 150 cfs into the Kankakee River. Typically, the flow of discharge from Outfall 004 is gradually increased at the start of a cycle, starting at 50 cfs (1.4 m3/s) and subsequently increasing. Relative to the annual average streamflow of the Kankakee River, the discharge from Outfall 004 accounts for approximately 3 percent of the flow (USGS 2025-TN11703). The fluctuation in flow associated with.

Table 3-18 Effect Determinations for the Physical and Biological Features of the Proposed Sheepnose Mussel Critical Habitat (Continued)

PBF	Determination[(a)]	Description	Analysis
			the use of Outfall 004 would not be of a volume or velocity that could dislodge mussels or destroy their habitat or that of their host fishes. The impacts to PBF 1 during the proposed SLR term are considered to be insignificant because the potential changes in flow regime will not be of a magnitude that would impact the flow of oxygen and nutrients necessary for the respiration and filtration of sheepnose mussels in a way that could be meaningfully measured
PBF 2: Habitat Connectivity	NLAA	Suitable substrates and connected instream habitats, characterized by geomorphologically stable stream channels and banks (i.e., channels that maintain lateral dimensions, longitudinal profiles, and sinuosity patterns over time without an aggrading or degrading bed elevation) that support the mussel species and respective host fishes (e.g., sand and gravel substrate with moderate flow, aquatic vegetation, in and adjacent to riffles and shoals). Connectivity is characterized by suitable water quality, lack of barriers to dispersal (e.g., perched culverts, hydropower dams that lack passage for host fishes, water control structures), and presence of suitable shelter habitat and forage base for host fish. Long reaches of connected stream habitat support population resilience and dispersal.	The proposed SLR would also involve the continued occasional operation of Outfall 004 as authorized per the NPDES permit and described in the analysis of PBF 1. The thermal plumes resulting from the release of thermal effluent via Outfall 004 could create barriers to fish passage for the host species of the sheepnose mussel. The impacts associate with the operation of Outfall 004 would be temporary in nature and of short duration. Cooling water discharges are regulated by the IEPA, under Section 316(a) of the CWA. Thermal effluent criteria and limitations are imposed through special conditions in the DNPS NPDES permit. Under CWA Section 316(a), EPA or the States must establish thermal effluent limitations that assure the protection and propagation of the waterbody's balanced, indigenous population of shellfish, fish, and wildlife. Nonetheless, thermal discharges can affect habitat availability and fish behavior or migration. For instance, if a thermal plume extends across a river, it can affect fish migration by causing individuals to exert additional energy to avoid heated water, or it can block passage altogether. In general, the NRC staff has found thermal effects on listed species to be insignificant or discountable. The proposed SLR would not involve any other activities that

Table 3-18 Effect Determinations for the Physical and Biological Features of the Proposed Sheepnose Mussel Critical Habitat (Continued)

PBF	Determination[a]	Description	Analysis
			have the potential to impact habitat connectivity within SHNO 2. The activities associated with the proposed SLR would not result in impacts to habitat connectivity that could be meaningfully measured or detected.
PBF 3: Water and Sediment Quality	NLAA	Water and sediment quality necessary to sustain natural physiological processes for normal behavior, growth, and viability of all life stages, including appropriate levels of dissolved oxygen (generally above 2 to 3 ppm), salinity (generally below 2 to 4 ppm), and temperature (generally below 86°F). Additionally, concentrations of contaminants, including (but not limited to) ammonia, nitrate, copper, and chloride, are below acute toxicity levels for mussels.	Water quality parameters, including the potential for heat shock, may be impacted by the occasional discharge of thermal effluent via Outfall 004 over the SLR term. Heat shock occurs when water temperature meets or exceeds the thermal tolerance of an aquatic species for some duration of the exposure (NRC 2024-TN10161). In most situations, fish can avoid areas that exceed their thermal tolerance limits, although some aquatic species or life stages lack such mobility. Mussels downstream of Outfall 004 may be impacted by an increase in temperature and contaminants while the outfall is in use. However, the discharged effluent is expected to rise to the surface of the water column and any mussels that may be present are expected to be either completely or partially buried in substrate, which would insulate them from the thermal impacts. Additionally, the change in temperature from upstream of Outfall 004 to downstream is typically less than 1°F while the siphon is in use (Table 3-15). The IEPA, not the NRC, regulates DNPS discharge through its Illinois NPDES permitting program. This permit ensures that authorized discharges do not harm aquatic species and DNPS must have an Illinois NPDES permit to operate. Therefore, the proposed continued discharge of effluent from DNPS over the SLR term is not anticipated to exceed the above thresholds that are required to support the health of mussel species. The impacts to PBF 3 during the proposed SLR would be

Table 3-18 Effect Determinations for the Physical and Biological Features of the Proposed Sheepnose Mussel Critical Habitat (Continued)

PBF	Determination[(a)]	Description	Analysis
			insignificant because the discharge of thermal effluent via Outfall 004 will not affect water quality to a degree that the necessary water quality parameters will not be met.
PBF 4: Presence of Host Fish Species	NLAA	The presence and abundance of host fishes necessary for recruitment of the species. For the sheepnose, these are mimic shiner (*Notropis volucellus*) and sauger (*Sander canadensis*). Laboratory studies conducted by Hove et al. (TN11868) found that 11 additional fish species are able to act as host fish and produce sheepnose juveniles.	The previous section addressing the salamander mussel, sheepnose mussel, and scaleshell mussel describes the presence, abundance, and low impingement rates of known natural host fishes (mimic shiner and sauger) within the action area, as well as other fish species observed as host fishes only in laboratory studies. The proposed action would involve the continued low risk of indirect impingement of the sheepnose mussel. Natural host species of the mussel have been documented in impingement surveys, but in low numbers. Therefore, the impacts to PBF 4 during the proposed SLR term would be insignificant because the risk of direct or indirect impingement of sheepnose mussel host fish will not be of a magnitude to impact the presence and abundance of the host fish within the action area.

CEG = Constellation Energy Generation, LLC; CWA = Clean Water Act of 1972, as amended; DNPS = Dresden Nuclear Power Station; EPA = U.S. Environmental Protection Agency; IEPA = Illinois Environmental Protection Agency; NLAA = may affect but is not likely to adversely affect; NPDES = National Marine Fisheries Service; NRC = U.S. Nuclear Regulatory Commission; PBF = physical and biological feature; SLR = subsequent license renewal.

(a) 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).

Source: 89 FR 101100-TN11378.

Summary of Effects

The proposed DNPS SLR *may affect but is not likely to adversely affect* PBFs 1, 2, 3, and 4 of SHNO 2, the proposed critical habitat unit of sheepnose mussel in the Kankakee River. The proposed action may cause habitat alterations from the continued withdrawal from the Kankakee River via the intake canal and the continued periodic discharge into the Kankakee River via Outfall 004. However, any effects on the value of the habitat to the conservation of the species are considered insignificant because any responses in mussel behavior or fitness would be so small that they could not be meaningfully measured or detected.

When discharging effluent to the Kankakee River via Outfall 004, the licensee will abide by relevant Federal and State regulations, including conditions set forth in NPDES Permit No. IL0002224 (Section 3.7.5.2).

Conclusion for Designated Critical Habitat of the Sheepnose Mussel

All potential effects on the sheepnose mussel critical habitat resulting from the proposed action would be insignificant. Therefore, the NRC staff concludes that the proposed action *may affect but is not likely to adversely affect* the critical habitat of the sheepnose mussel. Because the critical habitat is proposed for Federal designation, the ESA does not require the NRC to consult with or receive concurrence from the FWS as long as the action is not likely to adversely modify the proposed critical habitat.

<u>Rusty Patched Bumblebee and Mead’s Milkweed</u>

In Section 3.8.1.2, the NRC staff concludes that rusty patched bumble and Mead’s milkweed may occur in the action area within grassland portions of the site. The NRC staff analyzed project impacts on these species together because they use similar habitats and because rusty patched bumblebee is a known pollinator of Mead’s milkweed (FWS 2022-TN11834). For details regarding the species biology, please refer to the rusty patched bumblebee species status assessment (FWS 2016-TN11192) and the Mead’s milkweed recovery plan (FWS 2003-TN11842) that can be found on the species ECOS profile maintained by the FWS (FWS 2025-TN11832, FWS 2023-TN11830).

For the proposed SLR, the NRC staff reviewed known threats for each species (FWS 2003-TN11842, FWS 2016-TN11192) and determined that three potential effects required evaluation: (1) habitat loss and degradation; (2) pesticide use; and (3) climate change and pollinator decline. Two threats were determined to be extremely unlikely and not considered further as potential effects: (1) no SLR activities would impact the presence or exposure to rusty patched bumble pathogens; and (2) there would be no activities that could result in the introduction and expansion of feral swine, whose range does not extend into northern Illinois (USDA 2025-TN11899).

Habitat Loss and Degradation

The proposed DNPS SLR would not involve any habitat loss, land-disturbing activities, or any activities that would degrade existing natural areas or potential habitats for the rusty patched bumble bee or Mead’s milkweed. The continued preservation of existing grasslands and other natural areas on the site through the partnership with WHC (Section 3.6.2 and

Section 3.6.3.5) would benefit both species. Additionally, through this partnership, CEG avoids mowing in areas where milkweed is identified (CEG 2025-TN11341).

Pesticide Exposure

Bumble bees are directly susceptible to exposure to insecticides and can be indirectly susceptible to herbicides through the reduction in floral resource availability. Mead's milkweed could be directly affected by inadvertent exposure to herbicides. During the proposed SLR term, CEG would continue applying herbicides as needed and according to labeled uses but has no plans to apply herbicides in natural areas unless for the purpose of invasive plant management (Section 3.6.3.5). However, all herbicide application would be targeted and, therefore, unlikely to result in hazardous levels of contaminant exposure for either species. As such, this potential impact is insignificant because it is unlikely to reach the scale where take may occur.

Climate Change and Pollinator Decline

The Illinois populations of Mead's milkweed are considered moderately vulnerable to climate change. Mead's milkweed may be directly impacted by climate change due to the associated changes to water quality, drought and flooding, and the spread of invasive species. The pollinator species are expected to experience impacts from the increased frequency and intensity of extreme weather and climate-related events as well as from changes in seasonal temperatures and precipitation patterns.

Mead's milkweed are primarily pollinated by large bees, including European honeybee (*Apis melifera*), rusty patched bumblebee (*Bombus affinis*), brown-belted bumblebee (*Bombus griseocollis*), Southern Plains bumblebee (*Bombus fraternus*) and the chimney bee (*Anthrophora abrupta*). Mead's milkweed pollinators have declined throughout the United States due to stressors including habitat loss, food stress, exposure to pesticides, pathogens, and climate change related impacts. Few studies investigate the impacts of climate change on bees. Most studies that assess potential impacts of climate change on pollinators come from studies on butterflies. Associated effects from climate change may lead to a decrease in resource availability and nesting habitat for the rusty patched bumble bee (FWS 2016-TN11192).

Impacts on climate change during normal operations at nuclear power plants can result from the release of GHGs from stationary combustion sources, refrigeration systems, electrical transmission and distribution systems, and mobile sources. However, such emissions are typically very minor because nuclear power plants do not normally combust fossil fuels to generate electricity. During the proposed SLR term, the contribution of DNPS operations to climate-change-related effects would be too small to be meaningfully measured, detected, or evaluated for both species.

Summary of Effects

The potential stressors evaluated in this section are unlikely to result in effects on rusty patched bumble bee or Mead's milkweed that could be meaningfully measured, detected, or evaluated, and such stressors are otherwise unlikely to occur for the following reasons:

- The proposed action would not involve any habitat loss, land-disturbing activities, or any activities that would degrade existing natural areas or potential habitat for the species.
- Continued preservation of the existing natural areas on the site would benefit rusty patched bumble bees and Mead's milkweed, should the species be present.

- Herbicide use would be applied according to labeled uses and only applied in natural areas for the purpose of invasive plant management. Due to the targeted nature of herbicide application and its minimal use within natural areas of the DNPS site, the likelihood of exposure to herbicide is low. This represents an insignificant effect because it is unlikely to reach the scale where take may occur.
- The contribution of DNPS operations to climate-change-related effects would be too small to be meaningfully measured, detected, or evaluated.

Conclusion for the Rusty Patched Bumble Bee

All potential effects on the rusty patched bumble bee resulting from the proposed action would be insignificant or discountable. Therefore, the NRC staff concludes that the proposed action *may affect but is not likely to adversely affect* the rusty patched bumble bee. Following the issuance of the draft SEIS, the NRC staff will seek the FWS' concurrence with this finding.

Conclusion for the Mead's Milkweed

Because the proposed action would not have any effect on potential habitat occurring within the action area, the NRC staff concludes that the proposed action *may affect but is not likely to adversely affect* the Mead's milkweed. Following the issuance of the draft SEIS, the NRC staff will seek the FWS' concurrence with this finding.

Eastern Prairie Fringed Orchid

In Section 3.8.1.2, the NRC staff concludes that eastern prairie fringed orchids may occur in the action area. This species typically inhabits tallgrass prairies east of the Mississippi River that have calcareous silt loam soils and calcareous wetlands with open portions of fends, sedge meadows, marshes, and bogs. While once numerous and widespread, populations have declined with the disappearance of eastern prairies by conversion of habitat for crop fields, grazing, intensive and continuous hay mowing, drainage, and related human uses. Other reasons for the decline include succession to woody vegetation, competition from non-native species, and over-collection. Remaining populations tend to be small, unprotected, and unmanaged.

FWS identifies the primary threat to the conservation of the eastern prairie fringed orchid as habitat loss and degradation (FWS 1999-TN11869). Habitat loss and degradation has resulted primarily from the conversion of natural habitat to agricultural land use for crop production as well as commercial and residential development. Increased livestock grazing has also contributed to this species' decline. Additionally, much of the habitat required for the orchid is no longer under fire suppression controls, which has resulted in an increase of the encroachment of woody vegetation throughout much of the suitable habitat available for the orchid (CEG 2025-TN11341).

The proposed DNPS SLR would not involve any habitat loss, land-disturbing activities, or any activities that would degrade existing natural areas or potential habitats for the eastern prairie fringed orchid. CEG reports no observations of this species at DNPS (CEG 2025-TN11341). However, should the species be present, the continued preservation of existing natural areas through CEGs partnership with WHC, as described in Section 3.6.2, would benefit the eastern prairie fringed orchid.

Continued herbicide application during the proposed SLR term is described in Section 3.6.3.5. Herbicide application could affect eastern prairie fringed orchid in the action area by indirect exposure to these chemicals. However, all application would be restricted to manicured portions of the site or be targeted for invasive plant management. Therefore, it is unlikely that the eastern prairie fringed orchid will be exposed to hazardous levels of herbicide, and this potential impact is insignificant because it is unlikely to reach the scale where take might occur.

Summary of Effects

The potential stressors evaluated in this section are unlikely to result in effects on eastern prairie fringed orchid that could be meaningfully measured, detected, or evaluated, and such stressors are otherwise unlikely to occur for the following reasons:

- The proposed action would not involve any habitat loss, land-disturbing activities, or any activities that would degrade existing natural areas or potential habitat for eastern prairie fringed orchid.
- Continued preservation of the existing natural areas on the site would benefit eastern prairie fringed orchid, should the species be present.
- Herbicide use would be applied according to labeled uses and would only be applied in natural areas for the purpose of invasive plant management. The targeted nature of herbicide application and its minimal use within natural areas of the DNPS site make the likelihood of herbicide exposure low. This represents an insignificant effect because it is unlikely to reach the scale where take may occur.

Conclusion for the Eastern Prairie Fringed Orchid

Because the proposed action would not have any meaningful effect on potential habitat occurring within the action area, the NRC staff concludes that the proposed action *may affect but is not likely to adversely affect* the eastern prairie fringed orchid. Following the issuance of the draft SEIS, the NRC staff will seek the FWS' concurrence with this finding.

Hine's Emerald Dragonfly

In Section 3.8.1.2, the NRC staff concludes that Hine's emerald dragonflies may occur in the action area. Hine's emerald dragonfly has probably been extirpated in Alabama, Indiana, and Ohio, and today can only be found in Illinois, Michigan, Missouri, and Wisconsin. This dragonfly lives in calcareous (high in calcium carbonate) spring-fed marshes and sedge meadows overlaying dolomite bedrock. Generally, species habitat is characterized by the presence of slowly flowing water and nearby or adjacent forest edges.

The FWS listed Hine's emerald dragonfly as an endangered species in 1995 (60 FR 5264-TN11864), designated critical habitat for it in 2007 (70 FR 51102-TN11865) and revised the critical habitat designation in 2010 (75 FR 21394-TN11866). The closest critical habitat unit for the Hine's emerald dragonfly is Illinois Unit 1 located approximately 15 mi (24 km) upriver along the Des Plaines River. Prior to 2023, all occurrences of the species were restricted to northern Will County, close to the borders with DuPage and Cook Counties. However, a new species location was confirmed in 2023 on private property in Channahon, Will County, Illinois (FWS 2024-TN11859). This discovery expands the known extent of the Lower Des Plaines River Valley population.

The FWS identifies the most significant threats to the Hine's emerald dragonfly as habitat destruction/alteration and contamination. Per the status review published by the FWS in 2025, the predominant threats to know occupied sites in Illinois are fragmentation, hydrological, vehicle mortality, and invasive plants (FWS 2024-TN11859). A few sites also face threats from direct loss of habitat and all-terrain vehicles, and one site faces threats from contaminants.

The proposed DNPS SLR would not involve any activities that may cause habitat loss for the Hine's emerald dragonfly. There will be no land or wetland disturbing activities, or any activities that would alter, degrade, or fragment potential on site habitat for the species. The continued preservation of existing natural areas through the partnership with WHC, as described in Section 3.6.2, would benefit the Hine's emerald dragonfly. Additionally, the safety and security measures implemented at the site ensure that recreational all-terrain vehicle activities will not occur on site.

During the proposed DNPS SLR term, vehicular traffic from truck deliveries, site maintenance activities, and personnel commuting to and from the site would continue as they have during the current licensing term. Vehicle use would occur primarily in areas where dragonflies would be unlikely to be present, such as along established county and State roads or within industrial-use areas of the DNPS site. Accordingly, the likelihood of Hine's emerald dragonfly mortality from vehicle collisions is considered to be discountable.

FWS defines hydrological threats to be any impacts to the quantity and quality of surface and subsurface hydrology. Effects to surface and subsurface hydrology are addressed in Section 3.5.3.1 and Section 3.5.3.2 and are both considered to be SMALL, as they are not detectable or are so minor that they will neither destabilize nor noticeably alter any important attribute of the resource. Therefore, any hydrological impacts on the Hine's emerald dragonfly would be insignificant.

FWS defines contaminant threats to be any habitat altering chemicals and other substances that may cause direct or indirect take. During the proposed SLR term, CEG would continue applying herbicides as needed and according to labeled uses but has no plans to apply herbicides in natural areas unless for the purpose of invasive plant management (Section 3.6.3.5). Continued herbicide application could affect Hine's emerald dragonflies in the action area by indirect exposure to these chemicals. However, all herbicide application would be targeted and, therefore, unlikely to result in hazardous levels of contaminant exposure.

Summary of Effects

The potential stressors evaluated in this section are unlikely to result in effects on Hine's emerald dragonfly that could be meaningfully measured, detected, or evaluated, and such stressors are otherwise unlikely to occur for the following reasons:

- The proposed action would not involve any habitat loss, land-disturbing activities, or any activities that would degrade existing natural areas or potential habitat for Hine's emerald dragonfly.
- Continued preservation of the existing natural areas on the site would benefit the Hine's emerald dragonfly, should the species be present.
- Herbicide use would be applied according to labeled uses and would only be applied in natural areas for the purpose of invasive plant management. The targeted nature of herbicide application and its minimal use within natural areas of the DNPS site make the

likelihood of herbicide exposure low. This represents an insignificant effect because it is unlikely to reach the scale where a take might occur.

Conclusion for the Hine's Emerald Dragonfly

Because the proposed action would not have any meaningful effect on potential habitat occurring within the action area, the NRC staff concludes that the proposed action *may affect but is not likely to adversely affect* the Hine's emerald dragonfly. Following the issuance of the draft SEIS, the NRC staff will seek the FWS' concurrence with this finding.

Monarch Butterfly and Western Regal Fritillary

In Section 3.8.1.2, the NRC staff concludes that monarch butterflies and western regal fritillaries may occur in the action area. Monarch butterflies may occur during spring and fall migration when individuals are moving between areas of more suitable habitat. If present, monarchs would occur occasionally and for short periods of time. Suitable habitat to support western regal fritillaries occurs on site; however, better suited habitat occurs in the vicinity of DNPS that the species would preferentially occupy. For details regarding the species biology, please refer to the proposed listing FRNs (89 FR 100662-TN10959, 89 FR 63888-TN10907) and species status assessments (FWS 2024-TN11177, FWS 2023-TN11861) that can be found on the species ECOS profile maintained by the FWS (FWS 2023-TN11862, FWS 2025-TN11863).

The primary drivers affecting the health of these species are as follows: (1) habitat loss and degradation; (2) insecticide exposure; and (3) climate change effects (FWS 2024-TN11177).

Habitat Loss and Degradation

The conversion of native grassland to agricultural land use is a primary risk factor affecting the status of the western regal fritillary and the monarch butterfly. Conversion of grasslands reduces the amount, availability, connectedness, size, and quality of habitat. While the primary cause of conversion is agricultural activities, any development activity that impacts native grasslands may reduce habitat. This includes activities such as road construction, housing and commercial development, and energy projects. The proposed DNPS SLR would not involve any habitat loss, land-disturbing activities, or any activities that would degrade existing natural areas or potential habitats for butterflies.

Milkweed is known to exist on the DNPS site in natural stands and new stands have been introduced through the conservation program developed in partnership with the WHC (Section 3.8.1.2). Milkweed on site is protected from mowing and when new individuals of milkweed are identified, DNPS avoids mowing in the area around the plants (CEG 2025-TN11341). The continued preservation and enhancement the natural areas on the site, as well as the introduction and protection of milkweed on the site, would benefit monarch butterflies.

Invasive grasses and woody plant encroachment degrade native grassland quality and quantity. There are no activities proposed during the proposed SLR term that would increase the presence of invasive plants or result in woody plant encroachment within the potentially suitable habitat on site. CEG maintains an invasive species management plan and actively monitors and treats invasives on site (Section 3.6.3.5). The management of invasive species on site would benefit the butterflies, should the species be present.

Periodic disturbances, such as fire, haying, and mowing, are necessary for the long-term conservation of these grassland habitats. Without periodic disturbances, grasslands can become overgrown with woody vegetation, reducing suitable habitat. However, periodic disturbances have the potential to negatively impact the species if individuals are present during the disturbing activities. CEG does not plan to conduct any activities during the proposed SLR term that could cause disturbance within the natural grassland areas of the site. CEG does maintain areas within the developed portion of the site by mowing; however, these areas are unlikely to provide suitable habitat for the butterflies.

Insecticide Exposure

Most insecticides are nonspecific and broad-spectrum in nature. Furthermore, the larvae of many Lepidopterans are considered major pest species, and insecticides are specifically tested on this taxon to ensure that they will effectively kill individuals at the labeled application rates (FWS 2024-TN11177). Insecticide use is most often associated with agricultural production. Studies looking specifically at the dose response of monarchs to neonicotinoids, organophosphates, and pyrethroids have demonstrated monarch toxicity (e.g., Krischik et al. 2015-TN8596; James 2019-TN8595; Krishnan et al. 2020-TN8597; Bagar et al. 2020-TN8594). Moreover, the magnitude of risk posed by insecticides may be underestimated, as research usually examines the effects of the active ingredient alone, while many of the formulated products contain more than one active insecticide.

During the proposed SLR term, CEG would continue applying herbicides as needed and according to labeled uses but has no plans to apply herbicides in natural areas unless for the purpose of invasive plant management (Section 3.6.3.5). Continued herbicide application could directly affect butterflies in the action area by injuring or killing individuals exposed to these chemicals. Certain herbicides such as glyphosate (e.g., Round Up) can kill milkweed and violets, which could affect the ability of the species to lay eggs and the availability of larval food sources. While no targeted surveys have been conducted, CEG reports that they have not observed any species of violet on site (CEG 2025-TN11341). It is possible that violets may exist in undeveloped portions of the action area. Given the targeted nature of herbicide application, violet populations are not expected to be impacted. Monarchs are only likely to occur in the action area seasonally during spring and fall migration when individuals are moving between areas of more suitable habitat. Continued herbicide application could affect butterflies in the action area by indirect exposure to these chemicals. However, all herbicide application would be targeted and, therefore, unlikely to result in hazardous levels of contaminant exposure.

Climate Change Effects

Impacts associated with the contribution of the proposed SLR operations on climate change are described in the section above describing the effects on the Mead’s milkweed and rusty patched bumblebee and would be too small to be meaningfully measured, detected, or evaluated. Additionally, the western regal fritillary is sensitive to drought as it decreases the availability of flowering nectar plants necessary to the species’ survival and fitness. The activities associated with the proposed SLR would not impact the potential for droughts to occur.

Summary of Effects

The potential stressors evaluated in this section are unlikely to result in effects on monarch butterflies or western regal fritillaries that could be meaningfully measured, detected, or evaluated, and such stressors are otherwise unlikely to occur for the following reasons:

- The proposed action would not involve any habitat loss, land-disturbing activities, or any activities that would degrade existing natural areas or potential habitat. Additionally, there will be no activities that could cause woody plants or invasive species encroachment.
- Continued preservation of the existing natural areas on the site would benefit the butterflies. The DNPS CEG partnership with WHC has resulted in the additional planting of milkweed and CEG avoids mowing where milkweed occurs.
- Mowing will only occur within developed and industrial portions of the DNPS site where the butterfly species are less likely to occur.
- Herbicide use would be applied according to labeled uses and would only be applied in natural areas for the purpose of invasive plant management. The targeted nature of herbicide use within natural areas of the site makes the likelihood of herbicide exposure low.
- The contribution of DNPS operations to climate-change-related effects on butterflies would be too small to be meaningfully measured, detected, or evaluated.

Conclusion for the Western Regal Fritillary

All potential effects on the western regal fritillary resulting from the proposed action would be insignificant or discountable. Therefore, the NRC staff concludes that the proposed action *may affect but is not likely to adversely affect* the western regal fritillary. Because the western regal fritillary is proposed for Federal listing, the ESA does not require the NRC to consult with or receive concurrence from the FWS regarding this species as long as the continued existence of the species is not jeopardized.

Conclusion for the Monarch Butterfly

All potential effects on the monarch butterfly resulting from the proposed action would be insignificant or discountable. Therefore, the NRC staff concludes that the proposed action *may affect but is not likely to adversely affect* the monarch butterfly. Because the monarch butterfly is proposed for Federal listing as threatened, the ESA does not require the NRC to consult with or receive concurrence from the FWS regarding this species as long as the continued existence of the species is not jeopardized.

3.8.3 No-Action Alternative

Under the no-action alternative, the NRC would not issue renewed licenses, and DNPS would shut down on or before the expiration of the current renewed facility operating licenses. Upon shutdown, the plant would require substantially less cooling water and would produce little to no discernable thermal effluent. Thus, the potential for impacts on all aquatic species related to cooling system operation would be significantly less than under the proposed action. The ESA action area would most likely be the same or similar to the area described in Section 3.8.1.1; however, the portion of the Kankakee River that experiences effects from the discharge of Outfall 004 would not be part of the action area, as this outfall would likely not be utilized under the no-action alternative. The northern long-eared bat, tricolored bat, Indiana bat, whooping crane, eastern massasauga rattlesnake, salamander mussel, sheepnose mussel, sheepnose mussel critical habitat, scaleshell mussel, Mead's milkweed, eastern prairie fringed orchid, Hine’s emerald dragonfly, monarch butterfly, western regal fritillary, and rusty patch bumblebee may occur in the action area (Section 3.8.1). The NRC would consult with the FWS, as appropriate, to address potential effects to these species resulting from the shutdown and decommissioning of the plant. No EFH or national marine sanctuaries occur in the region

(Section 3.8). Thus, shutdown would not result in impacts on EFH or sanctuary resources. Actual impacts would depend on the specific decommissioning activities and whether any listed species or critical habitats are present when the no-action alternative is implemented.

3.8.4 Replacement Power Alternatives: Common Impacts

The ESA action area for the replacement power alternatives would depend on various factors including site selection, current land uses, planned construction activities, temporary and permanent structure locations and parameters, and the timeline of the alternative. The federally listed species, critical habitats, EFH, and national marine sanctuaries potentially affected by the replacement power alternatives would depend on the boundaries of the alternative’s effects and the species and habitats federally protected when the alternative is implemented. For instance, if DNPS continues to operate until the end of the current license term and a replacement power alternative is implemented at that time, FWS may have listed new species, delisted currently listed species whose populations have recovered, or revised EFH designations. These listing and designation activities would change the potential for the various alternatives to impact federally protected ecological resources. Additionally, the requirements for consultation under the ESA, MSA, and NMSA would depend on whether Federal permits or authorizations are required to implement each alternative.

Section 3.8.5 and Section 3.8.6 describe the types of impacts that terrestrial and aquatic resources would experience under each alternative. Impacts on special status species and habitats would likely be similar in type. However, the magnitude and significance of such impacts could be greater for special status species and habitats because such species and habitats are rare and more sensitive to environmental stressors.

3.8.5 Natural Gas Alternative

The NRC does not license natural gas facilities; therefore, the NRC would not be responsible for ESA, MSA, or NMSA consultations for this alternative. The Federal and private responsibilities for addressing impacts on federally protected ecological resources under this alternative would be similar to those described in Section 3.8.4. Ultimately, the magnitude and significance of adverse impacts on federally protected ecological resources resulting from this alternative would depend on the site location and layout, plant design, plant operations, and the protected species and habitats present in the action area when the alternative is implemented.

3.8.6 Renewable and Natural Gas Combination Alternative

The NRC does not license natural gas facilities, wind installations, or solar installations; therefore, the NRC would not be responsible for ESA, MSA, or NMSA consultations for this alternative. The Federal and private responsibilities for addressing impacts on federally protected ecological resources under this alternative would be similar to those described in Section 3.8.2. Ultimately, the magnitude and significance of adverse impacts on federally protected ecological resources resulting from this alternative would depend on the site location and layout, plant design, plant operations, and the protected species and habitats present in the action area when the alternative is implemented.

3.9 Historic and Cultural Resources

This section describes the cultural background and the historic and cultural resources found at DNPS and in the surrounding area. NEPA (TN661) 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, including such resources as sacred sites" (CEQ and ACHP 2013-TN4603). Section 106 of the NHPA (TN4839) requires Federal agencies to consider the effects of their undertakings on historic properties. While NHPA emphasizes impacts on historic properties, 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 (CEQ and ACHP 2013-TN4603). In accordance with 36 CFR 800.8(c) (TN513), the NRC complies with the obligations required under NHPA Section 106 through the NEPA process.

Historic and cultural resources are the material culture left behind from past human activity. Cultural resources include sites, objects, landscapes, structures, or other natural features of significance to groups of people who have traditional association with it. Historic properties are defined as resources eligible for listing in the NRHP. The NRHP is the Nation's official list recognizing buildings, structures, objects, sites, and districts of national, State, or local historical significance which merit preservation. The criteria for eligibility are listed in 36 CFR 60.4 (TN1682) and include (a) association with significant events in history; (b) association with the lives of persons significant in the past; (c) embodiment of distinctive characteristics of type, period, or construction; and (d) sites or places that have yielded, or are likely to yield, important information.

In the context of NEPA, the proposed undertaking is the SLR of the current renewed operating licenses, which would extend the current operating term another 20 years. The Area of Potential Effect (APE) consists of the approximately 2,459 ac (995 ha) of the DNPS site and the transmission lines up to the first substation that may be directly or indirectly affected by land-disturbing or other operational activities associated with continued plant operations and maintenance and/or refurbishment activities. The APE may extend beyond the DNPS site if CEG maintenance and operational activities affect historic properties. This determination is made irrespective of land ownership or control.

In accordance with the NHPA, the NRC is required to make a reasonable effort to identify historic properties within the APE. If the NRC finds that either there are no historic properties within the APE or the undertaking[1] (SLR) would have no effect on historic properties, the NRC provides documentation of this finding to the State Historic Preservation Officer (SHPO). In addition, the NRC notifies all consulting parties, including Federally recognized Indian Tribes, and makes this finding public through the NEPA process prior to issuing the renewed operating licenses. Similarly, if historic properties are present and could be affected by the undertaking, the NRC is required to assess and resolve any adverse effects in consultation with the SHPO and any Tribe that attaches religious and cultural significance to identified historic properties.

In Illinois, the Historic Preservation Division of the Illinois Department of Natural Resources is responsible for administering Federal and State-mandated historic preservation programs to identify, evaluate, register, and protect the State's archaeological and historic resources under the direction of the Illinois SHPO. The Historic Preservation Division maintains the Illinois Inventory of Archaeological Sites electronic database, which inventories all the registered cultural resources within the State, including those within DNPS, and the Historic and

[1] An undertaking is "a project, activity, or program funded in whole or in part under the direct or indirect jurisdiction of a Federal agency, including those carried out by or on behalf of a Federal agency; those carried out with Federal financial assistance; and those requiring a Federal permit, license or approval" (see 36 CFR 800.16(y)) (TN513).

Architectural Resources Geographic Information System, the State's public inventory of historic buildings, structures, sites, objects, and districts.

As part of its SLR application, CEG submitted an ER, which contains information and an analysis of the environmental impacts of the proposed action, including the impacts of refurbishment activities, if any, associated with SLR and the impacts of operation during the SLR term. In addition to its independent review, the NRC staff uses this information to support its NHPA Section 106 consultation obligations.

3.9.1 Cultural Background

This section documents the precontact, ethnographic, and historic chronology of the proposed action's region. Illinois has several well-known archaeological sites in the southwest portion of the State that have contributed to the understanding of human populations over the course of the past 15,000 years. The Koster site near Kampsville, Illinois contributed to important discoveries on early human occupation, including some of the oldest evidence of food preparation, cemeteries for burying deceased members, and the presence of domesticated dogs (ISM 2000-TN11018). The Modoc Rockshelter in Randolph County, Illinois is one of the earliest examples of Indigenous populations using rock shelters as long-term base camp sites during the Archaic period. The site provided one of the best-known opportunities for examining factors important to Archaic cultural evolution, human adaptations, and changing Holocene environments. The excellent preservation of artifacts, cultural features, and faunal remains helped develop better site interpretation methods and recovery techniques for small-scale plant and animal remains and radiocarbon analyses (Styles et al. 1983-TN11066; ISM 2000-TN11018). Last, the Cahokia site in southwest Illinois is the largest pre-Columbian site north of Mexico and a prime example of Mississippian era chiefdoms. Cahokia developed and influenced advanced societies by demonstrating organizational complexity, political stratification, planned community development, mound building, farming and subsistence practices, and complex mortuary practices (Emerson 2000-TN11081).

Approximately 15,000 years ago, the APE was covered by an ice sheet during the Wisconsinian glacial period. Archaeological evidence demonstrates that human occupation in the area began around 13,000 years ago. The chronology of the region is divided into the following periods: Paleoindian (13,000–10,000 before present [BP]), Archaic (10,000–3,000 BP), Woodland (3,000 BP to Anno Domini [AD] 1000), Mississippian (AD 1000–1300), the Late Prehistoric and Contact periods (1300–1800), and the Historic Period (1800 to present). The context described below helps archaeologists understand what previous research has been conducted in the area to inform cultural resource professionals what potential natural and cultural resources may be encountered in the APE. General patterns summarizing each time period are briefly described below.

3.9.1.1 Paleoindian Period (13,000–10,000 BP)

The Paleoindian period is considered to represent the earliest documented human occupation in the region, extending more than 12,000 years ago to the terminal Pleistocene period. This period is typically characterized by small groups of highly mobile nomadic hunters who followed large game such as mammoths, mastodons, and bison and inhabited small semi-permanent camps. There has been ongoing dialogue in the archaeological community on what is considered the earliest documented human occupation in North America. Scholars typically associate the Clovis culture with the Paleoindian Period, although there are a number of well-known archaeological sites across North America that pre-date Clovis period sites. These include the Meadowcroft Rockshelter in Pennsylvania (Adovasio et al. 1990-TN10487), Paisley Caves in Oregon (Gilbert et al. 2008-TN10488), and White Sands in New Mexico (Pigati et al. 2023-TN10489).

Stone tool technologies of this era are mostly associated with the Clovis and Folsom cultures. Both are known for their fluted points and large spear points made from high quality chert, characterized by a groove notched out in the middle to bottom half of the point, allowing it to be attached to handles. Aside from fluted points, the Paleoindian toolkit also includes unfluted lanceolate projectile points, side scrapers, end scrapers, hammerstones, pitted stones, bifacial knives, drills, and other flake tools (Koldehoff 2013-TN11917).

In Illinois, Clovis and Dalton sites are contemporary with the Paleoindian period. Clovis sites typically consist of small scatters of stone tools and chipped lithics but in some cases, may be larger camp sites such as the Mueller site in St. Clair County, Illinois (Koldehoff and Walthall 2000-TN11067). Dalton sites are smaller in comparison to Clovis sites. Archaeological evidence suggests that Dalton populations were the first groups to settle into the landscape, utilizing caves and rock shelters as habitation sites and local chert to manufacture their tools (Koldehoff and Walthall 2000-TN11067). Dalton groups not only used the landscape more intensively, but also in larger populations. Near St. Louis, Missouri, the Kimmswick site recovered Clovis points and other stone tools in the same layers as mastodon bones (Koldehoff and Walthall 2000-TN11067). Over 200 Clovis tools were retrieved during excavations at the aforementioned Mueller site in St. Clair County, Illinois. Dalton component sites have been identified in St. Louis County, Missouri and at the Olive Branch site in Alexander County, Illinois.

3.9.1.2 Archaic Period (10,000–3,000 BP)

The Archaic period is documented as starting around 10,000 years ago and marks the transition from nomadic to more sedentary settlement patterns and increased subsistence on multiple resources including smaller game and plants. The Archaic period was considered to be a period of transition; a slow, progressive trend toward exploitation of forest niches, better technologies and networks of interaction and cultural diffusion that helped spread pottery, food production and customs of politics and religion (Anderson and Sassaman 2012-TN10494). Archaic sites in Illinois include small, temporary campsites as well as larger village sites that were the locales of long-term or repeated occupation (Wiant and Berkson 2000-TN11068).

The introduction of the atlatl (a small wooden or bone stick with a hook at one end to propel darts or spears), the invention of pottery, plant cultivation, mound building, and trade began to first appear during the Archaic period in Illinois (ISM 2000-TN11019; Bense 1994-TN10495). The Archaic toolkit included polished and ground stone woodworking tools including axes, adzes and wedges, stone grinding implements, plant processing tools such as manos and metates, and fire cracked rock used in hearths and stone boiling. Specialized artifacts such as drills, awls, needles, gouges, smaller projectile points, knives, drills, and scrapers are also common in the Archaic archaeological record (USACE 2007-TN11021).

In the Illinois River Valley, the Archaic Period is divided into three subperiods: Early (10,000–8000 BP), Middle (8,000–5,000 BP), and Late Archaic (5,000–3,000 BP). During the Early Archaic, semi-nomadic hunting and gathering lifestyles continued and followed settlement patterns similar to those in the Paleoindian period. Small bands of people lived at sites for short periods of time before moving to other locations. Instead of consuming large game, which had become extinct by the Early Archaic, modern game species such as white-tailed deer, elk, bear, rabbit, and turkey were consumed. The Koster site in Green County, Illinois dates to the Early

Archaic and has cultural deposits ranging from 9,000 years ago through the Historic period (TDAR 2018-TN11075). The site has been able to provide significant data on Archaic floral and faunal subsistence, settlement, stone and bone tool technologies, burial practices, and lifestyles, including the presence of domesticated dogs (ISM 2000-TN11018). Cultural material recovered from Early Archaic-dated deposits included Graham Cave Side-Notched, Kirk Notched, Rice Stemmed, and LeCroy-type projectile points, hammerstones/manos, cylindrical pestles, adzes, axes, choppers, grinding slabs, and tools made from bone and antler (USACE 2007-TN11021; Brown and Vierra 1983-TN11077).

In the Middle Archaic, populations settled along river valleys, which offered abundant resources for subsistence without having to move settlement locations. Resources such as waterfowl, fish, freshwater mussels, turtle, marsh roots, tubers and seeds from wild plants were near floodplains while upland forests provided fauna such as white-tailed deer and nuts for harvesting. Stone tool technologies changed to stemmed bifacial and large side-notched projectile points and increased the use of ground stones and bones for tools (Wiant and Berkson 2000-TN11068).

Major technological, subsistence, and settlement changes occurred during the Late Archaic. In the Midwest, settlements were semi-permanent and populations consistently returned to specific resource locations seasonally. Settlement along river valleys increased, as seen in areas such as the Illinois Waterway. Trade networks began to emerge, which afforded the opportunity to trade resources such as copper from the Great Lakes, marine shells from the Atlantic and Gulf coasts, hematite and magnetite from the Ozarks, galena from the Upper Mississippi Valley, and high quality lithics from areas outside of Illinois. Stone tool assemblages from the Late Archaic included the use of large spear points and knives. Smaller dart points begin to appear as well (USACE 2007-TN11021; Wiant and Berkson 2000-TN11068).

The Red Ochre phase dates to the Late Archaic period. The Red Ochre culture (3200–2800 BP) was first identified by Cole and Deuel in 1937 (1937-TN11166) based on archaeological sites in the central Illinois River Valley. The culture is defined by flexed burials in pits on ridges of sand, gravel, or loess, the sprinkling of powdered hematite in burial contexts, “turkey tail” type projectile points crafted from bluish gray chert sourced from southern Illinois and Indiana, large lanceolate ceremonial knives of whitish flint/chert, and caches of ovate-triangular points (Ritzenthaler and Quimby 1962-TN11085; Wiant and Berkson 2000-TN11068). Red Ochre sites close to the project area include the Beake, Kankakee River, Oak Grove, and Dyer sites in Lake County, Illinois (Ritzenthaler and Quimby 1962-TN11085).

3.9.1.3 Woodland Period (3000–1000 BP)

The Woodland period is represented by settled village life, more intensive plant cultivation, more consistent use of pottery, and the emergence of earthworks and associated burial complexes. Cultigens such as squash, sunflower, marshelder (*Iva annua*) and charred goosefoot (*Chenopodium*) began to be domesticated in the Late Archaic but their cultivation intensified during the Woodland Period (Anderson and Sassaman 2012-TN10494). These cultigens, along with maize, were consumed during the Woodland and became more important during the subsequent Mississippian period. Regional pottery emerged at the beginning of this period and towards the end of the Woodland, the bow and arrow were introduced.

The Woodland period is commonly associated with the Hopewell culture and its vast trade network of raw materials and finished goods known as the Hopewell Interaction Sphere. The Hopewell culture originates from Ohio, consisting of smaller populations which expanded across eastern North America, exchanging resources via the Hopewell Interaction Sphere. In addition to exchanging resources with populations in the now-Midwest, the Ohio Hopewell also procured obsidian from as far as Yellowstone, mica from the Blue Ridge Mountains in the Carolinas, and shells from the Gulf of Mexico (NPS 2021-TN9875; National Geographic 2023-TN9878). Note that the Gulf of Mexico was renamed as the Gulf of America in February 2025 (DOI 2025-TN11826). The Ohio Hopewell were also mound builders, noted for their construction of earthen walls often built in geometric patterns and mounds of various shapes. Mounds served as burial places, but it was also believed that the earthworks represented places of ceremonial gathering (NPS 2021-TN9875).

Similar to the Archaic, the Woodland period is divided into three subperiods: the Early Woodland (3,000–2,200 BP), Middle Woodland (2,200–1,800 BP) and the Late Woodland (1,800–1,250 BP). Early Woodland populations remained largely hunting and gathering societies, consuming aquatic and terrestrial species, upland and bottomland plant species, as well as domesticated squash, barley, and goosefoot (USACE 2007-TN11021). Early Woodland populations also began using pottery, which had developed in the southeast United States during the Late Archaic period. Early pottery types of this phase are associated with the Marion culture. Marion pottery is thick, coarse, and flat on the bottom with markings impressed on the interior and exterior of the vessel from coarsely woven fabrics. Marion pottery has been found throughout the State, especially in sites along major rivers and streams (ISM 2018-TN11087).

One of the most defining features of the Middle Woodland period is the emergence of burial mounds, which are monumental earth or stone works that served as ceremonial centers (Bense 1994-TN10495). The complexes are mainly found in high locations, such as hilltops, but can also be found in floodplains. Burial mounds were associated with elaborate mortuary practices. Grave goods observed in excavations included carved stone pipes, copper axe blades, necklaces made of river pearls, pottery vessels, spear points, and copper ear ornaments. Archaeological sites dating to the Middle Woodland are associated with the Havana-Hopewell phase, named after a major village and mound group site in the present-day town of Havana, Illinois. Havana site types consist of permanently occupied base camps, mortuary or ritual camps related to bluff-top mound groups, and ritual transaction centers marked by floodplain mound groups and habitation sites. Havana village sites in the State include Havana, Pool, and Dickson sites but have also been identified in the Upper Great Lakes region, Kankakee, and Wabash River valleys (Yerkes 1988-TN11088).

Towards the end of the Middle Woodland period, interregional trade, complex ceremonial and mortuary practices, and elaborate pottery decoration began to decline. The Late Woodland marked changes in sociocultural development, ideology, subsistence, and technology. Smaller political units began to appear and habitation sites shifted toward smaller, more numerous dispersed locales. Increased use of ceramic vessels led to the manufacturing of a variety of functional forms, such as larger storage vessels, jars, bowls, and plates but were not elaborately decorated as pottery types from previous periods. Maize agriculture intensified, becoming more important by the end of the period. The invention of the bow and arrow about 1,500 years ago is perhaps one of the more significant developments of the Late Woodland Period. This change in technology allowed for greater hunting success over the dart and atlatl, since bow-launched points had greater impact, which further maximized wild game harvesting. It also may be responsible for the dramatic increase in warfare seen in some areas (Bense 1994-TN10495; Peskin 2011-TN9872; Walthall 1980-TN10498). Groups contemporary to the Late Woodland period include the White Hall, Weaver, Steuben, and Rosewood cultures. They are distinguished primarily for their ceramic styles (Farnsworth 2000-TN11083).

3.9.1.4 Mississippian (AD 1000–1300 BP)

The Mississippian period began around AD 1000 and ended around the period of European contact in the 16th century. This period marked the development of chiefdoms, monumentally scaled architecture, social and political transformations, increased reliance on maize and starchy seed agriculture, hierarchical organization and political and religious symbology. Chiefdoms were large, sociopolitical entities with fortified villages established along major rivers. Villages had central plazas surrounded by temple and/or mortuary mounds. Flat-topped temple mounds were constructed at these and other sites for religious practices. Surrounding settlements and farmsteads provided labor and services to the elite. Maize, along with beans and squash, were major components of the Mississippian diet at this time (Anderson 1994-TN10499; Anderson and Sassaman 2012-TN10494).

One of the earliest, largest, and most influential Mississippian sites in North America is Cahokia. Located in southwest Illinois east of St. Louis, Cahokia was the political and religious epicenter of Mississippian culture. Cahokia and its surrounding sites was the most impressive and politically centralized prehistoric society to ever emerge in terms of size, population, and organizational complexity (Anderson and Sassaman 2012-TN10494). Cahokia was continuously occupied for nearly 400 years. At its peak around AD 1100, the site spanned over 4,000 ac (1,618 ha), had almost 120 earthen mounds, and populations up to 20,000 (Cahokia Mounds 2025-TN11089). Sites such as Cahokia demonstrated and reinforced social order and stratification of peoples by status, kin, group, and gender. Today, Cahokia is a state park that protects the site’s 50 monumental earthworks, including Monks Mound, the largest earthen mound in the United States.

Cahokia’s warfare, political, social, and economic interactions most likely influenced subsequent developments, but may have had limited reach beyond the American Bottom region. Cultural similarities to Cahokia are evident in the Illinois, Apple, Kaskaskia and Vermilion Rivers. The Spoon River and central Illinois River valleys had a least seven major fortified temple towns during the Mississippian. Contemporary villages in west-central Illinois include Dickson Mounds and the Larson and Orendorf village sites in northwest Illinois (Emerson 2000-TN11081).

3.9.1.5 Late Prehistoric and Contact Periods (1300–1800)

The Late Prehistoric period marks the decline of Mississippian culture and the beginning of European contact. Characteristics of the Mississippian period, such as land tied to specific territories, religious plazas centered around crop production, specialization of labor, and markets for the exchange of goods, continued through Late Prehistoric (Griffin 1967-TN9876).

Mississippian culture continued then shifted to the southern part of the State after the 1400s. The Oneota culture became prominent in the northern and western portions of the State, while the Langford culture remained in northern and eastern Illinois. Langford groups resided in small villages with mounds but appeared to have a less complex social structure. Langford groups were known to farm intensively but also supplemented their diet with deer and riverine resources such as waterfowl and shellfish (Emerson and Brown 1992-TN11719). Fisher and Huber cultures eventually derived from the Oneota culture. The Fisher Oneota first emerged during the 12th century in northern Illinois and in the lower Lake Michigan area at a time when the Langford culture was occupying the upper Illinois River valley. Eventually, they occupied the same regions and shared similar cultural traditions as the Lanford phase. Archaeologists believe that the Huber Oneota developed from the Fisher phase around the 15th century, moving to the Chicago/Kankakee area (Esarey 2000-TN11082; Emerson and Brown 1992-TN11719).

The Hoxie Farm site near Thornton Village in Cook County, Illinois has both Fisher and Huber components. Excavations demonstrated a large densely populated village side surrounded by fortifications (Jackson and Emerson 2014-TN11725). The site's main occupation area contained the site's densest concentration of features and material. Excavations uncovered artifact-rich midden deposits and over 1,500 precontact features. The site produced the largest collection of copper-based metal artifacts recorded from a precontact site in the Chicago area (Jackson 2017-TN11726).

The arrival of European explorers/settlers in the 1600s marked the beginning of the Contact period. The first Europeans to explore Illinois were a small party of French explorers who arrived in the summer of 1673 and included missionary Jacques Marquette and fur trader Louis Jolliet (Warren 2000-TN11084). The two dominant Indigenous groups during Contact were the Illinois (or Illiniwek) Indians and the Miami (ISM 2002-TN11090). The Illinois were a confederation of 12 Tribes that occupied and controlled most of central, western, and southern Illinois (later referred to as Illinois Country). The Illinois are thought to have included the Cahokia, Chepoussa, Chinko, Coiracoetanon, Espeminkia, Kaskaskia, Michibousa, Michigamea, Moingwena, Peoria, Tamaroa, and Tapouro. The Miami occupied several villages south and west of Lake Michigan in Northern Illinois (ISM 2002-TN11090; Warren 2000-TN11084). In the 1700s, Illinois territory shrank and the Miami moved to present-day Indiana. Other Tribes began migrating into Illinois Country. By 1770, Tribes including the Mesquakie (Fox), Iowa, Kickapoo, Mascouten, Piankashaw, Potawatomi, and Sauk migrated into the area. The Winnebago (Ho-Chunk) came into the Rock River Valley in the 1800s. Over time, many of the Tribes disappeared or merged with others. Five Tribes survived into the 1700s: the Cahokia, Kaskaskia, Michigamea, Peoria, and the Tamaroa.

Two historic sites today are former locations of occupied villages. The Zimmerman site in La Salle County, Illinois was occupied intermittently by the Kaskaskia and Peoria Tribes from 1673 to 1720. Excavations from the 1940s recovered shell-tempered Danner-type pottery and French traded items (ISM 2000-TN11091). In Randolph County, Illinois, the Waterman site is the location of the former Michigamea village, which was strategically located for protection from raiding war parties near the French Fort de Chartres, at the time approximately 1 mi (1.6 km) from the village. The Michigamea remained at the Waterman village until 1765, when they moved west of the Mississippi River to avoid British rule (Warren 2000-TN11084; ISM 2000-TN11092).

3.9.1.6 Historic Period (1800 to present)

The Historic period began with settlers who entered the area as part of the general westward expansion. The end of the Revolutionary War in 1783 resulted in immigrants flooding into Illinois. The earliest settlers were primarily farmers from the Carolinas, Kentucky, and Tennessee. The Kaskaskia and the Peoria became the dominant Indigenous groups through the 1800s (ISM 2002-TN11090; Warren 2000-TN11084). Treaties and land cessions with the United States government and the Black Hawk War of 1832 led Tribes to forcibly abandon the area by the early 1830s (Warren 2000-TN11084). The APE is within the ceded lands of the Miami Tribe of Oklahoma and the Peoria Tribe of Indians of Oklahoma (MIAC 2025-TN11094).

The DNPS site is located within Will and Grundy Counties. Will County was established in 1826 from portions of Cook and Iroquois Counties and Grundy County was created from LaSalle County in 1841 (Grundy County 2024-TN11737). The first settlers were farmers, many from New England and New York. Early development of the area was associated with transportation and mining projects. The first transportation project to come to the region was the Illinois and

Michigan (I&M) Canal. Construction for the 96 mi (156 km) canal was authorized by Congress in 1822 after acquiring lands along the Des Plaines and the Illinois Rivers ceded via the 1816 treaty signed with the Potawatomi, the Ottawa, and the Chippewa (NRC 2004-TN7247). Construction began in 1836 and ended in 1848. The combination of the canal and Chicago, Illinois' position as the primary railroad hub in the Midwest helped transform the northern region of the State from a sparsely settled frontier district to a commercial, agricultural, and industrial region. Many towns, such as Morris and Joliet, Illinois originated during the canal’s construction and became stopping points for commerce along the way (Mansberger and Stratton 2000-TN11738; Grundy County 2024-TN11737). Commercial traffic on the I&M Canal declined in the 1900s due to the construction of the Chicago Sanitary and Ship Canal in 1900 and the 1906 construction of the Calumet-Sag Canal. The final blow to the I&M Canal was the federal construction of the Illinois Waterway system in 1933. The new waterway system boasted a 9 ft (2.7 m) wide channel for navigation, including the capacity for larger tow boats to pass. The I&M Canal could not compete, permanently ceasing operations (Mansberger and Stratton 2000-TN11738). Subsequent industries in the region transitioned to coal mining, limestone quarrying, oil refineries, and, during World War II, ammunition production (Electronic Encyclopedia of Chicago 2005-TN11741).

3.9.2 Historic and Cultural Resources at DNPS

To identify historic and cultural resources within the APE, a literature review was conducted through the Illinois Inventory of Archaeological Sites and the Historic and Architectural Resources Geographic Information System, the State’s public inventory of historic buildings, structures, sites, objects, and districts within the State, to gain a better understanding of the historic and cultural resources within the region. A 1 mi (1.6 km) radius was used to identify all historic properties that could be potentially affected by the proposed action/undertaking (SLR). No traditional cultural properties (TCPs) are known to be within the project area. A total of 50 archaeological sites have been previously recorded within 1 mi (1.6 km) of the APE. The majority of the sites are precontact period sites (34 total). Thirteen are historic and the remaining three are multicomponent, containing both historic and precontact cultural material.

Of the 50 archeological sites, 12 are within the project APE. Five sites (11GR2, GR391, GR457, GR476, and GR490) are recorded as precontact sites and consist of lithic scatters, projectile points, and pottery sherds. The remaining 7 sites are historic era sites. These sites (GR461, GR462, GR463, GR464, GR475, GR488, and GR489) consist of historic debris, concrete foundations, and farm equipment (IIAS 2025-TN11777). Of the 12 sites, GR475 and GR746 are potentially eligible for the NRHP. Site GR475 was registered as a historic debris site with a remnant platform, stone feature, and concentration of cinder blocks and field stones (Eichmann 2021-TN11778). Site GR476 was recorded as a moderately dense subsurface lithic scatter consisting of flake shatter, proximal flakes, and one retouched tool (Eichmann 2021-TN11779). None of the flakes had diagnostic features to be able to assign it to a temporal period (Archaic, Woodland, etc.). The remaining 10 sites within the project APE are considered not eligible for the NRHP with the exception of GR2, which is unevaluated for the NRHP (IIAS 2025-TN11777).

Archaeological Surveys

No archaeological survey was completed as part of the SLR application. A total of 46 previous surveys have been documented within 1 mi (1.6 km) of the project APE. Ten surveys were conducted within the project APE. The earliest documented survey was performed by SCI Engineering, Inc. in 2004 for the development of a small residential area. No cultural resources were identified in the 13 ac (5 ha) survey (Warner 2004-TN11742). In 2012, Upper Midwest

Archaeology conducted a Phase I survey for the proposed Russ Campground and Marina. Two precontact lithic scatter sites were recorded (GR391 and GR392). Both sites were recommended not eligible for the NRHP (Finney 2012-TN11743). In 2016, Environmental Resources Management conducted a Phase I investigation for the proposed development of the Three Rivers Energy Center. A total of 80 ac (32 ha) was surveyed and one new site, a Middle Archaic lithic scatter, was recorded. The site was recommended not eligible for the NRHP (Doperalski 2016-TN11744). In 2019, In Situ Archaeological Consulting conducted a Phase I survey for the proposed installation of a natural gas pipeline for the Alliance Pipeline Three Rivers Lateral Project near the western boundary of the APE. Approximately 286 ac (115 ha) were surveyed, in which 3 previously recorded sites (GR148, GR222, and 6600033) were revisited and 8 new archaeological sites were recorded (GR457 through GR464). Site GR463 was listed as unevaluated for the NRHP and the remaining seven sites were recommended not eligible for the NRHP (Picka et al. 2019-TN11745).

Limited details are available on the five remaining surveys performed within the APE. The Illinois Inventory of Archaeological Sites website demonstrates that three surveys were performed by Environmental Resources Management in 2021 and 2023 (241160, 24242, and 90488) but the archaeological reports documenting the details of those surveys are not available for review. Similarly, the last two surveys do not have any information on the purpose of the surveys, when the surveys were conducted, or the agency(ies) associated with the surveys.

Architectural Resources

No historic architectural resources are documented within the APE or within the 1 mi (1.6 km) of the DNPS site. Because DNPS completed construction of its three units between 1959 and 1970, respectively (CEG 2025-TN11341), DNPS meets the 50-year age requirement for evaluation for potential listing on the NRHP. As part of its confirmatory review, the NRC staff requested that CEG conduct an architectural survey, meeting the standards set forth in 36 CFR 800.4(b) (TN513), of all facilities 45 years or older on the DNPS site and to apply the National Register criteria as required in 36 CFR 800.4(c). CEG is in the process of completing the request and expects the survey and draft results to be finalized prior to the issuance of the final EIS, currently scheduled for October 2025 (CEG 2025-TN11341).

Historic Districts

Two historic districts are within 1 mi (1.6 km) of the project APE. The I&M Canal was briefly discussed in Section 3.9.1.6. The canal opened for navigation in 1848 and was the first complete water route from the east coast, connecting the southern tip of Lake Michigan with the Illinois River south to the Mississippi River and Gulf of America. Gulf of America refers to the former Gulf of Mexico, which was renamed in February 2025 (DOI 2025-TN11826). The Canal was originally 60 ft (18 m) wide, 6 ft (1.8 m) deep, and had 15 locks to accommodate differences in elevation (IDNR 2025-TN11807). The completion of the Chicago Sanitary and Ship Canal along with the Illinois Waterway caused the I&M Canal to close for navigation in 1933. Today, the canal is listed on the NRHP and is designated as a National Historic Landmark. In 1984, the National Park Service established the canal as a National Heritage Corridor, the first in the nation, to protect the cultural, historical, natural, recreational and economic resources within the region (Mansberger and Stratton 2000-TN11738). The heritage area is comprised of 60 cities and towns, from Chicago, Illinois to LaSalle-Peru, Illinois.

The Dresden Island Lock and Dam is directly north of the project APE. The dam was constructed between 1929 and 1933 and became a crucial component of an integral slack water system built to permit commercial barges and towboat access to the Illinois Waterway. The District includes four contributing resources: the lock, auxiliary lock, the 1500 ft (457 m) concrete pier dam, and the 1930s-built control station building. The District was accepted in the NRHP in 2004 under Criterion A for its contribution to the long-term maritime, transportation, and industrial history of the Illinois Waterway. It was also considered significant under Criterion C as a representative example of a USACE-approved lock and dam construction of the early 1900s (DOI 2004-TN11746).

3.9.3 Procedures and Integrated Cultural Resources Management Plan

CEG has several administrative controls and environmental procedures that aim to identify, protect, and minimize potential impacts to historic properties within the DNPS site. Procedure SA-AA-117, *Excavation, Trenching, and Shoring*, outlines work practices for excavation, trenching, and shoring. The procedure defines Cultural, Historical, and Paleontological resources and aims to protect against impacts to sites and unanticipated discoveries of historic and cultural resources. Prior to starting a project that requires land disturbance in a previously undisturbed area, CEG staff would contact the Illinois State Historic Preservation Office to perform a review, regardless of whether or not a previous cultural resources survey has been performed in the area (CEG 2025-TN11341). The procedure is used in conjunction with CEG’s Excavation Permit. Procedure EN-AA-103-F-02, *Environmental Screening Checklist*, oversees the environmental checklist process. The “Land” section of the procedure addresses potential impacts as a result of ground-disturbing activities. Procedure EN-AA-103, *Environmental Review*, oversees the aforementioned environmental checklist process. The document provides a process for screening proposed activities to determine if an activity requires further evaluation for environmental impacts and risk. Last, EN-AA-103-0001, *Environmental Evaluations*, provides environmental personnel with direction on performing environmental evaluations to identify the environmental and regulatory impacts, if any, of proposed activities.

CEG does not have a separate Inadvertent Discovery Plan, but upon discovery of human remains, CEG would engage their site security team, who would then engage the local law enforcement. If remains are over 100 years old, the Illinois SHPO would take over jurisdiction. If the remains are considered less than 100 years old, the coroner would maintain jurisdiction. In Illinois, human remains and associated burial artifacts are protected by the State’s Human Skeletal Remains Protection Act (CEG 2024-TN10914).

3.9.4 Proposed Action

Table 3-2 identifies one plant-specific (Category 2) issue related to historic and cultural resources applicable to DNPS during the SLR term. This issue is analyzed below.

3.9.4.1 Environmental Site Audit Visit

As part of the proposed action, NRC staff visited DNPS on December 12, 2024 to tour its facilities. Stops included the recent tree plantings near the hot canals, location for replacement power alternatives, and the east and west ISFSI pads. NRC staff also briefly visited the NRHP-listed Dresden Island Lock and Dam. The lockmaster on duty shared brief information on the history of the dam, including the 2022 upgrades on the lower and upper gates. Staff noted the obstructed view of the DNPS facilities from the dam due to the remoteness of the Dam’s facilities, tall vegetation, and topography.

3.9.4.2 Consultation

In accordance with 36 CFR 800.8 (TN513), "Coordination with the National Environmental Policy Act," the NRC initiated written Section 106 consultations with the Advisory Council on Historic Preservation (ACHP) (NRC 2024-TN11775), the Illinois SHPO (NRC 2024-TN11776), and 27 Federally recognized Tribes who might attach religious and cultural significance to historic properties in the APE. Consulting Tribes include the Bad River Band of the Lake Superior Tribe of Chippewa Indians, Bay Mills Indian Community, Bois Forte Band of Chippewa Indians, Citizen Potawatomi Nation, Forest County Potawatomi Community, Grand River Band of Ottawa Indians, Hannahville Indian Community, Ho-Chunk Nation of Wisconsin, Iowa Tribe of Kansas and Nebraska, Iowa Tribe of Oklahoma, Kickapoo Tribe of Oklahoma, Kickapoo Traditional Tribe of Texas, Kickapoo Tribe of Indians of the Kickapoo Reservation in Kansas, Little Traverse Bay Bands of Odawa Indians, Match-E-Be-Nash-She-Wish Band of Pottawatomi Gun Lake Tribe, Miami Tribe of Oklahoma, Menominee Indian Tribe of Wisconsin, Nottawaseppi Huron Band of the Potawatomi, Otoe-Missouria Tribe of Indians Oklahoma, Prairie Band Potawatomi Nation, Peoria Tribe of Indians of Oklahoma, Pokagon Band of Potawatomi Indians Michigan and Indiana, Sac and Fox Nation of Oklahoma, Sac and Fox Nation of Missouri in Kansas and Nebraska, Sac and Fox Tribe of the Mississippi in Iowa, Shawnee Tribe, and the Winnebago Tribe of Nebraska (NRC 2024-TN11780). The Section 106 consultation letters contained information about the proposed action, defined the APE, and notified consulting parties that the NRC staff would conduct its NHPA Section 106 consultation through the NEPA process in accordance with 36 CFR 800.8(c). The NRC also invited Tribes to identify their concerns, provide advice on the identification and evaluation of historic properties, including those of traditional, religious, and cultural importance, and, if necessary, participate in the resolution of any adverse effects to such properties.

A response was received from the Kickapoo Traditional Tribe of Texas on November 14, 2024, indicating that the Tribe does not own any land near the proposed project area and that the SLR would not affect any of the Tribe's known cultural, historical, or sacred sites (Kickapoo Traditional Tribe of Texas 2024-TN11784). The ACHP replied to the NRC on November 19, 2024 (ACHP 2024-TN11785).

3.9.4.3 Findings

The proposed action has the potential to impact potentially eligible archaeological sites GR475 and GR476 and may inadvertently affect the two National-Register listed properties adjacent to the project APE, the Dresden Island Lock and Dam and the I&M Canal.

No new construction or modifications are anticipated during the SLR period. Any facility operations and maintenance activities necessary to support the continued operation would be limited to previously disturbed areas and would be expected to be similar to current operations. Sites GR475 and GR476 are in existing transmission lines that are owned, operated, and maintained by Commonwealth Edison. If any ground disturbing work were to occur near or within the transmission line corridor, Commonwealth Edison would notify CEG to verify any responsibilities they would need to adhere to before proceeding. Additionally, CEG's environmental protocols and procedures would be followed to identify and protect historic and cultural resources (CEG 2025-TN11341). The Dresden Island Lock and Dam and the I&M Canal are close but outside the APE. During the environmental site audit in December 2024, neither resource appeared to be visible from the DNPS site. Additionally, it does not appear that actions associated with operations and maintenance would directly or indirectly affect the resources or its eligible contributing properties during the SLR period.

For the purposes of NHPA, the proposed action will result in No Adverse Effect to the two archaeological sites, as defined in 36 CFR 800.5(b) (TN513). There would be no impact to historic and cultural resources. NRC staff will make a finding of effect for the facilities once the pending architectural survey is complete and consultation with the Illinois SHPO has occurred.

3.9.5 No-Action Alternative

Under the no-action alternative, land-disturbance activities or dismantlement are not immediately anticipated, as these would be conducted during decommissioning. Therefore, facility shutdown and adoption of the no-action alternative would have no immediate effect on historic properties or historic and cultural resources. As stated in the decommissioning GEIS (NRC 2002-TN7254), the NRC concluded that impacts on cultural resources would be SMALL at nuclear plants where decommissioning activities would only occur within existing industrial site boundaries. Impacts cannot be predicted generically if decommissioning activities would occur outside of the previously disturbed industrial site boundaries, because impacts depend on plant-specific conditions. In these instances, impacts could only be determined through plant-specific analysis (NRC 2002-TN7254). In addition, 10 CFR 50.82 (TN249), “Termination of License,” requires power reactor licensees to submit a post-shutdown decommissioning activities report to the NRC. The post-shutdown decommissioning activities report describes planned decommissioning activities at the nuclear plant. Until the post-shutdown decommissioning activities report is submitted, the NRC staff cannot determine whether historic properties would be affected outside the existing industrial site boundary after the nuclear plant ceases operations.

3.9.6 Replacement Power Alternatives: Common Impacts

Impacts to historic and cultural resources from construction and operation of a replacement power alternative would be dependent on the site-specific conditions. Impacts would vary depending on the site location and layout, plant design, resources present, the degree of ground disturbance (i.e., land clearing, excavations), visual intrusions on the landscape, and/or noise from the construction and operation of the alternative. The appearance of the facility and associated transmission lines could also result in alterations to the visual setting which, whether temporary or permanent, could affect other types of historic and cultural resources such as cultural landscapes, architectural resources, or TCPs. Visual impacts would vary depending on structure heights, associated exhaust stacks, or cooling towers. Potential operational impacts could occur from activities associated with plant operations, ongoing maintenance, and modifications to the facility or transmission lines. Per CEG’s IEPA stormwater permit, any construction over 1 ac (0.4 ha) would require a SHPO letter of approval prior to proceeding with the action (CEG 2024-TN11347).

If the project has a Federal nexus (i.e., license, permit), the Federal agency would need to make a reasonable effort to identify historic properties within the APE and consider the effects of their undertaking on historic properties, in accordance with Section 106 of the NHPA. If historic properties are present and are affected by the undertaking, adverse effects would be assessed, determined, and mitigated with the SHPO and any Tribe(s) that attach religious and cultural significance to identified historic properties through the Section 106 consultation process. Similarly, impacts to historic and cultural resources considered under NEPA would need to be assessed.

3.9.7 Natural Gas Alternative

The natural gas alternative assumes that an NGCC plant with a design capacity of 2,120 MWe would be constructed on approximately 74 ac (30 ha) at the DNPS site with associated MDCTs. The NRC does not license natural gas facilities; therefore, the NRC would not be responsible for NHPA Section 106 consultation for this alternative. Potential impacts from this alternative are similar to those described in Section 3.9.6. There are known cultural resources in areas west of the cooling towers, indicating the possibility that unknown cultural resources may exist within the proposed alternative area footprint. Prior to any ground disturbance activity commencing, natural and cultural resources surveys should occur to confirm the presence or absence of cultural material and to avoid impacts to both, as much as reasonably possible. If cultural resources are not identified during the surveys, archaeological monitoring should occur during the implementation of construction in case cultural material is inadvertently encountered.

3.9.8 Renewable and Natural Gas Combination Alternative

The renewable and natural gas combination alternative would consist of an NGCC plant constructed at the DNPS site with a design capacity of 1,484 MWe, 41 MW onsite and thirty-six 125 MW offsite solar installations with battery storage, and six 300 MW offsite wind installations with battery storage. The NRC does not license natural gas facilities, wind installations, or solar installations; therefore, the NRC would not be responsible for NHPA Section 106 consultation for this alternative. Potential impacts from this alternative are similar to those described in Section 3.9.6. Construction of the NGCC plant on existing DNPS land could reduce potential impacts to natural and historic and cultural resources if construction is completed on previously disturbed lands. However, construction should consider the proximity of known cultural resources in the vicinity, in case cultural material is inadvertently encountered during ground disturbing activities.

For the wind and solar aspects, impacts could be greater due to the significant acreage needed. Depending on the location, increased impacts may occur to natural and cultural resources with clearing land, vegetation, leveling, and other mechanical means if the selected location has not been previously disturbed. Additionally, siting in remote/rural areas may also increase the chance of visual impacts. Wind turbines are large and are easily seen from miles away. The installation of any turbine would be an obstruction to the landscape, therefore, visual impacts may be greater, if not adverse, to any TCPs and/or historic properties, if present. While solar would require a smaller amount of acreage, there is more flexibility in siting compared to wind.

3.10 <u>Socioeconomics</u>

Socioeconomic factors that may be affected by nuclear power plant operations during the SLR term are described in this section. Nuclear power plants and the communities that support it can be described as a dynamic socioeconomic system. Communities provide people, goods, and services needed to operate the nuclear power plant. Nuclear power plants, in turn, pay for goods and services, wages, and benefits. The measure of a community’s ability to support a nuclear power plant depends on its ability to respond to changing socioeconomic conditions.

3.10.1 Nuclear Power Plant Employment

The socioeconomic region of influence (ROI) is defined by the areas where DNPS workers and their families reside, spend their income, and use their benefits, thus affecting socioeconomic conditions in the region. CEG employs 717 workers at DNPS. As indicated in Table 3-19, approximately 64 percent of these workers (460 individuals) reside in Will and Grundy Counties in the State of Illinois (CEG 2024-TN11347).

Most of the remaining CEG workers live in Illinois, Arizona, Georgia, Iowa, Indiana, and Michigan. Because most DNPS workers live in Will and Grundy Counties, the greatest socioeconomic effects are likely to be experienced in these two counties. Consequently, the analysis addresses the socioeconomic effects of SLR on these two counties, which are defined as the socioeconomic ROI.

Refueling and maintenance outages at DNPS occur on a 24-month cycle. During refueling outages, which on average last 16–28 days each, there are typically an additional 1,685 contract employees onsite (CEG 2024-TN11347).

Table 3-19 Residence of Constellation Energy Generation, LLC Full-Time Employees in the Dresden Nuclear Power Station Socioeconomic Region of Influence

County	Number of Employees	Percentage of Total
Will	257	36%
Grundy	203	28%

Source: CEG 2024-TN11347.

3.10.2 Regional Economic Characteristics

Goods and services are needed to operate DNPS, some portion of which are purchased within the socioeconomic ROI. Payments for these goods and services provide jobs and income in the local economy. This section presents information on employment and income in the socioeconomic ROI.

3.10.2.1 Regional Employment and Income

According to the U.S. Census Bureau's (USCB) 2019–2023 American Community Survey 5-Year Estimates, the educational services and healthcare and social assistance industry represented the largest employment sector in the socioeconomic region of influence, followed by the retail trade (USCB 2023-TN11787). The population in the region of influence was 751,370 persons (USCB 2023-TN11790) and the number of individuals employed full-time, year round over the age of 16 was 278,707 (USCB 2023-TN11791). Table 3-20 compares the income in each of the two counties in the socioeconomic ROI against the Illinois State average.

Table 3-20 Estimated Income Information for the Dresden Nuclear Power Station Socioeconomic Region of Influence, 2019–2023, 5-Year Estimates

Income Information	Will County	Grundy County	State of Illinois
Median household income (in 2023 dollars)	107,799	93,060	81,702
Per capita income (in 2023 dollars)	46,216	43,744	45,104

Source: USCB 2023-TN11787.

3.10.2.2 Unemployment

According to the USCB 2019–2023 American Community Survey 5-Year Estimates, the unemployment rates in Will and Grundy Counties were 4.8 percent and 4.5 percent, respectively. Comparatively, the unemployment rate in the State of Illinois during the same period was higher at 5.8 percent (USCB 2023-TN11787).

3.10.3 Population Characteristics

According to the 2020 Census, an estimated 504,585 people live within a 20 mi (32 km) radius of DNPS, which equates to a population density of 402 persons per square mile (persons/mi^2) (155 persons/km^2) (CEG 2024-TN11347). Using the LR GEIS (NRC 2024-TN10161) measure of sparseness, this number of people per square mile translates to a Category 4, “Least sparse” population density which the LR GEIS defines as “greater than or equal to 120 persons per square mile within 20 mi [32 km].” An estimated 7,387,191 people live within a 50 mi (80 km) radius of DNPS, which equates to a population density of 941 persons/mi^2 (368 persons/km^2) (CEG 2024-TN11347). Using the LR GEIS, this translates to a Category 4 proximity index. Therefore, DNPS is in a high population area based on the 1996 LR GEIS spareness and proximity matrix (NRC 1996-TN288).

Table 3-21 shows recorded population growth from 2000 to 2020 and projected population growth from 2020 to 2050 for Will and Grundy Counties. During the last 2 decades, the populations in Will and Grundy Counties increased rapidly, with over 30 percent increase in population from 2000 to 2010. Population growth from 2010 to 2020 continued but at more moderate rates of approximately three percent in Will County and five percent in Grundy County. Based on projections, the populations of Will and Grundy Counties are expected to continue to grow through 2051 if current rates of fertility, mortality, and migration remain unchanged.

Table 3-21 Population and Percent Growth in the Dresden Nuclear Power Station Socioeconomic Region of Influence

Metric	Year	Will County Population	Will County Percent Change	Grundy County Population	Grundy County Percent Change	Region of Influence Population	Region of Influence Percent Change
Recorded	2000	502,266	-	37,535	-	539,801	-
Recorded	2010	677,560	34.9	50,063	33.4	727,623	+34.8
Recorded	2020	696,355	2.8	52,533	4.9	748,888	+2.9
Projected	2030	902,476	29.6	63,245	20.4	965,721	+29
Projected	2040	1,017,506	12.7	69,986	10.7	1,087,492	+12.6
Projected	2051	1,141,582	12.2	77,258	10.4	1,218,840	+12

“-” denotes no entry in table cell.
Sources: USCB 2001-TN11828; CEG 2024-TN11347.

3.10.3.1 Transient Population

Will and Grundy Counties also experience seasonal transient population growth as a result of local tourism, recreational activities, and college and university attendance. There are 37 parks within 6 mi (10 km) of DNPS, all within Will and Grundy Counties, including Goose Lake Prairie State Natural Area, the Illinois and Michigan State Trail, and the Midewin National Tallgrass Prairie. These parks offer trails, preserves, and natural areas for visitors. Based on the USCB’s

2019–2023 American Community Survey 5-Year Estimates (USCB 2023-TN11792), there were 1,701 seasonal housing units in the socioeconomic ROI.

3.10.3.2 Migrant Farm Workers

The Census of Agriculture is conducted every 5 years and provides a comprehensive compilation of agricultural production data for every county in the United States. The Census of Agriculture also reports the number of farms hiring migrant workers, defined as a farm worker whose employment required travel that prevented the worker from returning to their permanent place of residence the same day (USDA 2024-TN11243).

The 2022 Census of Agriculture includes information on migrant and temporary farm labor (i.e., working fewer than 150 days) (USDA 2024-TN11243). Table 3-22 presents information on migrant and temporary farm labor in Will and Grundy Counties. According to the 2022 Census of Agriculture, 578 farm workers were hired to work for fewer than 150 days and were employed on 231 farms in the two-county socioeconomic ROI. However, only four farms in the ROI reported hiring migrant workers and only one migrant worker was reported to the USDA.

Table 3-22 Migrant Farm Workers and Temporary Farm Labor in the Dresden Nuclear Power Station Socioeconomic Region of Influence

County	Number of Farms with Hired Farm Labor	Number of Farms Hiring Workers for Less Than 150 days	Number of Farm Workers Working for Less Than 150 days	Number of Farms Reporting Migrant Farm Labor	Total Migrant Worker Reported
Will	195	143	369	3	(D)
Grundy	104	88	209	1	1
Total	**299**	**231**	**578**	**4**	**1[(a)]**

(D) = data withheld to protect the confidentiality of individual farms or operations.
(a) The withheld data for Will County was not included in the region of influence (ROI) total.
Source: USDA 2024-TN11244.

3.10.4 Housing and Community Services

This section presents information on housing and community services, including education and water supply.

3.10.4.1 Housing

Table 3-23 lists the total number of occupied and vacant housing units, vacancy rates, and median values in the two-county socioeconomic ROI. Based on the USCB's 2019–2023 American Community Survey 5-Year Estimates, there were 274,008 housing units in the ROI, of which 261,828 were occupied. The median values of owner-occupied housing units in the ROI range from $298,000 in Will County to $259,200 in Grundy County (USCB 2023-TN11793). The homeowner vacancy rate was approximately 0.7 percent in Will County and 0.4 percent in Grundy County (USCB 2023-TN11794).

Table 3-23 Housing in the Dresden Nuclear Power Station Socioeconomic Region of Influence, 2019–2023

Housing Characteristic	Will County	Grundy County	Region of Influence
Total housing units	252,684	21,324	274,008
Occupied housing units	241,310	20,518	261,828
Total vacant housing units	11,374	806	12,180
Percent total vacant	4.5	3.8	4.4
Owner-occupied units	199,128	15,555	214,683
Median value (dollars)	298,000	259,200	295,189[a]
Owner vacancy rate (percent)	0.7	0.4	0.68[b]
Renter-occupied units	42,182	4,963	47,145
Median rent (dollars/month)	1,413	1,137	1,384[c]
Rental vacancy rate (percent)	3.9	2.0	3.7[b]

(a) Weighted average by owner-occupied units in Will and Grundy Counties.
(b) Weighted average by total housing units in Will and Grundy Counties.
(c) Weighted average by occupied units paying rent in Will and Grundy Counties.
Sources: USCB 2023-TN11846, USCB 2023-TN11848, USCB 2023-TN11847, USCB 2023-TN11792, USCB 2023-TN11794.

3.10.4.2 Education

As of the 2023–2024 school year, Will County has 36 public school districts with 104,605 students and 127 public schools. Plainfield School District 202 is the largest district by student population with 31 schools and 24,683 students (NCES-TN11900). Grundy County is smaller with 14 school districts, 33 public schools, and 13,277 students (NCES 2025-TN11901). Tax payments to Grundy County schools represented 72.3 percent of DNPS' tax obligation in 2022 (CEG 2024-TN11347).

3.10.4.3 Public Water Supply

The IDNR funds the Illinois Water Supply Planning Survey to plan water use over 11 water planning regions in the State. Will and Grundy Counties fall in the northeastern planning region. In Grundy County, the Morris Water Department supplies fresh water sourced from four deep groundwater wells to around 79 percent of the county's population (USGS 2015-TN5859). Will County draws its water supply from groundwater and surface water sources. In Joliet, the most populated city in Will County, the Ironton-Galesville aquifer is the primary water source. However, by 2030, that aquifer will not be sustainable, and Joliet will switch to Lake Michigan water from the City of Chicago.

Wastewater treatment facilities close to DNPS include a treatment facility 5 mi (8 km) north in the Village of Minooka, a wastewater facility 7 mi (11 km) south in the village of Coal City, and a wastewater plant in the Village of Channahon in Will County. Illinois residents using private well water must conduct their own water testing.

DNPS is not connected to a municipal water system. The facility pumps groundwater from three onsite production wells for its potable water and process water needs. Separate onsite tanks store potable water or demineralized water. DNPS also treats its own sanitary wastewater at a onsite sewage treatment plant (CEG 2024-TN11347).

3.10.5 Tax Revenues

DNPS provides annual property tax payments to Grundy and Will Counties, local school districts, and other tax jurisdictions in each county. These include county townships, forest preserves, county commissions, township roads, libraries, park districts, forest departments, and emergency services. The largest of the tax payments are generally to Grundy County Schools. For example, Grundy County Schools represented 72.3 percent of DNPS' tax obligation in 2022, Grundy County property tax represented 11 percent, and other municipalities represent 16 percent.

Table 3-24 presents total annual property tax payments to Grundy and Will Counties, schools, and other jurisdictions for the years 2018 through 2022, as well as an evaluation of the DNPS property tax as a percent of total revenues.

From 2018 to 2023, DNPS contributed $3,800,000 each year for required annual payments to the Illinois Emergency Management Agency and Office of Homeland Security for emergency plan support to fulfill obligations under the Illinois Nuclear Safety Preparedness Act (CEG 2025-TN11341).

Table 3-24 Tax Payments by Constellation Energy Generation, LLC to Grundy and Will Counties, 2018–2022

Year	Grundy County Property Tax and Revenues (USD)	Total DNPS Property Tax Payment to Grundy County (USD)	% of Total Grundy Property Tax Paid by DNPS	Will County Property Tax and Revenues	Total DNPS Property Tax Payment to Will County (USD)	% of Total Will County Property Tax Paid by DNPS	DNPS Payment to All Schools (USD)	DNPS Payment to All Remaining County Municipalities (USD)
2018	23,854,936	3,507,083	14.7	125,900,000	6,730	0.01	17,149,119.6	3,805,129.5
2019	24,490,305	3,311,923	13.5	128,800,000	7,256	0.01	17,219,336.7	3,934,313.9
2020	24,603,617	3,131,451	12.7	132,200,000	8,020	0.01	17,431,918.1	3,944,340.5
2021	27,775,429	2,994,443	10.8	135,200,000	7,234	0.01	17,498,778.0	4,021,993.9
2022	29,764,221	2,998,339	10.1	141,400,000	7,067	0.01	19,173,329.0	4,347,749.0

DNPS = Dresden Nuclear Power Station.
Sources: CEG 2024-TN11347; County of Grundy 2022-TN11873.

3.10.6 Local Transportation

Transportation in the DNPS region includes a rural and urbanized road network, plus rail and air travel. Interstate-55 moves traffic between Chicago, Illinois and St. Louis, Missouri, serving as the primary transportation corridor in the region, and providing commuter access to DNPS. Once off of the interstate, the two-lane paved CR 4000 North/Pine Bluff Road routes traffic to the plant entrance via North Dresden Road (CEG 2024-TN11347).

Table 3-25 shows the average annual daily traffic volumes for CR 4000 North/Pine Bluff Road from 2018 to 2021. As shown in Table 3-25, traffic volume counts on CR 4000 North/Pine Bluff Road west of South Will Road decreased from 2018 to 2021. Traffic volume counts on North Dresden Road north of the intersection with Pine Bluff Road were fairly consistent from 2018 to 2020, increased in 2021, and decreased in 2022 (IDOT 2025-TN11880).

Table 3-25 Total Average Annual Daily Traffic Counts on U.S. Highway 20/North Ridge Road

Roadway and Location	Annual Average Daily Traffic Volume Estimate 2018	Annual Average Daily Traffic Volume Estimate 2019	Annual Average Daily Traffic Volume Estimate 2020	Annual Average Daily Traffic Volume Estimate 2021	Annual Average Daily Traffic Volume Estimate 2022
CR 4000 North/Pine Bluff Road	5,100	4,500	4,500	4,041	4,500
North Dresden Road	2,650	2,300	2,300	8,052	1,650

Sources: CEG 2024-TN11347; IDOT 2025-TN11880.

3.10.7 Proposed Action

Socioeconomic effects of ongoing operations at DNPS have become well established as regional socioeconomic conditions have adjusted to the presence of the nuclear power plant. However, changes in employment and tax payments could impact community services and housing demand, as well as traffic volumes in communities near the nuclear power plant.

As explained in the LR GEIS (NRC 2024-TN10161), and as cited in Table 3-1 of this SEIS, socioeconomic impacts of SLR would be SMALL for all nuclear power plants. Five Category 1 socioeconomic issues were evaluated in the LR GEIS. These Category 1 issues are:

- employment and income, recreation and tourism
- tax revenue
- community services and education
- population and housing
- transportation

The LR GEIS did not identify any nuclear plant-specific Category 2 socioeconomic issues (NRC 2024-TN10161). The NRC staff's SLR review did not identify any new and significant socioeconomic information that would change the impact findings in the LR GEIS. Additionally, the NRC staff did not identify any additional socioeconomic issues beyond those listed in Table 3-1.

There would be no SLR-related refurbishment activities, and CEG has no plans to add additional permanent employees to support plant operations during the proposed SLR term (CEG 2024-TN11347). There are also no plans to add additional permanent operation staff to support surveillance, monitoring, inspections, testing, trending, and recordkeeping activities (CEG 2024-TN11347). Consequently, people living near DNPS would not experience any changes in socioeconomic conditions during the SLR term beyond what is currently already experienced. Therefore, the impact of continued reactor operations during the proposed SLR term would not exceed the SMALL socioeconomic impacts predicted in the LR GEIS.

3.10.8 No-Action Alternative

3.10.8.1 Socioeconomics

Under the no-action alternative, the NRC would not renew the operating licenses, and DNPS would shut down on or before the expiration of the current facility operating licenses. This would have a noticeable impact on socioeconomic conditions in the counties and communities near

DNPS. The loss of jobs, income, and tax revenue would have an immediate socioeconomic impact. As jobs are eliminated, some, but not all, of the over 717 workers could leave the region. Income from the buying and selling of goods and services needed to maintain the power plant would also be reduced. In addition, loss of tax revenue could affect the availability of public services.

If DNPS workers and their families move away, increased vacancies and reduced demand for housing would likely cause property values to fall. The greatest socioeconomic impact would be experienced in the communities located nearest to DNPS, in Grundy and Will Counties. However, the loss of jobs, income, and tax revenue may not be as noticeable in larger communities, due to the time and steps required to prepare the nuclear plant for decommissioning. Therefore, depending on the jurisdiction, socioeconomic impacts from not renewing the operating licenses and terminating reactor operations at DNPS could range from SMALL to MODERATE.

3.10.8.2 Transportation

Traffic volume on roads near DNPS may be noticeably reduced after the termination of reactor operations. Any reduction in traffic volume would coincide with workforce reductions at DNPS. The number of truck deliveries and shipments would also be reduced until active decommissioning. Therefore, due to the time and steps required to prepare the nuclear plant for decommissioning, traffic-related transportation impacts would be SMALL.

3.10.9 Replacement Power Alternatives: Common Impacts

The following sections describe the potential environmental effects of replacement energy technologies that could be implemented as a consequence of the NRC not renewing the DNPS operating licenses in the case of a no-action alternative. The NRC staff evaluated workforce requirements for replacement energy technologies to measure their possible effects on current socioeconomic and transportation conditions. Table 3-26 summarizes socioeconomic and transportation impacts. The following sections discuss the common socioeconomic and transportation impacts during construction and operation of replacement power generating facilities.

3.10.9.1 Socioeconomics

Socioeconomic impacts are defined in terms of changes in the social and economic conditions of a region. For example, the creation of jobs and the purchase of goods and services during the construction and operation of a replacement power plant could affect regional employment, income, and tax revenue. For each alternative, two types of jobs would be created: (1) construction jobs, which are transient, short in duration, and less likely to have a long-term socioeconomic impact, and (2) operations jobs, which have the greater potential for permanent, long-term socioeconomic impacts.

The selection of a replacement power alternative could create opportunities for employment and income and generate tax revenue in the local economy; at the same time, employment, income, and tax revenue could be greatly reduced or eliminated in communities near the nuclear power plant if the replacement units are sited in other counties. These impacts would be similar to those described in Section 3.10.8. The following provides a discussion of the common socioeconomic and transportation impacts on the communities near replacement power plants during the construction and operations of these alternatives.

Table 3-26 Socioeconomic and Transportation Impacts of Replacement Power Alternatives for Dresden Nuclear Power Station

Alternative	Resource Requirements	Impacts	Discussion
Natural Gas	Large construction workforce at the DNPS site. Likely fewer workers during operations than current DNPS operation requires.	SMALL to LARGE	Construction impacts at the DNPS site would be substantial because of the rural nature of the site and nearby communities. Noticeable traffic volume impacts on local roads during construction. Operations impacts would likely be bounded by current DNPS operations impacts.
Renewable and Natural Gas Combination	Construction at several sites would employ a noticeable number of workers. Fewer operations workers during operations than current DNPS operations.	SMALL to MODERATE	Traffic volume impacts on local roads may be noticeable during construction. Workers would likely be scattered throughout the region and would not likely have a noticeable effect on local economy after construction.

DNPS = Dresden Nuclear Power Station.
Sources: NRC 2019-TN6824; DOE 2011-TN8387; BLM 2019-TN8386; Tegen 2016-TN8826.

Construction

During the construction of a replacement power plant, the relative economic effect of an influx of workers on the local economy and tax revenue would vary, with the greatest impacts occurring in the communities where most construction workers would reside and spend their income. As a result, some local communities could experience an economic boom during construction from increased tax revenue and income generated by expenditures for goods and services and increased demand for temporary (rental) housing. After construction, local communities would likely experience a return to preconstruction economic conditions.

Operation

Before the commencement of startup and operations of a replacement power plant, local communities would see an influx of operations workers and their families and increased demand for permanent housing and public services. These communities would also experience the economic benefits from increased income and tax revenue generated by the purchase of goods and services needed to operate a new replacement power plant. Consequently, when compared to construction, power plant operations would have a greater potential for effecting permanent, long-term socioeconomic impacts on the region.

3.10.9.2 Transportation

Transportation impacts are defined in terms of changes in level-of-service conditions on local roads. Additional vehicles during construction and operations could lead to traffic congestion, level-of-service impacts, and delays at intersections on local roads.

Construction

Transportation impacts would consist of commuting workers and truck deliveries of equipment and material to the construction site. Traffic volumes would increase substantially during shift changes. Trucks would deliver equipment and material to the construction site and remove waste material, thereby increasing the amount of traffic on local roads. The increase in traffic volumes could result in levels of service impacts and delays at intersections during certain hours of the day. In some instances, construction material could also be delivered and removed by rail or barge.

Operation

Traffic volumes would be greatly reduced after construction is completed because of the smaller size of the operations workforce. Transportation impacts from operations would include daily commuting operations workers, truck deliveries of equipment and material, and removal of waste material.

3.11 Human Health

DNPS, with its two operating units, is both an industrial and a nuclear power plant facility. Similar to any industrial facility or nuclear power plant, the operation of DNPS during the SLR term would produce various human health risks for workers and members of the public. This section describes the human health risks resulting from the operation of DNPS, which are those related to radiological exposure, chemical hazards, microbiological hazards, electromagnetic fields, physical occupational hazards, and electric shock hazards. The description of these risks is followed by the NRC staff's analysis of the potential impacts on human health from the proposed action of DNPS SLR and alternatives to the proposed action.

3.11.1 Radiological Exposure and Risk

Operation of a nuclear power plant involves the use of nuclear fuel to generate electricity. Through the fission process, the nuclear reactor splits uranium atoms, resulting generally in (1) the production of heat, which is then used to produce steam to drive the plant's turbines and generate electricity, and (2) the creation of radioactive byproducts. As required by NRC regulations specified in 10 CFR 20.1101 (TN283), "Radiation Protection Programs," CEG designed a radiation protection program to protect onsite personnel (including employees and contractor employees), visitors, and offsite members of the public from radiation and radioactive material at DNPS. The DNPS radiation protection program is extensive and includes, but is not limited to, the following:

- organization and administration (e.g., a radiation protection manager who is responsible for the program and who ensures there are trained and qualified workers for the program)
- implementing procedures
- as low as is reasonably achievable (ALARA) program to minimize dose to workers and members of the public
- dosimetry program (i.e., measure radiation dose of plant workers)
- radiological controls (e.g., protective clothing, shielding, filters, respiratory equipment, and individual work permits with specific radiological requirements)
- radiation area entry and exit controls (e.g., locked or barricaded doors, interlocks, local and remote alarms, personnel contamination monitoring stations)
- posting of radiation hazards (i.e., signs and notices alerting plant personnel of potential hazards)
- recordkeeping and reporting (e.g., documentation of worker dose and radiation survey data)

- radiation safety training (e.g., classroom training and use of mockups to simulate complex work assignments)
- radioactive effluent monitoring management (i.e., controlling and monitoring radioactive liquid and gaseous effluents released into the environment)
- radioactive environmental monitoring (e.g., sampling and analysis of environmental media, such as direct radiation, air, water, groundwater, milk, food products [corn, soybeans, and peanuts], fish, oysters, clams, crabs, silt, and shoreline sediment to measure the levels of radioactive material in the environment that may impact human health)
- radiological waste management (i.e., controlling, monitoring, processing, and disposing of radioactive solid waste)

To evaluate radiation exposure to DNPS personnel, the NRC staff reviewed the data contained in NUREG-0713, Volume 44, “Occupational Radiation Exposure at Commercial Nuclear Power Reactors and other Facilities 2022: Fifty-Fifth Annual Report” (NRC 2024-TN11165). The 55th Annual Report was the most recent annual report available at the time of this environmental review. It summarizes the occupational exposure data in the NRC’s Radiation Exposure Information and Reporting System database through 2022. These data are reported by nuclear power plant operators, as required by 10 CFR 20.2206 (TN283), “Reports of Individual Monitoring,” which requires them to report their occupational exposure data to the NRC annually.

NUREG-0713 contains a calculation of a 3-year average collective dose per reactor for workers at all nuclear power reactors licensed by the NRC. The 3-year average collective dose is one of the metrics that the NRC uses in the Reactor Oversight Program to evaluate the applicant’s ALARA program. Collective dose is the sum of the individual doses received by workers at a facility licensed to use radioactive material over a 1-year period. There are no NRC or EPA standards for collective dose. Based on the data for operating boiling-water reactors like the reactors at DNPS, the average annual collective dose per reactor year was 100 person roentgen-equivalent-man (rem) (NRC 2024-TN11165). In comparison, DNPS had a reported annual collective dose per reactor year of 59.044 person-rem (NRC 2024-TN11165). Section 3.13 discusses offsite dose to members of the public.

3.11.2 Chemical Hazards

Federal and State environmental agencies regulate the use, storage, and discharge of chemicals, biocides, and sanitary wastes. Such environmental agencies also regulate how facilities like DNPS manage minor chemical spills. Chemical and hazardous wastes can potentially impact workers, members of the public, and the environment.

At DNPS, chemical effects could result from discharge of wastes, heavy metal leaching, the use and disposal of chemicals, and chemical spills. Workers may encounter chemicals when adjusting coolant systems, applying biocides, during maintenance activities on equipment containing hazardous chemicals, and when solvents are used for cleaning. CEG’s ER (CEG 2024-TN11347) states that it has a controlled materials program to oversee the proper use and storage of chemicals on site, and also has fleet procedures for managing PCB and asbestos.

DNPS controls the use, storage, and discharge of chemicals, biocides, and sanitary wastes at DNPS in accordance with its procedures and site-specific plans. CEG monitors and controls discharges of chemical and sanitary wastes through DNPS’s NPDES permit process, discussed in Section 3.5.1.3, as well as through DNPS’s industrial safety program, waste management procedures, and hazardous waste contingency plan. These procedures, plans, and processes are designed to prevent and minimize the potential for a chemical or hazardous waste release and, in the event of such a release, minimize the impact on workers, members of the public, and the environment.

3.11.3 Microbiological Hazards

Microbiological hazards occur when workers or members of the public come into contact with disease-causing microorganisms, also known as etiological agents. Thermal effluents associated with nuclear power plants that discharge to a river or lake, such as at DNPS, have the potential to promote the growth of certain thermophilic microorganisms linked to adverse human health effects. Microorganisms of particular concern include several types of bacteria and the free-living amoeba *Naegleria fowleri* (*N. fowleri*). There are optimum growth temperatures for the microorganisms of concern as further discussed in the LR GEIS (NRC 2024-TN10161).

The free-living amoeba *N. fowleri* prefers warm freshwater habitats and is the causative agent of human primary amebic meningoencephalitis. Infections occur when *N. fowleri* penetrate the nasal tissue through direct contact with water in warm lakes, rivers, or hot springs and migrate to the brain tissues. This free-swimming amoeba species grows best at higher temperatures of up to 115°F (46°C) (NPS 2023-TN11566). It is typically not present in waters below 95°F (35°C) (Tyndall et al. 1989-TN8598). *Legionella* is a genus of common warm water bacteria that occurs in lakes, ponds, and other surface waters, as well as some groundwater sources and soils. The bacteria thrive in aquatic environments as intracellular parasites of protozoa and are only pathogenic to humans when aerosolized and inhaled into the lungs. *Legionella* optimally grow in stagnant surface waters containing biofilms or slimes that range in temperature from 95 to 113°F (35 to 45°C), although the bacteria can persist in waters from 68 to 122°F (20 to 50°C) (AWT 2019-TN8518). As such, human infection is often associated with complex water systems within buildings or structures, such as cooling towers (CDC 2016-TN8519).

The DNPS cooling water system discharges to the Illinois River under NPDES Permit No. IL0002224. The Illinois River adjacent to DNPS is part of the Illinois Waterway and is also used for recreational fishing, boating, and jet-skiing. The NPDES permit sets a limit for the discharge temperature not to exceed 90°F (32°C) more than 10 percent of the time and never exceed 95°F (35°C).

The public can be exposed to thermophilic microorganisms during swimming, boating, or other recreational uses of freshwater. If these organisms are naturally occurring and a nuclear power plant’s thermal effluent enhances their growth, the public could experience an elevated risk of infection when recreating in the affected waters. Public exposure to *Legionella* spp. from nuclear power plant operation is generally not a concern because exposure risk is confined to cooling towers and related components and equipment, which are typically within the protected area of the site and, therefore, not accessible to the public.

Nuclear plant workers can be exposed to thermophilic microorganisms when performing cooling system maintenance through inhalation of cooling tower vapors because these vapors are often within the optimum temperature range for *Legionella* growth. Plant personnel most likely to come in contact with aerosolized *Legionella* are workers who clean and maintain cooling towers and condenser tubes. CEG has a comprehensive health and safety program with procedures that implement industrial hygiene practices, including personal protective equipment (PPE), as appropriate, for hazards and entry into confined spaces to minimize the potential for station worker exposure to microbiological hazards.

3.11.4 Electromagnetic Fields

As discussed in LR GEIS Section 3.9.2.3 and Section 4.9.1.1.4 (NRC 2024-TN10161), electric fields and magnetic fields, collectively referred to as electromagnetic fields (EMFs) are produced by any electrical equipment, including operating transmission lines. The information provided in these two LR GEIS sections is incorporated herein by reference. All nuclear power plants have electrical equipment and power transmission systems associated with them. Power transmission systems consist of switching stations (or substations) located on the nuclear power plant site and the transmission lines needed to connect the plant to the regional electrical distribution grid. Transmission lines operate at a frequency of 60 hertz (Hz) (60 cycles per second), which is low compared with the frequencies of 55 to 890 megahertz for television transmitters and 1,000 megahertz and greater for microwaves.

Transmission lines that are within the scope of the NRC's SLR environmental review are limited to: (1) those transmission lines that connect the nuclear plant to the substation where electricity is fed into the regional distribution and (2) those transmission lines that supply power to the nuclear plant from the grid (NRC 2024-TN10161). As discussed in Section 2.1.6.5, the 345 kV and the 138 kV transmission corridors continue beyond the DNPS site boundary but the in-scope transmission lines are located completely within the DNPS exclusion area (CEG 2024-TN11347).

Occupational workers or members of the public near transmission lines may be exposed to the EMFs produced by the transmission lines. The EMF varies in time as the current and voltage change, so that the frequency of the EMF is the same (e.g., 60 Hz for standard alternating current). Electrical fields can be shielded by objects such as trees, buildings, and vehicles. Magnetic fields, however, penetrate most materials, but their strength decreases with increasing distance from the source. The EMFs resulting from 60 Hz power transmission lines fall under the category of non-ionizing radiation. The LR GEIS (NRC 2024-TN10161) summarizes NRC-accepted studies on the health effects of EMFs. There are no U.S. Federal standards limiting residential or occupational exposure to EMFs from transmission power lines, but some States have set electric field and magnetic field standards for transmission lines (NIEHS 2002-TN6560). A voluntary occupational standard has been set for EMFs by the International Commission on Non-Ionizing Radiation Protection (ICNIRP 1998-TN6591). The National Institute for Occupational Safety and Health does not consider EMFs to be a proven health hazard (NIOSH 1996-TN6766).

3.11.5 Other Hazards

This section addresses two additional human health occupational hazards: (1) physical hazards and (2) electric shock hazards.

Nuclear power plants are industrial facilities that have many of the typical occupational hazards found at any other electric power generation utility. Nuclear power plant workers may perform electrical work, electric power line maintenance, repair work, and maintenance activities and may be exposed to potentially hazardous physical conditions. A physical hazard is an action, agent, or condition that can cause harm upon contact. Physical actions could include slips, trips, and falls from height. Physical agents could include noise, vibration, and ionizing radiation. Physical conditions could include high heat, cold, pressure, confined space, or psychosocial issues, such as work-related stress.

The Occupational Safety and Health Administration (OSHA) is responsible for developing and enforcing workplace regulations. Congress created OSHA by enacting the Occupational Safety and Health Act of 1970, as amended (TN4453). With specific regard to nuclear power plants, plant conditions that result in an occupational risk, but do not affect the safety of licensed radioactive materials, are under the statutory authority of OSHA rather than the NRC, as set forth in a memorandum of understanding between the NRC and OSHA (NRC 2013-TN10165). Occupational hazards are reduced when workers adhere to safety standards and use appropriate protective equipment; however, fatalities and injuries from accidents may still occur. CEG maintains an occupational safety program for its workers in accordance with OSHA regulations (CEG 2024-TN11347). CEG's ER (CEG 2024-TN11347) Section 3.10.2 states that only two OSHA recordable injuries occurred at DNPS during the 5-yr period from 2018 through 2022. CEG confirmed (CEG 2025-TN11341) that there have been no OSHA recordable injuries since the end of 2022; however, one OSHA recordable event occurred in November 2024.

The DNPS electrical safety program addresses proper clearances and safe work approaches and the use of mobile equipment for safe placement and operation. DNPS also has procedures that address grounding of vehicles, equipment, and structures. DNPS has a workplace hazard identification process that performs jobsite analysis of workplace hazards, focusing on mitigation activities to eliminate risk and the potential for both injury and human error. Work on the DNPS site is governed by a comprehensive industrial safety program. The program addresses electrical safety, the use of ladders and portable equipment, etc.

Based on its evaluation in the LR GEIS (NRC 2024-TN10161), the NRC staff has not found electric shock resulting from direct access to energized conductors or from induced charges in metallic structures to be a problem at most operating nuclear power plants. Generally, the NRC staff also does not expect electric shock from such sources to be a human health hazard during the SLR term. However, a site-specific review is required to determine the significance of the electric shock potential along the portions of the transmission lines that are within the scope of this SEIS. Transmission lines that are within the scope of the NRC's SLR environmental review are limited to: (1) those transmission lines that connect the nuclear power plant to the substation where electricity is fed into the regional distribution system and (2) those transmission lines that supply power to the nuclear power plant from the grid (NRC 2024-TN10161). The transmission lines that are in scope for the DNPS SLR environmental review are located on site between the nuclear power block and the 345-kV switchyard that connects the generating units to the regional grid.

CEG uses and follows OSHA standards for electric power generation, transmission, and distribution (TN654). Work on and near the in-scope transmission lines is governed by station procedure and DNPS's comprehensive health and safety program. The four in-scope transmission lines between the nuclear power block and the 345-kV switchyard are within the owner-controlled area (OCA) of DNPS and do not present an electric shock hazard to the public.

3.11.6 Proposed Action

As described in the LR GEIS (NRC 2024-TN10161) and as cited in Table 3-1 of this SEIS, for generic issues related to human health, the impacts of DNPS SLR would be SMALL. The NRC staff's review did not identify any new and significant information that would change the conclusion in the LR GEIS. Thus, as concluded in the LR GEIS, the impacts of the generic issues related to human health would be SMALL.

Table 3-2 identifies one uncategorized issue (EMFs) and two plant-specific (Category 2) issues (microbiological hazards to the public, electric shock hazards) related to human health applicable to DNPS SLR. Separately, the NRC staff have also considered the environmental and human health impacts of the Category 1 issues, design-basis accidents and severe accidents. These issues are analyzed below under postulated accidents.

3.11.6.1 Microbiological Hazards to the Public

In the LR GEIS (NRC 2024-TN10161), the NRC staff determined that there is a public health concern from microorganisms wherever surface waters receiving thermal effluents from nuclear power plants are accessible to the public. Specifically, 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.

The thermophilic microorganism *N. fowleri* can pose public health concerns in recreational use waters when these organisms are present in high enough concentrations to cause infection (CDC 2024-TN11874). There have been no reported cases of primary amebic meningoencephalitis in Illinois and no waterborne disease cases for untreated recreational waters in Illinois attributed to any of the microorganisms of particular concern in the most recent Centers for Disease Control and Prevention reports (CDC 2022-TN11875). An Illinois Department of Public Health (IDPH) letter dated September 5, 2023 (CEG 2024-TN11347) reports that there have been no reports of primary amebic meningoencephalitis caused by *Naegleria fowleri* as far back as IDPH records exist (i.e., 2004). Additionally, there have been no community-acquired outbreaks of Legionnaires' disease since 2004, and only one healthcare-associated outbreak in Will County. In September 2023, CEG received a letter from IDPH that identified no public health concerns attributable to thermophilic organisms in Grundy, Kendall, and Will Counties due to operations of DNPS (CEG 2025-TN11341). During SLR, thermal effluent discharged from DNPS into the adjacent Illinois River, which is publicly accessible for recreation, would continue to be subject to temperature restrictions. CEG confirmed that the cooling lake is surrounded by a perimeter fence to prevent access by members of the public. As discussed in Section 3.11.3, public exposure to *Legionella* spp. from nuclear power plant operation is generally not a concern because exposure risk is confined to cooling towers and related components and equipment, which are not accessible to the public.

During the proposed SLR term, the public health risk from *N. fowleri*, Legionnaires' disease or other microbiological hazards remains extremely low and the proposed action would not result in operational changes that would affect thermal effluent temperature or otherwise create favorable conditions. The NRC staff concludes that the impacts of thermophilic microorganisms on the public due to continued nuclear power plant operations at DNPS during the SLR term would be SMALL.

3.11.6.2 Electromagnetic Fields

The LR GEIS (NRC 2024-TN10161) does not designate the chronic effects of 60 Hz EMFs from powerlines as either a Category 1 or 2 issue. Until a scientific consensus is reached on the health implications of EMFs, the NRC will not classify them as either a Category 1 or a Category 2 issue.

During the proposed SLR term, plant workers and members of the public who live, work, or pass near an associated operating transmission line may be exposed to EMFs in the same way that they are exposed during the current license terms. Scientific consensus on the health implications of EMFs has not been established. The potential health effects from EMF exposure have been the subject of published studies as described in Section 4.9.1.1.4 of the LR GEIS (NRC 2024-TN10161), but consistent evidence of harmful effects remains inconclusive.

The NRC staff considers the LR GEIS finding of "UNCERTAIN" to still be appropriate and will continue to follow developments on this issue.

3.11.6.3 Electric Shock Hazards

Based on the LR GEIS (NRC 2024-TN10161), the Commission found that electric shock resulting from direct access to energized conductors or from induced charges in metallic structures has not been identified as a problem at most operating plants and generally is not expected to be a problem during the SLR term. However, a plant-specific review is required to determine the significance of the electric shock potential along the portions of the transmission lines that are within the scope of DNPS SLR review.

The four in-scope transmission lines between the nuclear power block and the 345 kV switchyard are within the OCA of DNPS and do not present an electric shock risk to the public.

The transmission corridors onsite containing 345 kV and 138 kV overhead transmission lines do have the potential for electric shock to workers through induced currents. CEG confirmed (CEG 2025-TN11341) that maintenance of the in-scope transmission lines performed by utility or specialty vendor personnel is in accordance with the Illinois Administrative Code Title 83 Section 305.20, and work by CEG staff near or under the energized overhead lines follows the guidance specified in the fleet electrical safety procedure for overhead power lines and hazardous induced voltages. Furthermore, CEG confirmed (CEG 2025-TN11341) that maintenance of the in-scope transmission lines performed in accordance with Section 8-505 of the Public Utilities Act (IEEE 2023-TN10132) and related requirements of the National Electrical Safety Code. Work on and near the in-scope transmission lines is governed by station procedure and DNPS's comprehensive health and safety program. As discussed in Section 3.11.5, DNPS maintains an occupational safety program in accordance with OSHA regulations for its workers, which includes protection from acute electric shock. Therefore, staff finds that the human health impact from electric shock hazards for the proposed SLR operating term would be SMALL.

3.11.6.4 Postulated Accidents

The LR GEIS evaluates the following two classes of postulated accidents as they relate to LR (NRC 2024-TN10161):

- Design-Basis Accidents: Postulated accidents that a nuclear facility must be designed and built to withstand without loss to the systems, structures, and components necessary to ensure public health and safety.

- Severe Accidents: Postulated accidents that are more severe than design-basis accidents because they could result in substantial damage to the reactor core.

As shown in Table 3-1 of this SEIS, the LR GEIS (NRC 2024-TN10161) addresses design-basis accidents and severe accidents as Category 1 issues and concludes that the environmental impacts of design-basis accidents and severe accidents are of SMALL significance for all nuclear power plants.

The NRC staff did not identify any new and significant information related to design-basis accidents during its independent review of CEG's ER (CEG 2024-TN11347), through the scoping process, through information requests made during the NRC staff's environmental site audit (CEG 2025-TN11341), or in its evaluation of other available information (generic and plant-specific). Therefore, the NRC staff concludes there is no new and significant information on the environmental impacts of design-basis accidents at DNPS during the SLR term that are not already discussed in the SEIS for the initial LR of DNPS (NRC 2004-TN7247) or generically evaluated for all nuclear power plants in the LR GEIS (NRC 2024-TN10161). Therefore, the NRC staff concludes that the potential impacts from design-basis accidents during the SLR term would be SMALL.

Additionally, as shown in Table 3-1 of this SEIS, the LR GEIS (NRC 2024-TN10161) also addressed severe accidents as a Category 1 issue and concluded that the environmental impacts from severe accidents are SMALL for all nuclear power plants. DNPS was specifically included in the plants evaluated in the LR GEIS. DNPS values (i.e., population dose risk, core damage frequency values) were presented in LR GEIS Tables E.3-1, E.3-11, and E.3-16. As provided in Table E.3-1 of the LR GEIS, the 51 person-rem per reactor year calculated in the 2004 DNPS SAMA analysis is three orders of magnitude lower than the 1996 LR GEIS estimate of the DNPS population dose risk value of 1,991 person-rem per reactor year (NRC 1996-TN288).

The NRC staff did not identify any new and significant information regarding severe accidents during its independent review of CEG's ER (CEG 2024-TN11347), through the scoping process, or through review of CEG's responses to information requests made during the NRC staff's SAMA virtual audit (CEG 2025-TN11341), that would significantly increase the environmental impact associated with severe accidents above the values previously projected in the 1996 LR GEIS. Therefore, the aggregate effect of new DNPS SLR information is consistent with the expectations of the 2013 LR GEIS and 2024 LR GEIS that the probability-weighted consequences of severe accidents for DNPS are bounded by the 1996 LR GEIS estimates. This reflects a substantial decrease in risk associated with a better understanding of new information and the DNPS probabilistic risk assessments. Thus, the NRC staff conclusion is that the overall impact of new and significant information since initial LR on the environmental impacts of severe accidents at DNPS continues to be well below the impact previously evaluated in the 1996 GEIS. Therefore, the conclusions in the 1996 LR GEIS, 2013 LR GEIS, and 2024 LR GEIS that "the probability-weighted consequences of atmospheric releases, fallout onto open bodies of water, releases to groundwater, and societal and economic impacts from severe accidents are SMALL" continues to apply for DNPS during the SLR term (NRC 1996-TN288, NRC 2013-TN2654, NRC 2024-TN10161).

As part of its initial LR application submitted in 2003, CEG included a SAMA analysis for DNPS in its ER (Exelon 2003-TN11723). As part of its review of the initial DNPS LR application, the NRC staff reviewed the analysis of SAMAs and documented its evaluation results in Supplement 17 to NUREG-1437 (NRC 2004-TN7247).

Because the NRC staff has previously considered SAMAs for DNPS, CEG is not required to perform another SAMA analysis for its SLR application (TN10253: 10 CFR 51.53(c)(3)(ii)(L)). In its SLR application ER, CEG evaluated areas of new and potentially significant information that could affect the environmental impact of postulated severe accidents during the SLR term (CEG 2024-TN11347). CEG's ER stated that it used the methodology in NEI 17-04, Revision 1, "Model SLR New and Significant Assessment Approach for SAMA," (NEI 2019-TN6815) to evaluate new and significant information as it relates to the DNPS SLR SAMAs. NEI 17-04 is endorsed in Regulatory Guide 4.2, Supplement 1, Revision 2 (NRC 2024-TN10280).

Table 4.15-7 of CEG's ER presented the quantitative screening results from the bounding SAMA evaluations (CEG 2024-TN11347). This table demonstrates that none of the quantitative screening evaluations resulted in a reduction in the aggregate Level 1 core damage frequency or Level 2 frequency greater than 50 percent.

The NRC staff reviewed CEG's onsite information process during a virtual SAMA audit (NRC 2024-TN11860). Requests for confirmation of information (NRC 2024-TN11650) were submitted to CEG, and the NRC staff found that the CEG's responses (CEG 2025-TN11341) were sufficient to complete the review. Further, the NRC staff did not find any potentially new and significant SAMAs.

Based on the NRC staff's review and evaluation of CEG's analysis of new and potentially significant information regarding SAMAs, as well as the NRC staff's independent analyses as described above, the NRC staff finds that there is no new and significant information for DNPS related to SAMAs.

3.11.7 No-Action Alternative

Under the no-action alternative, the NRC would not renew the DNPS operating licenses and DNPS would shut down on or before the expiration of the current operating licenses. Human health risks would be smaller following plant shutdown. The reactor units, which currently operate within regulatory limits, would emit less radioactive gaseous, liquid, and solid material to the environment. In addition, following shutdown, the variety of potential accidents at the plant (radiological or industrial) would be reduced to a limited set associated with shutdown events and fuel handling and storage. In Section 3.11.6, the NRC staff concluded that the impacts of continued plant operation on human health would be SMALL, except for "Chronic effects of electromagnetic fields (EMFs)," for which the impacts are UNCERTAIN. In Section 3.11.6.4, the NRC staff concluded that the impacts of accidents during operation are SMALL. Therefore, as radioactive emissions to the environment decrease, and as the likelihood and types of accidents decrease following shutdown, the NRC staff concludes that the risk to human health following plant shutdown would be SMALL.

3.11.8 Replacement Power Alternatives: Common Impacts

Impacts on human health from construction of a replacement power station would be similar to impacts associated with the construction of any major industrial facility. Compliance with worker protection rules, the use of personal protective equipment, training, and placement of engineered barriers would limit those impacts on workers to acceptable levels.

The impacts on human health from the operation of a facility for a replacement power alternative would depend on the energy technology (e.g., wind, solar, geothermal). Regulatory agencies, including the EPA and State of Illinois agencies, base applicable standards and requirements on human health impacts.

3.11.9 Natural Gas Alternative

Impacts on human health from the construction of an NGCC plant would be similar to those associated with a large industrial facility building project. Worker safety would be addressed by following the OSHA worker protection standards. The radiological human health impact on construction and operations workers due to working in proximity to operating and then decommissioning DNPS would be SMALL due to compliance with NRC regulations and adherence to ALARA principles.

Human health impacts from the operation of the NGCC plant would primarily be from air pollutant emissions. The NGCC plant would emit criteria air pollutants. Some pollutants, such as NO_x, contribute to ozone formation, which can create health problems. However, these criteria pollutants are regulated, and mitigative technology measures would be installed in the plant to limit the criteria air pollutant releases. Given the application of pollutant controls, compliance with air quality and OSHA worker safety standards, and oversight exercised by EPA and State agencies, the NRC staff finds that the operations-related impacts to human health under the NGCC alternative would be SMALL.

3.11.10 Renewable and Natural Gas Combination Alternative

The impacts of the renewable and natural gas combination alternative on human health are similar to the impacts related to the construction and operation of industrial facilities as discussed in Section 3.11.8, as well as the impacts of the natural gas alternative discussed in Section 3.11.9 (SMALL). For the renewable portion of this alternative, operational hazards for the workforce include potential exposure to toxic gas or chemicals, working in extreme weather, and physical hazards that include working at heights, near energized or rotating systems, high-pressure water, exposure to low-frequency sound, EMF exposure, and potential for electric shock. These operational hazards are reduced by compliance with worker protection rules, the use of PPE, and training, which would limit the impacts on workers to acceptable levels. Therefore, given the expected compliance with worker and environmental protection rules and the use of PPE, training, and engineered barriers, the NRC staff conclude that the potential human health impacts of the construction and operation of the renewable and natural gas combination alternative would be SMALL.

3.12 <u>Reserved</u>

10 CFR Part 51 (TN10253), Subpart A, Appendix B, Table B-1, "Summary of Findings on NEPA Issues for License Renewal of Nuclear Power Plants," requires an environmental impact statement for license renewal to include an analysis for the Category 2 issue of "Environmental Justice—Impacts on minority populations, low-income populations, and Indian Tribes." Executive Order 14173 (90 FR 8633-TN11607), "Ending Illegal Discrimination and Restoring Merit-Based Opportunity," issued January 21, 2025, revoked Executive Order 12898 (59 FR 7629-TN1450), "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations," issued February 11, 1994, among other things. Staff Requirements Memorandum (SRM)-COMSECY-25-0007, "Withdrawing the Environmental Justice Policy Statement and Environmental Justice Strategy," issued April 10, 2025 (NRC 2025-TN11721), approved publication of a notice in the *Federal Register* (90 FR 17887-TN11684), which explained that, in response to the policies in Executive Order 12898, the NRC had made voluntary commitments on environmental justice in its Policy Statement on the Treatment of Environmental Justice Matters in NRC Regulatory and Licensing Actions (Environmental Justice Policy Statement) and Environmental Justice Strategy (69 FR 52040-TN1009). Accordingly, with the revocation of Executive Order 12898, the NRC also withdrew its Environmental Justice Policy Statement and its Environmental Justice Strategy. Based on Executive Order 14173 and SRM-COMSECY-25-0007, and pursuant to 10 CFR 51.6 (TN10253), "Specific exemptions," the NRC staff has, upon its own initiative, determined that an exemption from the requirement to

address environmental justice in this SEIS is authorized by law and otherwise in the public interest. Accordingly, this SEIS does not address that issue.

3.13 Waste Management and Pollution Prevention

Like any operating nuclear power plant, DNPS will produce both radioactive and nonradioactive waste during the SLR term. This section describes waste management and pollution prevention at DNPS. The description of these waste management activities is followed by the NRC staff's analysis of the potential impacts of waste management activities from the proposed action (SLR) and alternatives to the proposed action.

3.13.1 Radioactive Waste

The NRC licenses nuclear power plants with the expectation that they will release a limited amount of radioactive material to both the air and water during normal operations. However, NRC regulations require that gaseous and liquid radioactive releases from nuclear power plants meet radiation dose based limits specified in 10 CFR Part 20 (TN283), "Standards for Protection Against Radiation," and the ALARA criteria in 10 CFR Part 50 (TN249), Appendix I, "Numerical Guides for Design Objectives and Limiting Conditions for Operation to Meet the Criterion 'As Low as is Reasonably Achievable' for Radioactive Material in Light-Water-Cooled Nuclear Power Reactor Effluents." The NRC places regulatory limits on the radiation dose that members of the public can receive from radioactive effluents of a nuclear power plant. For this reason, all nuclear power plants use radioactive waste management systems to control and monitor radioactive wastes.

DNPS uses liquid, gaseous, and solid waste processing systems to collect and treat, as needed, radioactive materials produced as a byproduct of nuclear power plant operations. Radioactive materials in liquid, gaseous, and solid effluents are reduced before being released into the environment so that the resultant dose to members of the public from these effluents is well within the NRC and EPA dose standards. Radionuclides that can be efficiently removed from the liquid and gaseous effluents before release are converted to a solid waste form for disposal in a licensed disposal facility.

CEG maintains a REMP to assess the radiological impact, if any, to the public and the environment from radioactive effluents released during operations at DNPS (CEG 2024-TN11347).

CEG has an Offsite Dose Calculation Manual (ODCM) that contains the methods and parameters for calculating offsite doses resulting from liquid and gaseous radioactive effluents. These methods ensure that radioactive material discharges from DNPS meet NRC and EPA dose standards. The ODCM also contains the requirements for the REMP (Exelon 2020-TN11685). As discussed during the environmental site audit, there are no proposed changes or upgrades to the effluent control program planned for the SLR term (CEG 2025-TN11341).

3.13.1.1 Radioactive Liquid Waste Management

The four systems described in the CEG ER used to process the liquid radwaste are the equipment drain system; the floor drain system; the maximum recycle system (which is part of the floor drain system); and the portable waste treatment system (CEG 2024-TN11347).

CEG's ER Section 2.2.6.1 states that the processed wastewater may be discharged to the river through the discharge canal (CEG 2024-TN11347). As discussed during the environmental site audit, DNPS has not had a routine (batch or continuous) radioactive liquid effluent discharge since 2009. DNPS may discharge if needed, but since 2009, instead of being discharged as effluent, processed water from the equipment drain system and floor drain system has been recycled into the condensate system (CEG 2025-TN11341).

CEG's ER Section 2.2.6.1 describes a "maximum recycle system;" however, this system is idle and not currently being used. Instead, the water from the equipment drain system is routed to a system referred to as advanced liquid processing. After being processed by the advanced liquid processing, water is sampled and routed back to the CSTs to be either discharged (if needed) or recycled into the condensate system. CEG's ER Section 2.2.6.1 describes portable waste treatment systems. As discussed during the audit, the portable waste treatment systems are only used when temporary waste treatment systems are needed in specific locations and are not part of the routine system (CEG 2024-TN11347, CEG 2025-TN11341).

The NRC staff reviewed 5 years of radioactive effluent release data from 2019 through 2023 (NRC 2024-TN11680). A 5-year period provides a dataset that covers a broad range of activities that occur at a nuclear power plant, such as refueling outages, routine operation, and maintenance, which can affect the generation of radioactive effluents into the environment. The NRC staff compared the data against NRC dose limits and looked for indications of adverse trends (i.e., increasing dose levels or increasing radioactivity levels).

As discussed below, effluent release data for the 5-year period analyzed by the NRC staff were found to be well below regulatory standards. For example, the calculated doses from radioactive liquid effluents released from DNPS during 2023 (NRC 2024-TN11680) are summarized below.

<u>Dresden Nuclear Power Station Unit 2 in 2023</u>

- The total-body dose to an offsite member of the public from DNPS Unit 2 radioactive effluents was 1.17×10^{-9} millirem (mrem) (1.17×10^{-11} millisievert [mSv)]), which is well below the 3 mrem (0.03 mSv) dose criterion in Appendix I of 10 CFR Part 50 (TN249).

- The maximum organ dose (gastrointestinal tract) to an offsite member of the public from DNPS Unit 2 radioactive effluents was 1.17×10^{-9} mrem (1.17×10^{-11} mSv), which is well below the 10 mrem (0.1 mSv) dose criterion in Appendix I of 10 CFR Part 50 (TN249).

<u>Dresden Nuclear Power Station Unit 3 in 2023</u>

- The total-body dose to an offsite member of the public from DNPS Unit 3 radioactive effluents was 1.17×10^{-9} (mrem (1.17×10^{-11} mSv), which is well below the 3 mrem (0.03 mSv) dose criterion in Appendix I of 10 CFR Part 50 (TN249).

- The maximum organ dose (gastrointestinal tract) to an offsite member of the public from DNPS Unit 3 radioactive effluents was 1.17×10^{-9} mrem (1.17×10^{11} mSv), which is well below the 10 mrem (0.1 mSv) dose criterion in Appendix I of 10 CFR Part 50 (TN249).

The NRC staff's review of CEG's radioactive liquid effluent control program shows that radiation doses to members of the public were maintained within NRC and EPA radiation protection standards, as contained in Appendix I to 10 CFR Part 50 (TN249), 10 CFR Part 20 (TN283), and Title 40, "Protection of Environment," of the 40 CFR Part 190 (TN739), "Environmental Radiation Protection Standards for Nuclear Power Operations." The NRC staff observed no adverse trends in the dose levels.

During the SLR term, CEG will continue to perform routine nuclear power plant refueling and maintenance activities. Based on CEG's past performance in operating a radioactive waste system at DNPS that maintains ALARA doses from radioactive liquid effluents, the NRC staff expect that CEG will maintain similar performance during the SLR term.

As documented in the effluent reports, there were no abnormal liquid releases in the period from 2020 through 2023 (NRC 2024-TN11680). CEG's ER Section 3.10.3 states that while there were no abnormal radioactive releases in 2018, 2020, 2021, or 2022, there were 16 abnormal liquid releases in 2019 as documented in the Annual Effluent Report (NRC 2024-TN11680). NRC staff also reviewed the 2018 effluent report to compare it to the 2019–2023 reports. For 2018–2022, DNPS effluents were well within ODCM and federally required limits. In reviewing the reports spanning 2018–2023, the NRC staff observed, and the licensee confirmed, that this difference was the result of the differing formats of the reports rather than an indication that anything different occurred in 2019 in comparison to the other years (in terms of effluent releases or discharges). An exception is the West Tritium Remediation well, which was put into service in September 2019 (CEG 2025-TN11341).

3.13.1.2 Radioactive Gaseous Waste Management

Section 2.2.6.1 of the CEG's ER discusses radioactive gaseous waste management. The NRC staff summarize that information below and incorporates the information from CEG's ER, Section 2.2.6.1 (CEG 2024-TN11347: p. 2-12), herein by reference. The gaseous waste management system used at DNPS is designed to remove fission product gases from the reactor coolant and minimize the amount of radioactive material released into the environment. The gases are stored for an appropriate time to allow for radioactive decay of the material to levels that comply with plant procedures to ensure that the radiation doses to members of the public are within regulatory limits (CEG 2024-TN11347). The radioactive gaseous waste sampling and analysis program specifications provided in the ODCM address the gaseous release type, sampling frequency, minimum analysis frequency, type of activity analysis, and lower limit of detection (i.e., sensitivity) for the radiation monitor (Exelon 2020-TN11685).

CEG calculates dose estimates for members of the public based on radioactive gaseous effluent release data and atmospheric transport models. CEG annual radioactive effluent release reports present in detail the radiological gaseous effluents released from DNPS and the resultant calculated doses. As described in Section 3.13.1.1, the NRC staff reviewed 5 years of radioactive effluent release data from the 2019–2023 reports (NRC 2024-TN11680). The NRC staff compared the data against NRC dose limits and looked for indications of adverse trends (i.e., increasing dose levels or increasing radioactivity levels) over the period of 2019–2023.

The calculated doses from radioactive gaseous effluents released from DNPS during 2023 (NRC 2024-TN11680) are summarized below.

<u>Dresden Nuclear Power Station Gaseous Effluents in 2023 Unit 2</u>

- The air dose due to noble gases with resulting gamma radiation in gaseous effluents was 1.09×10^{-3} milliradian (mrad) (1.09×10^{-5} milligray), which is well below the 10 mrad (0.1 milligray) dose criterion specified in Appendix I of 10 CFR Part 50 (TN249).
- The air dose from beta radiation in gaseous effluents was 4.31×10^{-5} mrad (4.31×10^{-7} milligray), which is well below the 20 mrad (0.2 milligray) dose criterion specified in Appendix I of 10 CFR Part 50 (TN249).

- The critical organ dose to an offsite member of the public from radiation in gaseous effluents as a result of iodine-131, iodine-133, hydrogen-3, and particulates with greater than 8-day half-lives was 2.06×10^{-2} mrem (2.06×10^{-4} mSv), which is below the 15 mrem (0.15 mSv) dose criterion in Appendix I of 10 CFR Part 50 (TN249).

<u>Dresden Nuclear Power Station Gaseous Effluents in 2023 Unit 3</u>

- The air dose due to noble gases with resulting gamma radiation in gaseous effluents was 4.05×10^{-4} mrad (4.05×10^{-6} milligray), which is well below the 10 mrad (0.1 milligray) dose criterion specified in Appendix I of 10 CFR Part 50 (TN249).
- The air dose from beta radiation in gaseous effluents was 1.86×10^{-5} mrad (1.86×10^{-7} milligray), which is well below the 20 mrad (0.2 milligray) dose criterion specified in Appendix I of 10 CFR Part 50 (TN249).
- The critical organ dose to an offsite member of the public from radiation in gaseous effluents as a result of iodine-131, iodine-133, hydrogen-3, and particulates with greater than 8-day half-lives was 1.59×10^{-2} mrem (1.59×10^{-4} mSv), which is below the 15 mrem (0.15 mSv) dose criterion in Appendix I of 10 CFR Part 50 (TN249).

The NRC staff's review of DNPS' radioactive gaseous effluent control program showed radiation doses to members of the public that were well below NRC and EPA radiation protection standards contained in Appendix I of 10 CFR Part 50 (TN249), 10 CFR Part 20 (TN283), and 40 CFR Part 190 (TN739). The NRC staff observed no adverse trends in the dose levels over the 5 years reviewed.

As documented in the effluent reports, there were no abnormal gaseous releases in the period 2020–2023 (NRC 2024-TN11680). CEG's ER Section 3.10.3 states that while there were no abnormal radioactive gaseous releases in 2018, 2020, 2021, and 2022, there were 4 abnormal gaseous releases in 2019 as documented in the Annual Effluent Report (NRC 2024-TN11680). NRC staff also reviewed the 2018 effluent report to compare it to the 2019–2023 reports. For 2018–2023, DNPS effluents were well within ODCM and federally required limits. In reviewing the reports spanning 2018–2023, the NRC staff observed, and the licensee confirmed, that this difference was the result of the differing formats of the reports rather than an indication that anything different occurred in 2019 in comparison to the other years in terms of effluent releases or discharges. As confirmed during the environmental site audit, there have been no reportable unplanned releases of gaseous radioactive materials since the ER was written (CEG 2025-TN11341).

During the SLR term, CEG would continue to perform routine plant refueling and maintenance activities. Based on CEG's past performance in operating a radioactive waste system at DNPS that maintains ALARA doses from radioactive gaseous effluents, the NRC staff expect that DNPS would maintain similar performance during the SLR term.

3.13.1.3 Radioactive Solid Waste Management

DNPS' radioactive solid waste management system provides for packaging and/or solidification of radioactive waste that will subsequently be shipped off site to an approved burial facility, in accordance with NRC regulations in 10 CFR Parts 61 (TN252) and 71 (TN301). Transportation of the radioactive solid waste is governed by the U.S. Department of Transportation regulations in 49 CFR Part 171 to 49 CFR Part 178 (TN10307).

Section 2.2.6.3 of CEG's ER discusses radioactive solid waste management. The NRC staff summarize that information below and incorporates the information in the CEG ER, Section 2.2.6.3 (CEG 2024-TN11347: pp. 2-13 to 2-14), herein by reference. Solid radioactive wastes are logged, processed, packaged, and stored for subsequent shipment and offsite burial. Solid radioactive wastes and potentially radioactive wastes include reactor components, equipment, and tools removed from service; chemical laboratory samples; spent resins; used filter cartridges; and radioactively contaminated hardware, as well as compacted wastes such as contaminated protective clothing, paper, rags, and other trash generated from plant design modifications and operations and routine maintenance activities. In addition, nonfuel radioactive solid wastes result from treating and separating radionuclides from gases and liquids and from removing contaminated material from various reactor areas. The waste is divided into two categories: (1) dry active waste and (2) wet active waste. Low-level radioactive waste (LLRW) is classified as Class A, Class B, Class C, or Greater-Than-Class-C (GTCC). Class A includes both dry active waste and processed waste (e.g., dewatered resins). Classes B and C normally include processed waste and irradiated hardware. The majority of LLRW generated at DNPS is Class A waste. Classes B and C wastes constitute a low percentage by volume of the total LLRW generated. Radioactive waste that is GTCC is the responsibility of the Federal government. Low-level mixed waste is managed and transported to the facility with which CEG has contracts.

CEG has a contract with Energy Solutions for the processing and disposal of all radiologically contaminated material from DNPS. Routine plant operation, refueling outages, and maintenance activities that generate radioactive solid waste would continue during the SLR term. Radioactive solid waste is expected to be generated and shipped off site for disposal during the SLR term. As discussed during the environmental site audit, there are no plans to change the radioactive solid waste disposal program during the SLR term (CEG 2025-TN11341).

3.13.1.4 Radioactive Waste Storage

CEG's ER Section 2.2.6.3 discusses the DNPS Radioactive Solid Waste Management Systems (CEG 2025-TN11341). As indicated in CEG's ER and discussed with the NRC staff at the virtual audit, DNPS has sufficient existing capability to store all generated LLRW on site. As discussed during the audit, there are no proposed upgrades or changes to the solid low-level waste (LLW) management program during the SLR term. DNPS does not currently store any GTCC waste on site and there is sufficient storage space for GTCC waste should it need to be stored (CEG 2024-TN11347, CEG 2025-TN11341).

CEG's ER Section 2.2.6.5 notes that DNPS provides onsite storage of mixed waste and ER Section 2.2.7 discusses hazardous and universal wastes (CEG 2025-TN11341). As confirmed during the audit, there are no other wastes, besides mixed waste, stored in the mixed waste storage location. There are no proposed upgrades or changes planned for the hazardous or mixed waste program during the SLR term. Additionally, the increased volume of nonhazardous waste disposed of in 2020 compared to other years in the period of 2018–2022 as seen in Table 2.2-2 in CEG's ER is due to housekeeping activities in preparation for potential decommissioning at that time (CEG 2025-TN11341).

DNPS does not currently generate or store mixed waste on site. No additional construction of onsite storage facilities would be necessary for LLRW or mixed waste storage during the proposed SLR term. As CEG confirmed during the audit, there are no proposed changes to the solid waste storage program during the SLR term. Also, there is no GTCC waste currently stored on site and there is adequate storage between the ISFSI, LLRW storage capacity, and spent fuel pools to safely store the GTCC waste likely to be generated during the SLR term, accounting for the needed capacity for the spent nuclear fuel generated through the SLR term (CEG 2025-TN11341).

DNPS has an alternative disposal site that is approximately 100 m^2 plot of land located in the OCA to the north of the site. In its 2014 application for the 10 CFR 20.2002 (TN283) disposal site, which was approved by the NRC in December 2015 (NRC 2015-TN11822), CEG estimated that 200,000 cubic feet (ft^3) (6,000 cubic meters [m^3]) of soils containing trace quantities of residual radioactive materials were accumulated at DNPS from various projects conducted between 2006 and 2012 (EGC 2014-TN11823). CEG confirms that, based on the available records generated per the site procedure implementing the requirements of the 10 CFR 20.2002 Disposal Permit and maintained in accordance with 10 CFR 50.75(g) (TN249), the actual volume of soil that was disposed of at the disposal site totals approximately 134,900 ft^3 (3,820 m^3). No sewage treatment drying bed waste was placed in this disposal area; therefore, no permits from the State of Illinois were required. CEG does not have any plans to add materials in this disposal area. The dose contribution from the disposal site will be accounted for at the time of license termination to meet the criteria for decommissioning in 10 CFR, Part 20, Subpart E, per the requirements of 10 CFR 50.82(a)(11)(ii) (CEG 2025-TN11341).

CEG stores spent fuel in the spent fuel pool and in an onsite ISFSI. The ISFSI safely stores spent fuel on site in licensed and approved dry cask storage containers. Spent fuel is stored in the ISFSI under a general license. CEG's ER Section 2.2.6.4 (CEG 2024-TN11347) states:

> The station has two separate ISFSIs. The East ISFSI is comprised of two sections and has space for 10 additional casks. The West ISFSI is one pad and has space for 13 additional casks. As of November 2023, DNPS has completed construction on an expansion of the West ISFSI that will provide adequate storage to operate through the subsequent period of extended operation (SPEO) for Units 2 and 3.

As confirmed during the audit, there are three ISFSI locations on the DNPS site. The East ISFSI, the West ISFSI, and the South ISFSI (which is referred to as the West ISFSI expansion in CEG's ER). The West ISFSI second pad construction has been completed. The South ISFSI has one completed pad that can accommodate fuel until approximately 2031. Land immediately to the north and adjacent to the South pad is planned for future ISFSI expansion. This additional pad in the South ISFSI would have enough capacity to accommodate dry storage needs, but the pools would still be necessary for spent fuel storage accounting for this additional expansion that is planned. If further expansion is deemed necessary, there are locations within the site on previously disturbed land that could be available (CEG 2025-TN11341). The NRC staff understand that CEG is allowed under a 10 CFR Part 72 (TN4884) general license as part of its 10 CFR Part 50 (TN249) licenses to build ISFSI capacity as necessary (see 10 CFR Part 72-TN4884).

3.13.1.5 Radiological Environmental Monitoring Program

CEG maintains a REMP to assess the radiological impact, if any, to the public and the environment from DNPS operations. The REMP measures the aquatic, terrestrial, and atmospheric environment for ambient radiation and radioactivity. Monitoring is conducted for the following: direct radiation, air, precipitation, well water, river water, surface water, milk, food products and vegetation (such as edible broad leaf vegetation), fish, silt, and shoreline sediment. The REMP also measures background radiation (i.e., cosmic sources, global fallout, and naturally occurring radioactive material, including radon). As part of the REMP, CEG conducts analyses of selected wells for the presence of gamma emitters and tritium in groundwater on a quarterly basis.

The NRC staff reviewed 5 years of annual radiological environmental monitoring data from 2019 through 2023 (Exelon 2020-TN11824, Exelon 2021-TN11825, Exelon 2022-TN11831, Exelon 2023-TN11835; CEG 2024-TN11837, CEG 2025-TN11839). A 5-year period provides a dataset that covers a broad range of activities that occur at a nuclear power plant, such as refueling outages, routine operation, and maintenance that can affect the generation and release of radioactive effluents into the environment. The NRC staff reviewed the data for indications of adverse trends (i.e., increasing dose levels or increasing radioactivity levels) over the period of 2019 through 2023.

In addition to the REMP, CEG established an onsite groundwater protection initiative program in accordance with NEI 07-07, "Industry Groundwater Protection Initiative" (NEI 2007-TN1913). This program monitors the onsite nuclear power plant environment to detect leaks from nuclear power plant systems and pipes containing radioactive liquid. Section 3.5.2.3 contains information on DNPS' onsite groundwater protection initiative program. CEG performs groundwater monitoring from a network of groundwater monitoring wells, indoor and outdoor piezometers, and manholes to monitor for potential radioactive releases to groundwater, environmental conditions, and groundwater elevation in accordance with site procedures as described in Section 3.6.2.4 of CEG's ER (CEG 2024-TN11347).

Based on its review of the REMP and inadvertent release data, the NRC staff find no apparent increasing trend in concentration or pattern indicating persistently high tritium or other radionuclide concentrations that might indicate an ongoing inadvertent release from DNPS. The groundwater monitoring program data at DNPS shows that CEG monitors, characterizes, and actively remediates spills, and that there were no significant radiological impacts to the environment from operations at DNPS.

3.13.2 Nonradioactive Waste

DNPS generates nonradioactive waste from nuclear power plant maintenance, cleaning, and operational processes. DNPS manages nonradioactive wastes in accordance with applicable Federal and State regulations, as implemented through its corporate procedures. DNPS generates and manages hazardous wastes, nonhazardous wastes, and universal wastes. CEG maintains a list of waste vendors that it has approved for use across the entire company to remove and dispose of the nonradioactive wastes off site. CEG maintains a list of approved waste vendors used to manage and dispose of hazardous, nonhazardous, and recyclable waste (CEG 2024-TN11347).

Waste minimization and pollution prevention are important elements of operations at all nuclear power plants. Licensees are required to consider pollution prevention measures as dictated by the Pollution Prevention Act (Public Law 101 5084 [TN6607]) and the Resource Conservation and Recovery Act of 1976, as amended (Public Law 94 580 [TN1281]).

The Resource Conservation and Recovery Act governs the disposal of solid waste. The IEPA Bureau of Land Permit Section is authorized by the EPA to implement the Resource Conservation and Recovery Act and regulate solid and hazardous waste in Illinois (CEG 2024-TN11347). DNPS has a nonradioactive waste management program to handle nonradioactive waste in accordance with Federal, State, and corporate regulations and procedures. DNPS maintains a waste minimization program that uses material control, process control, waste management, recycling, and feedback to reduce waste.

DNPS' SWPPP identifies potential sources of pollution that may affect the quality of stormwater discharges from permitted outfalls. The SWPPP also describes BMPs for reducing pollutants in stormwater discharges and assuring compliance with the site's NPDES permit (CEG 2024-TN11347).

DNPS also has an environmental management system (CEG 2024-TN11347). Procedures are in place to monitor areas within the site that have the potential to discharge oil into or on navigable waters, in accordance with the regulations in 40 CFR Part 112, "Oil Pollution Prevention" (TN1041). The Pollution Incident/Hazardous Substance Spill Procedure identifies and describes the procedures, materials, equipment, and facilities that CEG uses to minimize the frequency and severity of oil spills at DNPS.

DNPS is subject to the EPA reporting requirements in 40 CFR Part 110, "Discharge of Oil," under CWA Section 311(b)(4) (TN8485). Under these regulations, DNPS must report to the EPA's National Response Center any discharges of oil if the quantity may be harmful to the public health or welfare or to the environment. Based on the NRC staff's review of Section 9.5.3.6 of CEG's ER (CEG 2024-TN11347) and a review of records from 2018 to 2022, there have been no releases at DNPS that have triggered this notification requirement (CEG 2024-TN11347) during that time period. In addition, CEG confirmed that there have been no reportable spills under the provisions of 40 CFR Part 110 from 2018 through when the NRC staff's audit took place in December 2024 (CEG 2025-TN11341).

DNPS is subject to the reporting provisions of 40 CFR 262.34(d)(5)(iv)(C) (TN5492) as they relate to a fire, explosion, or other release of hazardous waste that could threaten human health outside the facility boundary or when the facility has knowledge that a spill has reached a surface water. Any such event must be reported to the EPA's National Response Center. Based on the NRC staff's review of Section 9.5.13.2 of CEG's ER and of records from 2019 to 2023, there have been no releases at DNPS during that time that triggered this notification requirement (CEG 2024-TN11347). In addition, CEG confirmed that there have been no inadvertent releases or spills at DNPS that would trigger the notification requirement from when CEG's ER was developed through the NRC staff audit in December 2024 (CEG 2025-TN11341).

3.13.3 Proposed Action

As described in the LR GEIS (NRC 2024-TN10161) and as cited in Table 3-1 of this SEIS, for generic issues related to waste management, the impacts of nuclear power plant LR and continued operations would be SMALL during the SLR term for the issues of LLRW storage and disposal, onsite storage of spent nuclear fuel, mixed waste storage and disposal, and nonradioactive waste storage and disposal. For the period after the licensed life for reactor operations, the impacts of onsite storage of spent nuclear fuel during the continued storage period are discussed in NUREG-2157 (NRC 2014-TN4117) and as stated in 10 CFR 51.23(b) (TN10253), are incorporated by reference into this SEIS. The NRC staff's review did not identify any new and significant information that would change the conclusions in the LR GEIS. Thus, as concluded in the LR GEIS, for these Category 1 (generic) issues, the impacts of continued operation on waste management during the SLR term would be SMALL.

CEG confirms that it will ensure that there will be adequate spent fuel storage to safely accommodate spent fuel on site for the current license term and during the proposed SLR term. The impacts of onsite storage of spent nuclear fuel during the SLR term is a Category 1 issue and has been determined to be SMALL at all plants, as stated in Table B-1 in Appendix B to

Subpart A of 10 CFR Part 51 (TN10253). For the period after the licensed life for reactor operations, the impacts of onsite storage of spent nuclear fuel during the continued storage period are discussed in NUREG-2157 (NRC 2014-TN4117) and as stated in 10 CFR 51.23(b), shall be deemed incorporated into this issue.

The ultimate disposal of spent fuel in a potential future geologic repository is a separate and independent licensing action that is outside the regulatory scope of this review. Per Appendix B to Subpart A of 10 CFR Part 51 (TN10253), the Commission concludes that the impacts presented in NUREG-2157 (NRC 2014-TN4117) would not be sufficiently large to require the NEPA conclusion, for any plant, that the option of extended operation under 10 CFR Part 54 (TN4878) should be eliminated. Accordingly, while the Commission has not assigned a single level of significance for the impacts of spent nuclear fuel and high-level waste disposal, this issue is considered generic to all nuclear power plants. There are no plant-specific (Category 2) waste management issues applicable to DNPS (Table 3-2).

3.13.4 No-Action Alternative

Under the no-action alternative, DNPS would cease operation at the end of the term of the current operating licenses or sooner and enter decommissioning. After entering decommissioning, the plant would generate less spent nuclear fuel, emit less gaseous and liquid radioactive effluents into the environment, and generate less low-level radioactive and nonradioactive wastes. In addition, following shutdown, the variety of potential accidents at the plant (radiological and industrial) would be reduced to a limited set associated with shutdown events and fuel handling and storage. Therefore, as radioactive emissions to the environment decrease, and the likelihood and variety of accidents decrease following shutdown and decommissioning, the NRC staff conclude that impacts resulting from waste management from implementation of the no-action alternative would be SMALL.

3.13.5 Replacement Power Alternatives: Common Impacts

The LR GEIS in Appendix D, Section D.4.10 provides types of wastes routinely associated with the construction and operation of replacement power alternatives (NRC 2024-TN10161). The NRC staff summarize that information below and incorporates the information in NUREG-1437, Revision 2, Appendix D, Section D.4.10 (NRC 2024-TN10161: p. D-38 and p. D-40), herein by reference.

<u>Construction</u>

Impacts would be from construction-related nonradiological debris. Materials and wastes would be accumulated on site and disposed of or recycled through licensed offsite disposal and treatment facilities (NRC 2024-TN10161).

<u>Operations</u>

Solid wastes would be generated throughout the period of plant operations. Most facilities produce small amounts of industrial solid wastes associated with onsite maintenance of equipment and infrastructure. Such wastes could include used oils, used glycol-based antifreeze, waste lead-acid storage batteries, spent cleaning solvents, and excess corrosion control coatings, requiring proper characterization and disposal. The LR GEIS in Appendix D, Section D.4.10 provides types of wastes routinely associated with the maintenance of mechanical and electrical equipment (NRC 2024-TN10161).

3.13.6 Natural Gas Alternative

Impacts from the waste generated during the construction of the NGCC plant would include those identified in Section 3.13.5 as common to all replacement power alternatives.

Waste generation from operation of the natural gas technology would be minimal. The only significant waste generated at a NGCC plant would be spent selective catalytic reduction catalyst (plants use selective catalytic reduction catalyst to control nitrogen oxide emissions). This spent catalyst is considered hazardous and would be disposed of at a facility that handles hazardous materials. Other than the spent selective catalytic reduction catalyst, waste generation at an operating NGCC plant would be limited largely to typical operations and maintenance of nonhazardous waste. Based on this information, the NRC staff conclude that the waste impacts for the natural gas alternative would be SMALL.

3.13.7 Renewable and Natural Gas Combination Alternative

Impacts from the waste generated during the construction and operation of the renewable and natural gas combination alternative would include those identified in Section 3.13.5 as being common to all replacement power alternatives.

The construction and operation of the solar PV facilities would create sanitary and industrial waste. This waste could be recycled or shipped to an offsite waste disposal facility. All the waste would be handled in accordance with appropriate State of Illinois regulations. Therefore, the NRC staff conclude that the waste management impacts resulting from the construction and operation of the PV facilities would be SMALL.

During construction of onshore wind facilities as part of the combination alternative, waste materials or the accidental release of fuels are expected to be negligible because of the very limited amount of traffic and construction activity that might occur with construction, installation, operation, and decommissioning of onshore turbine generators. Therefore, the waste management impacts resulting from the construction and operation of the onshore wind portion would be SMALL.

3.14 Evaluation of New and Significant Information

As stated in Section 1.4, for Category 1 (generic) issues, the NRC staff can rely on the analysis in the LR GEIS (NRC 2024-TN10161) unless otherwise noted. Table 3-1 lists the Category 1 issues that apply to DNPS during the proposed SLR term. For these issues, the NRC staff did not identify any new and significant information based on its review of CEG's ER (CEG 2024-TN11347), the SAMA and environmental site audits, the review of available information as cited in this SEIS, or arising through the environmental scoping process, that would change the conclusions presented in the LR GEIS.

New and significant information must be new, based on a review of the LR GEIS (NRC 2024-TN10161), as codified in Table B-1 in Appendix B to Subpart A of 10 CFR Part 51 (TN10253). Such information must also bear on the proposed action or its impacts, presenting a seriously different picture of the impacts from those envisioned in the LR GEIS (i.e., impacts of greater severity than impacts considered in the LR GEIS, considering their intensity and context).

The NRC defines new and significant information in Regulatory Guide 4.2, Supplement 1, Revision 2 "*Preparation of Environmental Reports for Nuclear Power Plant License Renewal Applications*" (NRC 2024-TN10280), as (1) information that identifies a significant environmental issue that was not considered or addressed in the LR GEIS and, consequently, not codified in Table B-1 in Appendix B to Subpart A of 10 CFR Part 51 (TN10253), or (2) information not considered in the assessment of impacts evaluated in the LR GEIS leading to a seriously different picture of the environmental consequences of the action than previously considered, such as an environmental impact finding different from that codified in Table B-1. Further, a significant environmental issue includes, but is not limited to, any new activity or aspect associated with the nuclear power plant that can act upon the environment in a manner or an intensity not previously recognized or quantified.

In accordance with 10 CFR 51.53(c) (TN10253), the applicant's ER must analyze the Category 2 (plant-specific) issues in Table B-1 in 10 CFR Part 51, Subpart A, Appendix B. Additionally, the applicant's ER must discuss actions to mitigate any adverse impacts associated with the proposed action and environmental impacts of alternatives to the proposed action. In accordance with 10 CFR 51.53(c)(3), the applicant's ER does not need to analyze any Category 1 issue unless there is new and significant information about a specific issue.

NUREG-1555, Supplement 1, Revision 2, "*Standard Review Plans for Environmental Reviews for Nuclear Power Plants for Operating License Renewal*," describes the NRC process for identifying new and significant information (NRC 2024-TN10251). The search for new information includes, but is not limited to:

- review of an applicant's ER (CEG 2024-TN11347) and the process for discovering and evaluating the significance of new information
- review of public comments
- review of environmental quality standards and regulations
- coordination with Federal, State, Tribal, and local environmental protection and resource agencies
- review of technical literature as documented through this SEIS

New information that the NRC staff discover is evaluated for significance using the criteria set forth in the LR GEIS. For Category 1 issues for which new and significant information is identified, reconsideration of the conclusions for those issues is limited in scope to assessment of the relevant new and significant information; the scope of the assessment does not include other facets of an issue that the new information does not affect.

The NRC staff reviewed the discussion of environmental impacts associated with operation during the renewal term in the LR GEIS and conducted its own independent review, including a public involvement process (e.g., public meetings and public comments) to identify new and significant issues for the DNPS SLRA environmental review. The assessment of new and significant information for each resource is addressed within each resource area discussion.

3.15 Impacts Common to All Alternatives

This section describes the impacts that the NRC staff consider common to all alternatives discussed in this SEIS, including the proposed action and replacement power alternatives. In addition, the following sections discuss the fuel cycles of the proposed action and replacement power alternatives, the termination and decommissioning of nuclear power plant operations and potential replacement power facilities, and GHG emissions and climate change.

3.15.1 Fuel Cycle

This section describes the environmental impacts associated with the fuel cycles of both the proposed action (uranium fuel cycle) and all replacement power alternatives that are analyzed in detail in this SEIS.

3.15.1.1 Uranium Fuel Cycle

The uranium fuel cycle consists of uranium mining and milling, the production of uranium hexafluoride, isotopic enrichment, fuel fabrication, reprocessing of irradiated fuel, transportation of radioactive materials, and management of low-level wastes and high-level wastes related to uranium fuel cycle activities. Impacts to the uranium fuel cycle are evaluated in the LR GEIS (NRC 2024-TN10161) and are considered to be generic (the same or similar at all plants), or Category 1. Section 4.14.1 of the LR GEIS describes in detail the generic potential impacts of the radiological and nonradiological environmental impacts of the uranium fuel cycle and transportation of nuclear fuel and wastes (NRC 2024-TN10161). The NRC staff incorporate the information in the LR GEIS Section 4.14.1 (NRC 2024-TN10161: pp. 4-150 through 4-164) herein by reference. The LR GEIS does not identify any plant-specific (Category 2) uranium fuel cycle issues (NRC 2024-TN10161).

As stated in the LR GEIS (NRC 2024-TN10161) and indicated in Table 3-1 of this SEIS, the generic issues related to the uranium fuel cycle would not be affected by continued operations associated with LR. The NRC staff identified no new and significant information for these issues. Thus, as concluded in the LR GEIS, the NRC staff find that the impacts of generic issues related to the uranium fuel cycle would be SMALL for the proposed DNPS SLR.

3.15.1.2 Replacement Power Plant Fuel Cycles

<u>Natural Gas Alternative</u>

Fuel cycle impacts for an NGCC power plant result from the transport of fuel to the facility and management and ultimate disposal of any wastes from fuel combustion. These impacts are discussed in more detail in Appendix D, Section D.4.12.1 of the LR GEIS (NRC 2024-TN10161) and can generally include the following: significant changes to land use and visual resources; impacts on air quality, including release of criteria pollutants, VOCs, and methane into the atmosphere; noise impacts; ecological impacts, and historic and cultural resource impacts within the pipeline footprint associated with the supply of the fuel; socioeconomic impacts from employment of workforce and service and support industries; health impacts on workers from exposure to airborne emissions such as methane gases; and generation of other industrial wastes.

<u>Renewable and Natural Gas Combination Alternative</u>

As stated in Appendix D, Section D.4.12.3 of the LR GEIS (NRC 2024-TN10161) (under “Renewable Alternatives”), the fuel cycles for renewable technologies such as wind and solar are difficult to define. This is because the associated natural resources exist regardless of any effort to harvest them for electricity production. Impacts from the presence or absence of these renewable energy technologies are often difficult to determine (NRC 2024-TN10161).

3.15.2 Terminating Power Plant Operations and Decommissioning

This section describes the environmental impacts of the DNPS SLR associated with the termination of operations and the decommissioning of a nuclear power plant and replacement power alternatives. All operating nuclear power plants will terminate operations and be decommissioned at some point after the end of their operating life or after a decision is made to cease operations. The proposed action would delay this eventuality for an additional 20 years beyond the current license term.

3.15.2.1 *Existing Nuclear Power Plant*

The decommissioning process begins when a licensee informs the NRC that it has permanently ceased reactor operations, defueled, and intends to decommission the nuclear plant. The licensee may also notify the NRC of the permanent cessation of reactor operations prior to the end of the license term. Consequently, most nuclear plant activities and systems dedicated to reactor operations would cease after reactor shutdown. The environmental impacts of decommissioning a nuclear power plant are evaluated in the decommissioning GEIS (NRC 2002-TN7254). Additionally, Section 4.14.2.1 of the LR GEIS (NRC 2024-TN10161) summarizes the incremental environmental impacts associated with nuclear power plant decommissioning activities. Termination of station operation and decommissioning impacts include waste volumes, changes in worker numbers, and changes in tax revenues. As listed in Table 3-1, there is one Category 1 issue for the “Termination of power plant operations and decommissioning,” applicable to DNPS decommissioning. The LR GEIS (NRC 2024-TN10161) did not identify any plant-specific (Category 2) decommissioning issues.

3.15.2.2 Replacement Power Facilities

<u>Natural Gas Alternative</u>

The environmental impacts from the termination of power plant operations and the decommissioning of a power generating facility are dependent on the facility’s decommissioning plan. Decommissioning plans generally outline the actions needed to restore the site to a condition equivalent in character and value to the site on which the facility was first constructed. General elements and requirements for a thermoelectric power plant decommissioning plan can include the removal of structures below grade, the removal of all accumulated waste materials, the removal of intake and discharge structures, and the cleanup and remediation of incidental spills and leaks at the facility.

The environmental consequences of decommissioning can generally include the following:

- short-term impacts on air quality and noise from the deconstruction of facility structures
- short-term impacts on land use and visual resources
- long-term reestablishment of vegetation and wildlife communities
- socioeconomic impacts caused by decommissioning the workforce and the long-term loss of jobs
- elimination of health and safety impacts on operating personnel and the public

These impacts are representative of those associated with decommissioning any thermoelectric power generating facility. Activities that are unique to the termination of operations and the decommissioning of a power generating facility include the safe removal of the facility from service, the reduction of residual fuel and wastes to a level that permits the release of the property under restricted conditions or unrestricted use, and the termination of the license.

Renewable and Natural Gas Combination Alternative

The environmental impacts from termination of power plant operations and decommissioning for the natural gas component of the combination alternative are described in the previous section. The decommissioning of renewable energy facilities would generally result in similar activities and environmental impacts. Decommissioning would involve the removal of facility components and any operational wastes and residues, if present, to restore sites to a condition equivalent in character and value to the site on which the facility was first constructed. In other circumstances, supporting infrastructure (e.g., buried utilities and pipelines) could be abandoned in place (NRC 2024-TN10161). The range of possible decommissioning considerations and impacts, depending on the renewable energy alternative considered, are discussed in Appendix D, Section D.4.13.3 of the LR GEIS (NRC 2024-TN10161), which is incorporated herein by reference.

3.15.3 Greenhouse Gas Emissions and Climate Change

The following sections discuss GHG emissions and climate change impacts.

3.15.3.1 Greenhouse Gases

Gases found in the Earth's atmosphere that trap heat and play a role in the Earth's climate are collectively termed GHGs. GHGs include carbon dioxide (CO_2), methane, nitrous oxide (N_2O), water vapor (H_2O), and fluorinated gases, such as hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride. The Earth's climate responds to changes in concentrations of GHGs in the atmosphere because these gases affect the amount of energy absorbed and heat trapped by the atmosphere. Increasing concentrations of GHGs in the atmosphere generally increase the Earth's surface temperature. Atmospheric concentrations of carbon dioxide, methane, and nitrous oxide have significantly increased since 1750 (IPCC 2023-TN8557).

Carbon dioxide, methane, nitrous oxide, and fluorinated gases (termed long-lived GHGs) are well mixed throughout the Earth's atmosphere, and their impact on climate is long-lasting and cumulative in nature as a result of their long atmospheric lifetime (EPA 2016-TN7561. Therefore, the extent and nature of climate change is not specific to where GHGs are emitted. Carbon dioxide is of primary concern for global climate change because it is the primary gas emitted as a result of human activities. Climate change research indicates that the cause of the Earth's warming over the last 50 years is due to the buildup of GHGs in the atmosphere resulting from human activities (IPCC 2013-TN7434; USGCRP 2014-TN3472, USGCRP 2017-TN5848, USGCRP 2018-TN5847). In 2019, global net GHG emissions were estimated to be 59 ± 6.6 gigatons of CO_2eq, with the largest share in gross GHG emissions being CO_2 from fossil fuels combustion and industrial processes. The atmospheric concentration of CO_2 (measured at 410 parts per million [ppm]) is higher than any time in at least 2 million years (IPCC 2023-TN8557). The annual rate of increase in atmospheric CO_2 over the last 60 years is 100 times faster than previous natural increases (USGCRP 2023-TN9762). The sixth assessment synthesis report from the Intergovernmental Panel on Climate Change states that "[i]t is unequivocal that human influence has warmed the atmosphere, ocean, and land" (IPCC 2023-TN8557).

In 2021, Illinois emitted approximately (228 MT) of CO_2eq (IEPA 2024-TN11876). The transportation sector and the electric power generation sector were the largest contributors to Illinois 2021 emissions, representing 24 percent and 21 percent, respectively, of total emissions (IEPA 2024-TN11876). Illinois' 2021 GHG emissions were 20 percent lower than 2005 emissions (IEPA 2024-TN11876). The CEJA (TN11284), signed into law in 2021, sets a statewide target of 100 percent carbon free power sector by 2045.

The operation of DNPS results in direct and indirect GHG emissions. CEG provided calculated direct (i.e., stationary combustion sources) and indirect (i.e., workforce commuting) GHG emissions, which are presented in Table 3-27. The direct emissions include emissions from: (1) combustion sources identified in Table 3-6; (2) process carbon dioxide used in the emergency fire suppression system and main generator hydrogen purging during outages; (3) sulfur hexafluoride used for main condenser tube leak testing, main control room tracer gas testing, and in circuit breakers; and (4) hydrofluorocarbon/perfluorocarbon refrigerants and ozone-depleting chemical refrigerants (CEG 2025-TN11341). Fluorinated gas emissions from refrigerant sources and from electrical transmission and distribution systems can result from leakage, servicing, repair, or disposal of sources. In addition to being GHGs, chlorofluorocarbons and hydrochlorofluorocarbons are ozone-depleting substances that are regulated by the CAA under Title VI, "Stratospheric Ozone Protection" (TN1141). CEG has procedures and training for performing sulfur hexafluoride leak testing, control room tracer gas testing, and the maintenance and inspections of the sulfur hexafluoride circuit breakers (CEG 2025-TN11341). CEG has a program in place at DNPS to manage the station refrigeration appliances for the management of ozone depleting substances. DNPS complies with the requirements established in Sections 608 of the CAA and 40 CFR, Part 82, Subpart F and Subpart H (40 CFR Part 82-TN10849). Section 608 of the CAA prohibits the intentional venting of ozone-depleting substances while maintaining, servicing, repairing or disposing of air conditioning or refrigeration equipment. Indirect emissions include emissions from purchased electricity usage and worker vehicle commuting. No DNPS data exist for indirect mobile emission sources from visitors and delivery vehicles (CEG 2024-TN11347).

3.15.3.2 Climate Change

Climate change is the decades or longer change in climate measurements (e.g., temperature and precipitation) that has been observed on a global, national, and regional level (IPCC 2007-TN7421; EPA 2016-TN7561; USGCRP 2014-TN3472). Globally, the year 2024 was the warmest year on record and the 10 warmest years since 1850 have occurred in the past decade (NOAA 2025-TN11287).

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 (1.1°C) 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. (0.08 cm) per decade (EPA 2024-TN10205). From 1901 to 2023, average surface temperature across the contiguous United States has increased by 0.17°F (0.09°C) 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. (0.4 cm) per decade (EPA 2024-TN10205).

Table 3-27 Annual Greenhouse Gas Emissions from Operation at Dresden Nuclear Power Station (Carbon Dioxide Equivalent, tons)

Year	Direct Emissions[(a)]	Indirect Emissions[(b)]	Total CO_2eq
2018	2,865	35,610	38,475
2019	3,180	64,445	67,625
2020	3,465	59,410	62,875
2021	4,130	59,685	63,815
2022	4,380	58,300	62,680
2023	2,935	62,745	65,680

CO_2eq = carbon dioxide equivalents; DNPS = Dresden Nuclear Power Station; EPA = U.S. Environmental Protection Agency's; GHG = greenhouse gas; GWP = global warming potential; USCB = U.S. Census Bureau.

Note: GHG emissions are reported in metric tons and converted to short tons. All reported values are rounded. To convert from short tons per year to metric tons, multiply values by 0.90718. Expressed in CO_2eq, a metric used to compare the emissions of GHGs based on their GWP. The GWP is a measure used to compare how much heat a GHG traps in the atmosphere. The GWP is the total energy that a gas absorbs over a period of time compared to carbon dioxide. CO_2eq is obtained by multiplying the amount of the GHG by the associated GWP. For example, the GWP of methane is 21; therefore, 1 ton of methane emission is equivalent to 21 tons of carbon dioxide emissions.

(a) Direct emissions include combustion sources in Table 3-6; sulfur hexafluoride used for main condenser tube leak testing, main control room tracer gas testing, and in circuit breakers; process carbon dioxide used in the emergency fire suppression system and main generator hydrogen purging during outages; and hydrofluorocarbon/perfluorocarbon refrigerants and ozone-depleting chemical refrigerants. Emissions calculations are based on emission factors from the EPA 2023 Emission Factors for Greenhouse Gas Inventories (EPA 2023-TN11637) table and hours of operation for combustion sources, sulfur hexafluoride usage and/or leaks, carbon dioxide gas usage, and fugitive emissions from refrigerants.

(b) Indirection emissions include emissions from purchased electricity and workforce commuting. Workforce commuting calculations are based on:

   i. Statistical information for carpooling rates from the USCB for workers in the Transportation and Warehouse and Utilities industry were used for the State of Illinois, and Will, Grundy, LaSalle, DuPage, Cook, Kankakee and Kendall Counties to compute a weighted average carpool rate for the DNPS workforce of 6.2% (USCB 2020-TN11881). The highest number of DNPS employees from 2018 through 2022 was 800 (CEG 2025-TN11341).

   ii. Based on the EPA's greenhouse gas equivalencies calculator, the CO_2eq/year was calculated as 3,323 metric tons for 775 vehicles (EPA 2024-TN11096).

Sources: CEG 2024-TN11347, CEG 2025-TN11341.

The United States Global Change Research Program (USGCRP) reports that since 1970, the contiguous United States is warming faster than the global average. Since 1970, global temperature has increased by 1.7°F (0.9°C), while average surface temperature in the contiguous United States has increased by 2.5°F (1.4°C) (USGCRP 2023-TN9762). Observed climate change indicators across the United States include increases in the frequency and intensity of heavy precipitation, earlier onset of spring snowmelt and runoff, rise of sea level and increased tidal flooding in coastal areas, an increased occurrence of heat waves, and a decrease in the occurrence of cold waves. Average sea level along the continental U.S. coastline has risen by about 11 in. (27 cm) over the last century, and between 1993 and 2020 average sea level rose 1.8 in. (4.6 cm) per decade (USGCRP 2023-TN9762).

Climate change and its impacts can vary regionally and seasonally, depending on local, regional, and global factors. Observed climate changes and impacts have not been uniform across the United States. Annual average temperature data for a greater part of the Midwest region (where DNPS is located) between 2002 and 2021 (relative to 1901–1960) exhibit an increase of 0.5°F to 2.0°F (0.28°C to 1.1°C) (USGCRP 2023-TN9762). The number of hot days (days at or above 95°F [35°C]) has decreased by 5.6 days, the number of cold days (days at or below 32°F [0°C]) days has decreased by 4.9 days, and the number of warm nights (nights at or above 70°F [21°C]) has increased by 0.6 days in the Midwest Region from 2002 to 2021 relative to 1901–1960 (USGCRP 2023-TN9762). Average annual precipitation from 2002 to 2021 (relative to the 1901–1960 average) for a greater part of the Midwest Region has increased by 5–15 percent (USGCRP 2023-TN9762). 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) from 1958 to 2021 (USGCRP 2023-TN9762). Summer surface water temperatures have been increasing for the Great Lakes since the late 1970s (USGCRP 2023-TN9762). Long term data (from 1900 to 2022) exhibits wetter conditions for Illinois, with the state having a standardized precipitation evapotranspiration index (SPEI) ranging between +1.5 and +2.5 (USGCRP 2023-TN9762). SPEI measures the combination of precipitation and evapotranspiration to determine if an area is experiencing extreme drought (negative SPEI) or extreme moisture (positive SPEI).

The NRC staff used the NOAA's "Climate at a Glance" tool to analyze temperature and precipitation trends for the 1895–2024 period in Illinois' Northeast Climate Division. A trend analysis shows that the average annual temperature has increased at a rate of 0.2°F (0.1°C) per decade, and average precipitation increased at a rate of 0.52 in. (13.2 mm) per decade (NOAA 2025-TN11877).

3.15.3.3 Proposed Action

3.15.3.3.1 Greenhouse Gas Emissions

As described in the LR GEIS (NRC 2024-TN10161) and as cited in Table 3-1 of this SEIS, the GHG impacts on climate change from continued operations would be SMALL. The NRC staff did not identify any new and significant information that would change the conclusion in the LR GEIS. GHG emissions from routine operations at DNPS included diesel generator and boilers, as well as mobile sources, and are minor. CEG does not anticipate future upgrades or replacement activities of emission sources during the SLR term to support plant operation that could result in a significant increase in GHG emissions. Thus, as concluded in the LR GEIS, for the "Greenhouse gas impact on climate change" generic issue, the impact of continued operation of DNPS on climate change would be SMALL.

3.15.3.3.2 Climate Change Impacts on Environmental Resources

As documented in the LR GEIS (NRC 2024-TN10161) and cited in Table 3-2 of this SEIS, there is a Category 2 issue "Climate change impacts on environmental resources" applicable to DNPS. According to the LR GEIS, the impacts of climate change on environmental resources during the LR term are location-specific and cannot be generally evaluated. Changes in climate can have broad implications for certain resource areas. Climate change may impact the affected environment in a way that alters the environmental resources that are impacted by the proposed action (SLR). For there to be a climate change impact on an environmental resource, the proposed action (SLR) must have an incremental new, additive, or increased physical effect or impact on the resource or environmental condition. Below, the NRC discusses climate change projections and the effects of climate change on environmental resource areas that may also be directly affected by continued operations during the SLR term.

Future global GHG emission concentrations (emission scenarios) and climate models are commonly used to project possible climate change. Climate models indicate that, over the next few decades, temperature increases will continue due to current GHG emission concentrations in the atmosphere (USGCRP 2023-TN9762). This is because it takes time for Earth's climate system to respond to changes in GHG concentrations; if GHG concentrations were to stabilize at current levels, this would still result in at least an additional 1.1°F (0.6°C) of warming (USGCRP 2018-TN5847). Over the longer term, the magnitude of temperature increases, and climate change effects, will depend on future global GHG emissions (USGCRP 2018-TN5847). Climate model simulations often use GHG emission scenarios to represent possible future social, economic, technological, and demographic development that, in turn, drive future emissions. Consequently, the GHG emission scenarios, their supporting assumptions, and the projections of possible climate change effects entail substantial uncertainty.

The NRC staff considered the best available climate change studies performed by USGCRP as part of the staff's assessment of potential climate change projections during the DNPS SLR term (2029–2049 for Unit 2 and 2031–2051 for Unit 3). The Fourth National Climate Assessment relies on the four Representative Concentration Pathways (RCPs) in the Intergovernmental Panel on Climate Change's Fifth Assessment Report and presents projected climate change categorized by U.S. geographic region (USGCRP 2018-TN5847). The Fifth National Climate Assessment (USGCRP 2023-TN9762) uses shared socioeconomic pathway, RCPs, and global warming levels when presenting projected climate change. Global warming levels are used to describe the level of global temperature increase, (e.g., 2.7°F or 1.5°C) relative to preindustrial temperature conditions (USGCRP 2023-TN9762). Climate model projections indicate that changes in climate will not be uniform across the United States. The results of these reports are summarized as follows.

Regional projections for annual mean temperature are available from the Fourth National Climate Assessment based on the RCP 4.5 and RCP 8.5 scenarios for the midcentury (2036–2065), as compared to the annual mean temperature for 1975–2005. The modeling predicts increases of 4.21–5.29°F (2.3–2.9°C) across the Midwest by midcentury, with higher GHG emission scenarios leading to greater and faster temperature increases (USGCRP 2017-TN5848). Under the RCP 8.5 scenario, the coldest and warmest extreme temperatures of the year are expected to increase by 9.44 and 6.71°F (5.2 and 3.7°C), respectively, in the Midwest by midcentury (USGCRP 2017-TN5848).

As for precipitation, the climate model simulations suggest small changes in average annual precipitation, with overall increases in average rainfall every season (USGCRP 2017-TN5848). Under an intermediate scenario (RCP 4.5), projected changes in annual precipitation by midcentury (2036–2065, relative to 1991–2020) for Illinois indicate primarily an increase ranging from 0.5–2 in. (1.27–5.07 cm) (USGCRP 2023-TN9762). The USGCRP, however, predicts continued increases in the frequency and intensity of heavy precipitation events across the United States, including across the Midwest. Generally, extreme precipitation events are observed to increase by 6–7 percent for each degree Celsius of temperature increase (USGCRP 2017-TN5848).

The following discussions consider the effects of climate change on environmental resources areas where the proposed action (SLR) has an incremental new, additive, or increased physical effect or impact on the resource.

<u>Air Quality</u>: Climate change can impact air quality as a result of changes in meteorological conditions. Air pollutant concentrations are sensitive to winds, temperature, humidity, and precipitation. Ozone levels and PM have been found to be particularly sensitive to climate change influences. Ozone is formed by the chemical reaction of nitrogen oxides and VOCs in the presence of heat and sunlight. The emission of ozone precursors also depends on the temperature, wind, and solar radiation (IPCC 2007-TN7421). Warmer temperatures, air

stagnation, droughts, and wildfires are favorable conditions for higher levels of ozone and $PM_{2.5}$ (USGCRP 2023-TN9762). USGCRP reports that there is medium confidence that climate change is projected to worsen air quality in many U.S. regions (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, while warmer average temperatures are projected to increase seasonal mean daily maximum 8-hr average ozone and $PM_{2.5}$ concentrations, increases in annual average precipitation will decrease $PM_{2.5}$ concentrations (USGCRP 2023-TN9762).

The impact of climate change on ozone and $PM_{2.5}$ under RCP 4.5, RCP 6.0, and RCP 8.5 scenarios for 2025–2035 relative to 1995–2005 has been examined (Nolte et al. 2018-TN8571). For the Ohio Valley region (which includes Illinois), increases in spring, autumn, and summer mean maximum daily 8-hr average ozone was projected under the RCP 4.5 and RCP 8.5, with summer increases under the RCP 8.5 scenario being the most statistically significant. Under the RCP 6.0 scenario, however, a decrease in the spring mean maximum daily 8-hr ozone was projected. With respect to $PM_{2.5}$, under the RCP 8.5 scenario, statistically significant decreases in annual mean concentrations of total $PM_{2.5}$ for Illinois was found (Nolte et al. 2018-TN8571). Under the RCP 4.5 and 6.0 scenarios, however, changes in the annual mean concentrations of total $PM_{2.5}$ for Illinois were not statistically significant.

As discussed in Section 3.3.2, the EPA designates Grundy County in nonattainment for ozone (1-hr and 8-hr (2015) standard) and maintenance for ozone (8-hr 1997 and 2008 standards) and $PM_{2.5}$ (EPA 2024-TN10954). Climate change can worsen air quality by comprising the attainment status of counties. However, as presented in Section 3.3.2, emissions from operation of DNPS are minor and represent less than 0.2 percent of Grundy County's total emissions. Therefore, the NRC staff conclude that the air quality impacts of continued operation of DNPS would not be exacerbated if climate change were to worsen air quality in Grundy County.

<u>Surface Water Resources</u>: Climatic changes, such as changes in air temperature and precipitation patterns, can affect the availability of water resources (NRC 2024-TN10161). Observational data and climate model projections for Illinois and the broader Midwest region indicate recent and potential future changes to precipitation, runoff, and air temperature that could influence surface water availability and water quality.

Observations of precipitation and air temperature in Illinois over the last two decades (2002–2021) compared to the 1901–1960 period show warmer and wetter average conditions with an increase in average annual temperature of 0.5–2°F (0.28–1.11°C) and an increase in annual average precipitation from 5 to greater than 15 percent compared to the historical baseline (USGCRP 2023-TN9762). Increases in precipitation have occurred for both winter and summer seasons. Another relevant trend across the broader Midwest region has been a 45 percent increase in extreme precipitation events (top one percent of heaviest precipitation events) over 1958-2021 (USGCRP 2023-TN9762). The frequency and severity of extreme precipitation events are projected to continue across the Midwest region, including Illinois (USGCRP 2023-TN9762). Precipitation projections for mid-century (2036–2065) under the intermediate emission scenarios (RCP 4.5) on average show a 0.5–2 in. (1.27–5.08 cm) increase in annual precipitation across Illinois compared to 1991-2020, while the driest 20 percent of RCP 4.5 projections show a 0–2 in. (0–5.08 cm) decrease in precipitation (USGCRP 2023-TN9762). Compared to precipitation, averaged projections for runoff show a smaller (0–0.5 in. or 0–1.27 cm) increase over the mid-century period for the RCP 4.5 scenarios (USGCRP 2023-TN9762). Increases in annual precipitation and heavy precipitation can increase runoff. Increased runoff and high-flow events can result in the transport of a higher sediment load and other contaminants to surface waters with potential degradation of ambient water quality. USGRP climate projections suggest an increase in conditions that could temporarily influence water quality (temperature and pollutants), but water availability is less of a concern as annual average precipitation and runoff are projected to increase.

Decreases in average precipitation coupled with increases in extreme precipitation, temperatures, and evapotranspiration can result in increased aridity, more frequent droughts, and reduction in the average flow of rivers and streams (USGCRP 2018-TN5847). The USGCRP does not identify aridification as a concern for the Midwest region, however changes in the amount and timing of precipitation and evapotranspiration could alter the seasonal balance of surface water supply and demand (USGCRP 2023-TN9762). The Midwest is projected to experience an increase in the number of hot days (≥ 95°F or 35°C) and the number of warm nights (≥ 70°F or 21.1°C) (USGCRP 2023-TN9762), both of which could increase surface water temperature and evaporation. However, recent observations of hot days show a 5.6-day reduction for 2002-2021 compared to 1901–1960 (USGCRP 2023-TN9762). Observed monthly cooling water intake temperatures at DNPS from 2010 to 2023 (Figure 3-4), which are representative of water temperature of the Kankakee River, and to a lesser degree the Des Plaines River, display some interannual variability, but do not show any significant trends of increasing intake temperatures over the 14 year period. Increased water temperatures may prompt the need for DNPS to run the MDCTs more often to comply with NPDES temperature discharge limits and thereby increase water consumption. However, given current consumption is a small fraction of available river flow, coupled with an anticipated increase in average river flows in the future, suggests that the impacts to water availability from the continued operation of DNPS would not be exacerbated by the projected changes in climate.

Regulatory agencies would need to account for changes in water availability in their water resources allocation and environmental permitting programs. Regardless of water use permitting constraints, nuclear power plant operators would have to account for any changes in water temperature in operational practices and procedures. Climatic changes, such as changes in air temperature and precipitation patterns, can affect the availability of water resources.

<u>Aquatic Resources</u>: Changes in water temperature can alter the balance of aquatic ecosystems. Water temperature is an essential physical property of all aquatic environments to which aquatic resources rely on. An increase in annual mean air temperature of 4.21–5.29°F (2.3–2.9°C) across the Midwest by midcentury and an increase in the in number of hot days (≥ 95°F or 35°C) and the number of warm nights (≥70°F or 21.1°C) is projected for the Midwest (USGCRP 2017-TN5848, USGCRP 2023-TN9762). Higher ambient air temperatures can increase surface water temperatures (USGCRP 2023-TN9762). Temperature directly affects water quality. Elevated water temperatures prolong the duration of thermal stratification in aquatic environments, resulting in the annual formation of distinct density layers (USGCRP 2014-TN3472). Extending thermal stratification in lakes can eliminate or reduce lake circulation and mixing patterns, resulting in reduced dissolved oxygen which can lead to nutrient, heavy metals, and toxin enrichment of the aquatic environment (USGCRP 2014-TN3472). These changes subsequently impact biodiversity and can result in changes to biological productivity. Nutrient enrichment and warming water temperatures can lead to harmful algal blooms which further reduce dissolved oxygen levels within aquatic environments (EPA 2025-TN11131, EPA 2025-TN11132). 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). Additionally, warmer water temperatures can increase the time a lake remains ice-free, promoting an increase in evaporation and reduction in water levels further

effecting the aquatic environment (EPA 2025-TN11131, EPA 2025-TN11132). CEG's adherence to permit requirements, such as temperature-related criteria established in the NPDES permit and applicable regulations, would minimize the impacts of continued operation of DNPS such that continued operations would not further exacerbate climate change-related impacts on the aquatic environment.

The effects of climate change on DNPS structures, systems, and components are outside the scope of the NRC staff's SLR environmental review. The environmental review documents the potential effects from continued nuclear power plant operation on the environment. Plant-specific environmental conditions are considered when siting nuclear power plants. This includes the consideration of meteorological and hydrologic siting criteria as set forth in 10 CFR Part 100 (TN282), "Reactor Site Criteria." NRC regulations require that plant structures, systems, and components important to safety be designed to withstand the effects of natural phenomena, such as flooding, without loss of capability to perform safety functions. Further, nuclear power plants are required to operate within technical safety specifications in accordance with the plants' NRC operating license, including coping with natural phenomena hazards. The NRC staff conduct safety reviews before allowing licensees to make operational changes due to changing environmental conditions. Additionally, the NRC staff evaluate nuclear power plant operating conditions and physical infrastructure to ensure safe operation under the plant's initial and renewed operating licenses through the NRC's Reactor Oversight Program. If new information about changing environmental conditions that threaten safe operating conditions or challenge compliance with the plant's technical specifications becomes available, the NRC staff will evaluate the new information to determine if any safety-related changes are needed at licensed nuclear power plants. This is a separate and distinct process from the NRC staff's SLR environmental review conducted in accordance with NEPA.

3.15.3.4 No-Action Alternative

Under the no-action alternative, the NRC would not issue subsequent renewed licenses, and DNPS would shut down on or before the expiration of the current renewed licenses. At some point, all nuclear plants will terminate operations and undergo decommissioning. The Decommissioning GEIS (NRC 2002-TN7254) considers the environmental impacts from decommissioning. The scope of impacts considered under the no-action alternative includes the immediate impacts resulting from activities at DNPS that would occur between plant shutdown and the beginning of decommissioning (i.e., activities and actions necessary to cease operation of DNPS). When the facility stops operating, a reduction in GHG emissions from activities related to plant operation, such as the use of diesel generators and employee vehicles, would occur. The NRC staff anticipate that GHG emissions for the no-action alternative would be less than those presented in Table 3-27, which shows the estimated direct GHG emissions from operation of DNPS and associated mobile emissions. Therefore, the NRC concludes that the impacts of the no-action alternative on climate change would be SMALL.

Since the no-action alternative would result in a loss of power-generating capacity due to plant shutdown, the sections below discuss GHG emissions associated with replacement baseload power generation for each replacement power alternative analyzed.

3.15.3.5 Natural Gas Alternative

This alternative would consist of an NCGG plant with a design capacity of 2,120 MWe based on a capacity factor of 87 percent. The LR GEIS (NRC 2024-TN10161) presents life cycle GHG emissions associated with natural gas power generation. Lifecycle GHG emissions from natural gas power generation can range from 120 to 930 grams of carbon equivalent per kilowatt hour. GHG emission sources during construction would be similar to construction of an industrial facility and include construction equipment, engine exhaust, and workforce commuting.

Applying emission factors developed by the DOE's National Energy Technology Laboratory (NETL 2022-TN10530) and listed in the LR GEIS Appendix D (NRC 2024-TN10161), an NGCC plant would emit approximately 6.9 million tons (6.2 million metric tons) CO_2eq/year. As can be seen from Table 3-28, if DNPS' generating capacity were to be replaced by a natural gas alternative, there would be a significant increase in GHG emissions (approximately three orders of magnitude increase). GHG emissions from the natural gas alternative has the highest emissions of the alternatives considered. Given the potential for a significant increase in GHG emissions, the NRC staff conclude that the impacts of natural gas alternative on climate change would be MODERATE. Given the potential for a significant increase in GHG emissions, the NRC staff conclude that the impacts of natural gas alternative on climate change would be MODERATE.

Table 3-28 Direct Greenhouse Gas Emissions from Operations of Dresden Nuclear Power Station Under the Proposed Action and Alternatives

Technology/Alternative	Carbon Dioxide Equivalent (tons/yr)[(a)]
Proposed Action[(b)]	4,380
No Action Alternative[(c)]	<4,380
Natural Gas Combined Cycle Alternative[(d)]	6.9 million
Combination Alternative pre-2045[(e)]	≤4.8 million up until December 31, 2044; 471,670 post-2045

CO_2eq = carbon dioxide equivalent; DNPS = Dresden Nuclear Power Station; DOE = U.S. Department of Energy; GHG = greenhouse gas; GWP = global warming potential; NETL = National Energy Technology Laboratory.

(a) CO_2eq is a metric used to compare the emissions of GHGs based on their GWP. The GWP is a measure used to compare how much heat a GHG traps in the atmosphere. The GWP is the total energy that a gas absorbs over a period of time compared to carbon dioxide. CO_2eq is obtained by multiplying the amount of the GHG by the associated GWP.

(b) The GHG emissions include direct emissions from onsite combustion sources at DNPS. This is conservatively based on 2022 emissions.

(c) Emissions resulting from activities at DNPS that would occur between plant shutdown and the beginning of decommissioning and assumed not to be greater than GHG emissions from operation at DNPS.

(d) Natural gas estimates based on a design capacity of 2,120 MWe and emission factors from DOE's National Renewable Energy Laboratory (NETL 2022-TN10530).

(e) Until December 31, 2024, the combination alternative would consist of a natural gas and solar with battery storage, and emissions would be primarily from the natural gas portion. Natural gas emissions estimated based on a design capacity of and emission factors from NETL (NETL 2022-TN10530). By January 1, 2045, the natural gas portion would be replaced entirely with solar and wind with battery storage component since all sources of purchased power must be from zero-carbon renewable energy sources. GHG emissions estimated based emissions factors from DOE's National Renewable Energy Laboratory (NREL 2012-TN10546, NREL 2013-TN11882) and the solar portion would consist of 4,541 MWe of solar with a capacity factor of 25 percent and the wind portion would consist of 1,800 MWe with a capacity factor of 41.4 percent.

3.15.3.6 Renewable and Natural Gas Combination Alternative

This alternative would be a combination of an NGCC plant with a gross design capacity of approximately 1,484 MWe and solar with battery storage. Furthermore, by January 1, 2045, the natural gas component would be phased out and replaced entirely with solar panel installation with battery storage and wind turbines with battery storage. The LR GEIS (NRC 2024-TN10161) discusses life cycle GHG emissions associated with natural gas power generation, solar power generation, and wind power generation. Lifecycle GHG emissions from natural gas power generation can range from 120 to 930 grams of carbon equivalent per kilowatt hour, GHG emissions from solar power can range from 5 to 217 grams of carbon equivalent per kilowatt hour, and GHG emissions from wind can range from 2 to 81 grams of carbon equivalent per kilowatt hour. The GHG emission sources during construction of the renewable portion of this combination alternative would be similar to the construction of an industrial facility and include construction equipment, engine exhaust, and workforce commuting. The GHG emissions from construction of the renewable portion of this combination alternative would depend on the construction duration and equipment usage of each component (i.e., wind, solar, natural gas). For instance, facility construction is responsible for 24 percent of wind life-cycle emissions and 19 percent of solar PV life-cycle emission (Nugent and Sovacool 2014-TN10630).

For the portion of this alternative prior to 2045, GHG emissions are primarily from the NGCC plant. Applying emission factors developed by the DOE's National Energy Technology Laboratory (NETL 2022-TN10530) and listed in the LR GEIS Appendix D (NRC 2024-TN10161), the NRC staff estimated that operation of the natural gas alternative with a design capacity of 1,484 MWe would emit 4.8 million tons (4.4 million metric tons) CO_2eq/year.

Post January 1, 2045, the natural gas portion of this alternative would be phased out entirely and replaced with solar and wind energy with battery storage. Therefore, once the natural gas portion is replaced, GHG emissions of the combination would be entirely from renewable energy sources. As discussed in Chapter 2, the solar portion of this alternative would consist of 4,541 MWe of solar with a capacity factor of 25 percent and the wind portion would consist of 1,800 MWe with a capacity factor of 41.4 percent. Based on emissions factors from DOE's National Renewable Energy Laboratory (NREL 2012-TN10546), the NRC staff estimated that the solar alternative with design capacity of 4,541 MWe would emit 456,030 tons (413,700 metric tons) CO_2eq/yr. Based on emissions factors from DOE's National Renewable Energy Laboratory (NREL 2013-TN11882), the NRC staff estimate that the wind alternative with design capacity 1,800 MWe would emit 15,640 tons (14,190 metric tons) CO_2eq/yr. These estimates assume 26 percent of the total lifecycle emissions for the operation of the solar facility and 9 percent of the total lifecycle emissions for the operation of the wind facility.

If DNPS were to be replaced by the combination alternative, this would result in an initial increase in GHG emissions from the natural gas portion of this alternative (approximately three orders of magnitude greater), but then GHG emissions would be negligible and not significantly greater than the proposed action (SLR). Therefore, the NRC staff conclude that the impacts of combination alternative on climate change would be SMALL to MODERATE.

3.16 Cumulative Effects of the Proposed Action

Cumulative effects may result when the environmental effects associated with the proposed action (SLR) are added to the environmental effects from other past, present, and reasonably foreseeable future actions. Cumulative effects can result from individually minor, but collectively significant, actions taking place over a period of time. As explained in the LR GEIS (NRC 2024-TN10161), the effects of an LR action, combined with the effects of other actions, could generate cumulative effects on a given resource.

Information from CEG's ER (CEG 2024-TN11348); responses to requests for additional information (CEG 2025-TN11341, CEG 2025-TN11342); information from other Federal, State, and local agencies; scoping comments; and information gathered during the environmental site audit at DNPS were used to identify past, present, and reasonably foreseeable future actions in the cumulative effects analysis.

- There are three existing ISFSIs on the DNPS site (East, West, and South). The East ISFSI has been constructed and currently has space for 10 additional casks. Expansion of the West ISFSI was completed in November 2023, providing adequate fuel storage capacity for the extent of the SLR period. The South ISFSI has a completed pad with fuel storage capacity through 2031, with an additional adjacent pad planned for future ISFSI expansion (CEG 2025-TN11341).
- The Three Rivers Energy Center is a 1,250 MW NGCC facility currently located in Goose Lake Township in Grundy County near the entrance of DNPS. The project started construction in 2020 and began operations in August 2023 (CPV 2023-TN10789).
- The Blue-Sky Solar Project is a 300 MW alternating current solar project located on approximately 2,670 ac (1,080 ha) between Dwight and Gardner in Grundy County. It was originally intended to commence operations in late 2024 (Power Technology 2024-TN10790); however, the current status of the project is unknown.
- Two NRC-licensed operating power plants are located in the vicinity of the DNPS: the Braidwood Generating Station (10 mi [16 km] south) and the LaSalle County Generating Station (23 mi [37 km] southwest). The Kerr-McGee Rare Earths Facility is a complex decommissioning site located 33 mi (53 km) north (CEG 2024-TN11347).
- The Morris Operation is a high-level radioactive waste storage of spent nuclear fuel, located to the southwest and adjacent to the DNPS (CEG 2024-TN11347).

3.16.1 Air Quality

The region of influence for the cumulative air analysis consists of Grundy County, where DNPS is located. CEG has not proposed any refurbishment activities or additional emission sources during the SLR term. As a result, air emissions from DNPS during the SLR term would be similar to those presented in Section 3.3. Cumulative changes to air quality in Grundy County would be the result of future projects and actions that change present day emissions within Grundy County, as well as from environmental trends as discussed in Section 3.15.3.3. Air emissions associated with operation of the Blue-Sky Solar Project would be negligible because no fossil fuels would be directly burned to generate electricity. Increases in air emissions from the present day could result from operation of the Three Rivers Energy Center, an NGCC facility. These facilities would need to comply with IEPA regulations and air permits.

3.16.2 Water Resources

3.16.2.1 Surface Water Resources

The description of the affected environment in Section 3.5.1 serves as the baseline for the NRC staff's cumulative impacts assessment for surface water resources. DNPS withdraws cooling water from the Kankakee River, though the Des Plaines River also contributes to withdrawals during low flow conditions. Cooling water, which constitutes the vast majority of facility discharges, is discharged shortly downstream of the confluence of the Kankakee and Des Plaines Rivers to the Illinois River. The magnitude of withdrawals and cooling water discharge varies substantially depending on operational mode, with withdrawals during the indirect open-cycle mode (June 15–September 30) approximately 18 times greater than during the closed-cycle mode followed during the rest of the year (October 1–June 14). Under Illinois law, no permit is required for surface water use within the State (IL Stat. 525-TN11677). DNPS is required to report annual withdrawals because its withdrawals exceed the minimum reporting limit (IL Stat. 525-TN11677).

Long-term records (Oct 1919–Jan 2025) at USGS gauge Marseilles on the Illinois River approximately 25 mi (40 km) downstream of DNPS indicate the lowest daily fifth percentile flow of 2,350 cfs (1,519 mgd or 5,748 MLd) and the lowest daily median flow of 4,920 cfs (3,179 mgd or 12,035 MLd). Consumptive use for DNPS operations is estimated at 87 cfs (56.2 mgd or 213 MLd) during the indirect open-cycle mode and 45 cfs (29 mgd or 110 MLd) during closed-cycle mode (CEG 2024-TN11347). During both operational mode periods, consumptive use is a small fraction of available flow (Figure 3-7). CEG has not identified any SLR-related refurbishment activities and has not proposed to increase surface water withdrawals or consumptive use during the SLR term. No new or proposed projects with the potential to substantially impact surface water withdrawals or consumptive water use were identified during the review.

Discharges from DNPS are regulated under administratively extended IEPA NPDES Permit No. IL0002224. The NPDES permit establishes seasonally varying thermal limits for DNPS cooling water discharge, depending on the month and operational mode (discussed in Section 3.5.1.3), that are designed to prevent adverse impacts to aquatic life (CEG 2024-TN11347). IEPA would be expected to alter NPDES discharge conditions, as necessary, to protect the water quality of the Illinois and Kankakee Rivers. Under the CWA, the NRC cannot issue a Federal permit or license unless the CWA Section 401 water quality certification has been issued, or the water quality certification requirement has been waived by a State or another authorized agency. The IEPA issued a Section 401 waiver for DNPS on February 3, 2023 (CEG 2024-TN11347). DNPS will continue operating under the current and future renewed IEPA permits during the SLR period and will also continue to implement its SWPPP and SPCC plan. Moreover, any offsite projects would similarly have to comply with IEPA regulations. While CEG does not anticipate any dredge-and-fill activities during the SLR term (CEG 2024-TN11347), dredging may be required based on routine bathymetric survey results of the intake and cooling canals. Constellation would follow the necessary procedures to obtain a CWA Section 404 permit if dredging is deemed necessary to prevent sediment accumulation in the intake canal or discharge canals. Several of the local water bodies, including the Des Plaines, Kankakee, and Illinois Rivers, do not meet water quality standards and are listed as impaired by IEPA. However, DNPS does not contribute to these impairments. Based on the review of relevant information, the NRC staff conclude that the proposed action would have no cumulative effect beyond what is already being experienced.

3.16.2.2 Groundwater Resources

The description of the affected environment in Section 3.5.2 serves as the baseline for the cumulative impacts assessment for groundwater resources. Groundwater flow paths in the power block area are toward the Kankakee and Illinois Rivers with groundwater discharge occurring into the rivers or locally into the plant intake, discharge, or cooling system canals where any contaminants would be diluted. In addition, groundwater in the protected area that is affected by inadvertent radionuclide releases does not flow toward the nearby domestic groundwater users. CEG will continue to implement its groundwater protection program and SPCC Plan to prevent and mitigate groundwater quality impacts.

DNPS withdraws groundwater for plant operations from the deep sandstone aquifers that are a principal source of water supply for public, industrial, and domestic users in the region. Aquifer water levels in the DNPS region are declining and the risk of future desaturation in the aquifers is considered high. The cumulative reduction in groundwater levels (hydraulic head) in the sandstone aquifers from past and present future use is several hundred feet in the DNPS region (Abrams et al. 2015-TN11688). This extensive groundwater use has had a destabilizing effect on the St. Peter (Ancell) aquifer northeast of DNPS in Will and Kendall Counties (Hadley et al. 2023-TN11695). The effect of past and present groundwater use on the deeper Ironton-Galesville aquifer has been noticeable but not destabilizing in the DNPS region. Cumulative impacts on the deep sandstone aquifers have been driven by large groundwater withdrawals exceeding 1 MGD (44 Lps). Groundwater use at DNPS is only about 25 gpm (1.6 Lps) and is not expected to increase during the SLR term. Based on this information, NRC staff conclude that cumulative impacts to groundwater resources from past, present, and future actions are MODERATE to LARGE in the DNPS area, but the relatively minor use of groundwater by DNPS during the SLR term would not contribute significantly to those impacts.

3.16.3 Socioeconomics

As discussed in Section 3.10.7, continued operation of DNPS during the SLR term would have no impact on socioeconomic conditions in the region beyond what is already being experienced. CEG has no planned activities at DNPS beyond continued reactor operations and maintenance.

Because CEG has no plans to hire additional workers during the SLR term, overall expenditures and employment levels at DNPS would remain unchanged and there would be no new or increased demand for housing and public services. Therefore, the only contributory effects would come from reasonably foreseeable future operational activities at DNPS and other planned offsite activities, unrelated to the proposed action. When combined with past, present, and reasonably foreseeable future activities, the proposed action would have no new or increased effect on socioeconomic conditions beyond what is currently being experienced.

3.16.4 Human Health

The NRC and EPA have established radiological dose limits to protect the public and workers from both acute and long-term exposure to radiation and radioactive materials. These dose limits are specified in 10 CFR Part 20 (TN283) and 40 CFR Part 190 (TN739), “Environmental Radiation Protection Standards for Nuclear Power Operations.” As discussed in Section 3.11.6, the impacts on human health from continued plant operations during the SLR term would be SMALL.

3.16.5 Waste Management and Pollution Prevention

This section considers the incremental waste management impacts of the proposed DNPS SLR term when added to the contributory effects of other past, present, and reasonably foreseeable future actions. In Section 3.13.3, the potential waste management impacts from continued operations at DNPS during the SLR term were determined to be SMALL.

As discussed in Section 3.13.1 and Section 3.13.2, CEG maintains waste management programs for radioactive and nonradioactive waste generated at DNPS and is required to comply with Federal and State permits and other regulatory waste management requirements. All industrial facilities, including nuclear power plants and other facilities within a 50 mi (80 km) radius of DNPS are also required to comply with appropriate NRC, EPA, and State requirements for the management of radioactive and nonradioactive waste. Current waste management activities at DNPS would likely remain unchanged during the SLR term.

Furthermore, the NRC staff expect that DNPS would continue to comply with Federal and State requirements for radioactive and nonradioactive waste.

Therefore, the proposed action, including continued radioactive and nonradioactive waste generation during the SLR term, would have no cumulative effect beyond what is already being experienced. This is based on DNPS' expected continued compliance with Federal and State of Illinois requirements for radioactive and nonradioactive waste management, as applicable, and the expected regulatory compliance of other waste producers in the area.

3.17 Resource Commitments Associated with the Proposed Action

This section describes the NRC staff's consideration of potentially unavoidable adverse environmental impacts that could result from implementation of the proposed action and alternatives; the relationship between short-term uses of the environment and the maintenance and enhancement of long-term productivity; and the irreversible and irretrievable commitments of resources.

3.17.1 Unavoidable Adverse Environmental Impacts

Unavoidable adverse environmental impacts are impacts that would occur after implementation of all workable mitigation measures. Carrying out any of the replacement energy alternatives considered in this SEIS, including the proposed action, would result in some unavoidable adverse environmental impacts.

Minor unavoidable adverse impacts on air quality would occur due to the emission and release of various chemical and radiological constituents from power plant operations. Nonradiological emissions resulting from power plant operations are expected to comply with Federal EPA and State emissions standards. Chemical and radiological emissions would not exceed the national emission standards for hazardous air pollutants.

During nuclear power plant operations, workers and members of the public would face unavoidable exposure to low levels of radiation as well as hazardous and toxic chemicals. Workers would be exposed to radiation and chemicals associated with routine plant operations and the handling of nuclear fuel and waste material. Workers would have higher levels of exposure than members of the public, but doses would be administratively controlled and are not expected to exceed regulatory standards or administrative control limits. In comparison, the alternatives involving the construction and operation of a non-nuclear power generating facility would also result in unavoidable exposure to hazardous and toxic chemicals, for workers and the public.

The generation of spent nuclear fuel and waste material, including low-level radioactive waste, hazardous waste, and nonhazardous waste, would be unavoidable. Hazardous and nonhazardous wastes would be generated at some non-nuclear power generating facilities. Wastes generated during plant operations would be collected, stored, and shipped for suitable treatment, recycling, or disposal in accordance with applicable Federal and State regulations. Due to the costs of handling these materials, the NRC staff expect that power plant operators would optimize all waste management activities and operations in a way that generates the smallest possible amount of waste.

3.17.2 Relationship between Short-Term Use of the Environment and Long-Term Productivity

The operation of power generating facilities would result in short-term uses of the environment, as described in Section 3.2 through Section 3.13. Short-term is the period of time that continued power generating activities take place.

Power plant operations require short-term use of the environment and commitment of resources (e.g., land and energy), indefinitely or permanently. Certain short-term resource commitments are substantially greater under most energy alternatives, including SLR, than under the no-action alternative because of the continued generation of electrical power and the continued use of generating sites and associated infrastructure. During operations, all energy alternatives entail similar relationships between local short-term uses of the environment and the maintenance and enhancement of long-term productivity.

Air emissions from nuclear power plant operations introduce small amounts of radiological and nonradiological emissions to the region around the plant site. Over time, these emissions would result in increased concentrations and exposure, but the NRC staff do not expect that these emissions would impact air quality or radiation exposure to the extent that they would impair public health and long-term productivity of the environment.

Continued employment, expenditures, and tax revenues generated during power plant operations directly benefit local, regional, and State economies over the short-term. Local governments investing project-generated tax revenues into infrastructure and other required services could enhance economic productivity over the long term.

The management and disposal of spent nuclear fuel, LLRW, hazardous waste, and nonhazardous waste require an increase in energy and consume space at treatment, storage, or disposal facilities. Regardless of the location, the use of land to meet waste disposal needs would reduce the long-term productivity of the land.

Power plant facilities are committed to electricity production over the short term. After these facilities are decommissioned and the area restored, the land could be available for other future productive uses.

3.17.3 Irreversible and Irretrievable Commitment of Resources

Resource commitments are irreversible when primary or secondary impacts limit the future options for a resource. For example, the consumption or loss of nonrenewable resources is irreversible. An irretrievable commitment refers to the use or consumption of resources for a period of time (e.g., for the duration of the action under consideration) that are neither renewable nor recoverable for future use. Irreversible and irretrievable commitments of resources for electrical power generation include the commitment of land, water, energy, raw materials, and other natural and man-made resources required for power plant operations. In general, the commitments of capital, energy, labor, and material resources are also irreversible.

The implementation of any of the replacement energy alternatives considered in this SEIS would entail the irreversible and irretrievable commitments of energy, water, chemicals, and—in some cases—fossil fuels. These resources would be committed during the SLR term and over the entire life cycle of the power plant, and they would be unrecoverable.

Energy expended would be in the form of fuel for equipment, vehicles, and power plant operations and electricity for equipment and facility operations. Electricity and fuel would be purchased from offsite commercial sources. Water would be obtained from existing water supply systems or withdrawn from surface water or groundwater. These resources are readily available, and the NRC staff do not expect that the amounts required would deplete available supplies or exceed available system capacities.

NEPA Section 102(2)(C)(v), as amended by the Fiscal Responsibility Act of 2023, requires Federal agencies to describe any irreversible and irretrievable commitment of Federal resources which would be involved in the proposed agency action. The Council on Environmental Quality has stated that “federal resources” mean resources owned by the Federal Government or held in trust for Tribal Nations (89 FR 35442-TN10163).

This section discusses the irreversible and irretrievable commitment of resources such as land, water, raw materials, and other natural resources. However, this section also notes the use of resources such as the commitment of capital, energy, labor, and material resources, which are also irreversible. As some of these types of resources are expended by the NRC during its review of the DNPS SLRA, the NRC staff consider that these could be considered Federal resources under the Fiscal Responsibility Act of 2023.

It is important to note that the NRC staff and applicant are unable to identify the specific origins of all future resources that might be consumed at this time. Some of the committed resources may ultimately be derived from Federally controlled lands, waters, funds, or other origins and some from non-Federal origins. By addressing the entirety of the resources in this SEIS, the NRC staff have ensured consideration of any possible Federal subcomponent.

4 CONCLUSION

4.1 Environmental Impacts of License Renewal

After reviewing the plant-specific (Category 2) environmental issues and one new uncategorized issue in this SEIS, the NRC staff concluded that issuing subsequent renewed operating licenses for DNPS would have SMALL impacts for the Category 2 issues and the new uncategorized issue applicable to SLR at DNPS, with one exception: impacts to aquatic resources for the Category 2 issue titled, "Water use conflicts with aquatic resources (plants with cooling ponds or cooling towers using makeup water from a river)," would be SMALL to MODERATE. The NRC staff considered mitigation measures for each issue, as applicable. The NRC staff concluded that no additional mitigation measure is warranted.

4.2 Comparison of Alternatives

In Chapter 3, the NRC staff considered the following alternatives to issuing renewed operating licenses for DNPS:

- no-action alternative
- natural gas
- renewable and natural gas combination

Based on the review presented in this SEIS, the NRC staff conclude that the environmentally preferred alternative is the proposed action. As shown in Table 2-2, all other replacement power alternatives have impacts in at least four resource areas that are greater than SLR, in addition to the environmental impacts inherent with new construction projects. To make up the lost power generation if the NRC does not issue subsequent renewed licenses for DNPS (i.e., the no-action alternative), energy decisionmakers may implement one of the replacement power alternatives discussed in Chapter 3, or a comparable alternative capable of replacing the power generated by DNPS, as appropriate.

4.3 Recommendation

The NRC staff's preliminary recommendation is that the adverse environmental impacts of SLR for DNPS are not so great that preserving the option of SLR for energy-planning decisionmakers would be unreasonable. This preliminary recommendation is based on the following:

- the analysis and findings in the LR GEIS
- the ER submitted by CEG
- the NRC staff's consultation with Federal, State, Tribal, and local agencies
- the NRC staff's independent environmental review
- the NRC staff's consideration of public comments received during the scoping process
- the NRC staff's consideration of new and significant information

5 REFERENCES

10 CFR Part 20. *Code of Federal Regulations*, Title 10, *Energy*, Part 20, “Standards for Protection Against Radiation.” TN283.

10 CFR Part 50. *Code of Federal Regulations*, Title 10, *Energy*, Part 50, “Domestic Licensing of Production and Utilization Facilities.” TN249.

10 CFR Part 51. *Code of Federal Regulations*, Title 10, *Energy*, Part 51, “Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions.” TN10253.

10 CFR Part 54. *Code of Federal Regulations*, Title 10, *Energy*, Part 54, “Requirements for Renewal of Operating Licenses for Nuclear Power Plants.” TN4878.

10 CFR Part 61. *Code of Federal Regulations*, Title 10, *Energy*, Part 61, “Licensing Requirements for Land Disposal of Radioactive Waste.” TN252.

10 CFR Part 71. *Code of Federal Regulations*, Title 10, *Energy*, Part 71, “Packaging and Transportation of Radioactive Material.” TN301.

10 CFR Part 72. *Code of Federal Regulations*, Title 10, *Energy*, Part 72, “Licensing Requirements for the Independent Storage of Spent Nuclear Fuel, High-Level Radioactive Waste, and Reactor-Related Greater than Class C Waste.” TN4884.

10 CFR Part 100. *Code of Federal Regulations*, Title 10, *Energy*, Part 100, “Reactor Site Criteria.” TN282.

18 CFR Part 157. *Code of Federal Regulations*, Title 18, *Conservation of Power and Water Resources*, Part 157, “Applications for Certificates of Public Convenience and Necessity and for Orders Permitting and Approving Abandonment Under Section of the Natural Gas Act.” TN7483.

29 CFR Part 1910. *Code of Federal Regulations*, Title 29, *Labor*, Part 1910, “Occupational Safety and Health Standards.” TN654.

36 CFR Part 60. *Code of Federal Regulations*, Title 36, *Parks, Forests, and Public Property*, Part 60, “National Register of Historic Places.” TN1682.

36 CFR Part 800. *Code of Federal Regulations*, Title 36, *Parks, Forests, and Public Property*, Part 800, “Protection of Historic Properties.” TN513.

40 CFR Part 50. *Code of Federal Regulations*, Title 40, *Protection of Environment*, Part 50, “National Primary and Secondary Ambient Air Quality Standards.” TN1089.

40 CFR Part 51. *Code of Federal Regulations*, Title 40, Protection of Environment, Part 51, “Requirements for Preparation, Adoption, and Submittal of Implementation Plans.” TN1090.

40 CFR Part 81. *Code of Federal Regulations*, Title 40, *Protection of the Environment*, Part 81, "Designation of Areas for Air Quality Planning Purposes." TN7226.

40 CFR Part 82. *Code of Federal Regulations*, Title 40, *Air Programs*, Subchapter C, *Protection of Environment*, Part 82, "Protection of Stratospheric Ozone." TN10849.

40 CFR Part 93. *Code of Federal Regulations*, Title 40, *Protection of Environment*, Part 93, "Determining Conformity of Federal Actions to State or Federal Implementation Plans." TN2495.

40 CFR Part 110. *Code of Federal Regulations*, Title 40, Protection of Environment, Part 110, "Discharge of Oil." TN8485.

40 CFR Part 112. *Code of Federal Regulations*, Title 40, *Protection of Environment*, Part 112, "Oil Pollution Prevention." TN1041.

40 CFR Part 125. *Code of Federal Regulations*, Title 40, *Protection of Environment*, Part 125, "Criteria and Standards for the National Pollutant Discharge Elimination System." TN254.

40 CFR Part 131. *Code of Federal Regulations*, Title 40, *Protection of Environment*, Part 131, "Water Quality Standards." TN4814.

40 CFR Part 190. *Code of Federal Regulations*, Title 40, *Protection of Environment*, Part 190, "Environmental Radiation Protection Standards for Nuclear Power Operations." TN739.

40 CFR Part 262. *Code of Federal Regulations,* Title 40, *Protection of Environment,* Part 262, "Standards Applicable to Generators of Hazardous Waste." TN5492.

49 CFR Parts 171-178. *Code of Federal Regulations*, Title 49, *Transportation*, Subchapter C, "Hazardous Materials Regulations (49 CFR Parts 171-178)." TN10307.

50 CFR Part 10. *Code of Federal Regulations*, Title 50, *Wildlife and Fisheries*, Part 10, "National Marine Fisheries Service, National Oceanic and Atmospheric Administration, Department of Commerce." TN5490.

50 CFR Part 402. *Code of Federal Regulations,* Title 50, *Wildlife and Fisheries*, Part 402, "Interagency Cooperation—Endangered Species Act of 1973, as amended." TN4312.

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6 LIST OF PREPARERS

Members of the U.S. Nuclear Regulatory Commission's (NRC's) Office of Nuclear Material Safety and Safeguards prepared this draft supplemental environmental impact statement with assistance from other NRC organizations and Pacific Northwest National Laboratory (PNNL). Table 6-1 identifies each contributor's name and education and experience.

Table 6-1 List of Preparers

Name	Education and Experience
Briana Arlene, NRC	Master Certification, NEPA BS Conservation Biology 18 years of experience in ecological impact analysis, Endangered Species Act Section 7 consultations, and essential fish habitat consultations
Jennifer Davis, NRC	BA, Historic Preservation and Classical Civilization (Archaeology) 5 years of archaeological fieldwork 23 years of experience in NEPA compliance, project management, historic and cultural resources impact analysis, and National Historic Preservation Act Section 106 consultations
Mitchell Dehmer, NRC	PSM Environmental Science GradCert Environmental Management GradCert Energy Policy BS Biology 10 years of combined academic and government experience
Lloyd Desotell, NRC	MS Civil Engineering MS Water Resources Management BA Environmental Studies Over 20 years of experience conducting surface and subsurface hydrologic analyses
Jerry Dozier, NRC	MS Reliability Engineering MBA Business Administration BS Mechanical Engineering 30 years of experience including operations, reliability engineering, technical reviews, and NRC branch management
Brian Glowacki, NRC	BS Environmental Engineering 5+ years of experience
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Caroline Hsu, NRC	BS Molecular Biology BA English Literature 13 years of government experience
Stephen Koenick, NRC	MS Environmental Engineering BS Mechanical Engineering Over 30 years of government experience
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Charles Moulton, NRC	MS Fire Protection Engineering MS Mechanical Engineering BS Mechanical Engineering 25 years of combined industry and government experience including hazard analysis, probabilistic risk assessment, and technical reviews
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Leah Parks, NRC	PhD Environmental Management MS Environmental Engineering BS Systems and Information Engineering 17 years of academic and government experience including nuclear power plant operations, health physics, decommissioning, waste management, environmental impact analysis, and performance assessment
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Michelle Rome, NRC	MS Biological Sciences BS Environmental Science 20 years of experience of governmental and industry experience in environmental impact analyses, endangered species consultations, essential fish habitat assessments, and regulatory analyses, including at the NRC and NOAA
Angela Sabet, NRC	MS Civil Engineering BS Geology 19+ years of project management in Construction, Environmental Compliance, and Power Projects, Certified Hazardous Materials Manager, Design-Build Professional, Leadership in Energy and Environmental Design Advanced Professional Building Design and Construction, Envision Sustainability Professional
Gerry Stirewalt, NRC	PhD Structural Geology with 2 post-doctoral appointments BA Geology and Mathematics Registered PG and CEG; Over 50 years relevant experience in Environmental and Engineering Geology, including 3D geospatial modeling of subsurface stratigraphy, tectonic faults, and groundwater contaminant plumes
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Table 6-1 List of Preparers (Continued)

Name	Education and Experience
Tam Tran, NRC	MBA Management MS Environmental Science MS Nuclear Engineering over 35 years of Federal project and program management
Michael Barthelmes, PNNL	MA Communications and Media Management 8 years of experience as a science and technical writer and editor BA Geology
Teresa Carlon, PNNL	BS Information Technology 30 years of experience as SharePoint administrator, project coordinator, and databases
Kirsten Chojnicki, PNNL	PhD Geological Sciences MS Geological Sciences BS Earth and Space Science 7 years management experience 12 years of experience in geology, 3 years of experience in environmental impact analysis
Caitlin Condon, PNNL	PhD Radiation Health Physics BS Environmental Health 6 years of experience in health physics, NEPA environmental impact assessments, waste management, radionuclide dispersion and dosimetry modeling.
Stephen Ferencz, PNNL	PhD Geosciences (Hydrogeology/Hydrology) MA Earth Sciences BA Geology 7 years of experience in hydrologic, groundwater, and water systems modeling; 3 years of experience in environmental remediation and site characterization
Julia Flaherty, PNNL	MS Environmental Engineering BS Civil Engineering 20 years of experience in boundary layer meteorology and dispersion modeling 15 years of experience in NEPA environmental impact assessments
Tracy Fuentes, PNNL	PhD Urban Design and Planning MS Plant Biology BS Botany Over 15 years of experience, including NEPA planning; environmental impact analysis, environmental resource monitoring, data analysis, and research
Lexie Goldberger, PNNL	MS Atmospheric Sciences BS Geophysical Sciences 10 years of experience including NEPA environmental impact assessments, field deployments, data analysis, and research
Dave Goodman, PNNL	JD Law BS Economics 12 years of experience including NEPA environmental impact assessments, ecological restoration, Endangered Species Act, land use and visual resources, and environmental law and policy

Table 6-1 List of Preparers (Continued)

Name	Education and Experience
William Ivans, PNNL	PhD Fire Protection Engineering MS Fire Protection Engineering MS Nuclear Engineering BS Nuclear Engineering 18 years of experience in probabilistic risk assessment, nuclear safety analysis, and technical reviews of risk-informed license amendment requests and severe accident mitigation alternatives
Rebecka Iveson, PNNL	MS Hydrogeology and Water Resource Management BS Earth and Environmental Science over 5 years in groundwater resource assessment and environmental impact evaluation, contaminated land risk assessment and remediation, and natural resource management and monitoring
Hayley McClendon, PNNL	BS Environmental Science 8 years of experience in environmental compliance and technical document preparation and review.
Philip Meyer, PNNL	PhD Civil Engineering MS Civil Engineering BA Physics 30 years relevant experience in subsurface hydrology and contaminant transport, including 15 years of experience in groundwater resource assessment and environmental impacts analysis
Dan Nally, PNNL	MA Urban and Environmental Policy and Planning BS Biology 11 years of experience in preparation and review of NEPA documents, related regulatory compliance, and conducting public outreach and engagement
Mike Parker, PNNL	BA English Literature 25 years of experience copyediting, document design, and formatting and 20 years of experience in technical editing
Rajiv Prasad, PNNL	PhD Civil and Environmental Engineering MTech Civil Engineering BE Civil Engineering 25 years of experience in applying hydrologic principles to water resources engineering, hydrologic design, flooding assessments, environmental engineering, and impacts assessment including 15 years of experience in NEPA environmental assessments of surface water resources
Adrienne Rackley, PNNL	MS Economics BA Business Administration AA General Studies
Lindsey Renaud, PNNL	MA Anthropology BA Anthropology 13 years in cultural resource management, Section 106 and 110 compliance, and NEPA environmental impact assessments. Secretary of the Interior-qualified Registered Professional Archaeologist. Experience in Tribal engagement and Native American Graves Protection and Repatriation Act compliance

Table 6-1 List of Preparers (Continued)

Name	Education and Experience
Kacoli Sen, PNNL	PhD Cancer Biology MS Zoology (Specialization Ecology) BS Zoology Diploma in Environmental Law Over 6 years of document editing and production experience
Steven Short, PNNL	M.S., Nuclear Engineering M.B.A., Business Administration B.S., Nuclear Engineering 40 years of experience including nuclear safety analysis, probabilistic risk assessment, technical reviews of risk-informed license amendment requests and severe accident mitigation alternative analyses
Susan Tackett, PNNL	20 years document formatting/copyediting experience at PNNL 7 years of experience word processing, formatting, and proof-reading, 4 years technical editing of safety analysis reports and engineering as-built reports
Dana Vesty, PNNL	BS Environmental Science PWS (Professional Wetland Scientist) 8 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 BS Biology 11 years of relevant experience in environmental impact assessment and aquatic ecology

AM or MA = Master of Arts; BA = Bachelor of Arts; BS = Bachelor of Science; CEG = Certified Engineering Geologist DoD = U.S. Department of Defense; DOE = U.S. Department of Energy; DOI = U.S. Department of Interior;; GradCert = Graduate Certificate; 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; NOAA = National Oceanic and Atmospheric Administration; NRC = U.S. Nuclear Regulatory Commission; PG = Professional Geologist; PhD = Doctor of Philosophy; PNNL = Pacific Northwest National Laboratory; PSM = Professional Science Masters; PWS = Professional Wetland Scientist; SAMA = Severe Accident Mitigation Alternative.

7 LIST OF AGENCIES, ORGANIZATIONS, AND PERSONS TO WHOM COPIES OF THIS SUPPLEMENTAL ENVIRONMENTAL IMPACT STATEMENT ARE SENT

Table 7-1 List of Agencies, Organizations, and Persons to Whom the U.S. Nuclear Regulatory Commission Sent Copies of this Supplemental Environmental Impact Statement

Name	Affiliation
Gordon, Alison	U.S. Geological Survey
McClain, Krystle Z.	U.S. Environmental Protection Agency
Alderson, Randy	Coal City Fire District
Kucharz, Mary J.	Grundy County
Gibson, Eric	Grundy County Highway Department
Schroder, Madison	Generation Atomic
Namuo, Clyne	Joliet Junior College
Spencer, Chris	Coal City Community Unit School District No. 1
Norton, Nancy	Grundy Economic Development Council
Loichinger, Jaime	Advisory Council on Historic Preservation
Mayer, Carey	Illinois State Historic Preservation Office
Blanchard, Robert	Bad River Band of the Lake Superior Tribe of Chippewa Indians
Gravelle, Whitney B.	Bay Mills Indian Community
Chavers, Catherine J.	Bois Forte Band of Chippewa Indians
Barrett, John	Citizen Potawatomi Nation
Crawford, James A.	Forest County Potawatomi Community
Meshigaud, Kenneth	Hannahville Indian Community
Greendeer, Jon	Ho-Chunk Nation of Wisconsin
Rhodd, Timothy	Iowa Tribe of Kansas and Nebraska
Keyes, Jacob	Iowa Tribe of Oklahoma
Cheatham, Gail	Kickapoo Tribe of Indians of the Kickapoo Reservation in Kansas
Kaskaske, Darwin	Kickapoo Tribe of Oklahoma
Gasco, Regina	Little Traverse Bay Bands of Odawa Indians
Peters, Bob	Match-e-be-nash-she-wish Band of Pottawatomi
Kakkak, Gena	Menominee Indian Tribe of Wisconsin
Lankford, Douglas G.	Miami Tribe of Oklahoma
Rios, Dorrie	Nottawaseppi Huron Band of the Potawatomi
Shotton, John R.	Otoe-Missouria Tribe of Indians
Harper, Craig	Peoria Tribe of Indians of Oklahoma
Wesaw, Matthew J.	Pokagon Band of Potawatomi Indians
Rupnick, Joseph	Prairie Band Potawatomi Nation
Carnes, Tiauna	Sac and Fox Nation of Missouri in Kansas and Nebraska
Carter, Randle	Sac and Fox Nation of Oklahoma
Jefferson, Vern	Sac and Fox Tribe of the Mississippi in Iowa

Table 7-2 List of Agencies, Organizations, and Persons to Whom the U.S. Nuclear Regulatory Commission Sent Copies of this Supplemental Environmental Impact Statement (Continued)

Name	Affiliation
Barnes, Benjamin	Shawnee Tribe
Kitcheyan, Victoria	Winnebago Tribe of Nebraska
Yob, Ron	Grand River Band of Ottawa Indians

NRC = U.S. Nuclear Regulatory Commission; SEIS = supplemental environmental impact statement.
Many scoping commenters did not provide their contact or affiliation information. The NRC staff have listed the names of these commenters in the scoping summary report (NRC 2025-TN11463). The commenters were offered an opportunity to receive this SEIS. However, the staff could not send a copy of this SEIS to the commenters who did not provide contact information, and those persons are not listed here. Appendix C lists correspondence with agencies and Tribes, including distribution of the SEIS.

APPENDIX A

COMMENTS RECEIVED ON THE DRESDEN NUCLEAR POWER STATION ENVIRONMENTAL REVIEW

A.1 Comments Received During the Scoping Period

The U.S. Nuclear Regulatory Commission (NRC, the Commission) conducted a scoping process for the environmental review of the Dresden Nuclear Power Station, Units 2 and 3 (DNPS), subsequent license renewal application in accordance with the National Environmental Policy Act of 1969, as amended (NEPA) (TN661). On August 5, 2024, the NRC issued a notice of intent to conduct an environmental scoping process for subsequent license renewal of DNPS that was published in the *Federal Register* (89 FR 63450-TN10783). In its notice of intent, the NRC requested that members of the public and stakeholders submit comments on the scope of the environmental review for DNPS to the Federal Rulemaking Website at Regulations.gov.

The DNPS scoping process also included two public meetings as virtual webinars on August 20, 2024. To advertise this public meeting, the NRC issued press releases and purchased newspaper advertisements. Attendees at the public meetings included NRC staff; Constellation Energy Generation, LLC staff; local officials; and several members of the public. After the NRC staff presented the prepared statements on the subsequent license renewal process, the NRC staff opened the meeting for public comments. Attendees made oral statements that were recorded and transcribed by a certified court reporter. A summary and a transcript of the public scoping meeting are available in the NRC's Agencywide Documents Access and Management System (ADAMS) under ADAMS Accession No. ML24292A055 (NRC 2024-TN11870). The ADAMS Public Electronic Reading Room is accessible at http://www.nrc.gov/reading-rm/adams.html.

At the conclusion of the scoping period process, the NRC staff issued a scoping summary report (NRC 2025-TN11463). The report contains comments received during the public meetings and received electronically during the scoping period, as well as the NRC staff's consideration of these comments.

A.2 References

89 FR 63450. August 5, 2024. "Constellation Energy Generation, LLC; Dresden Nuclear Power Station, Units 2 and 3; Notice of Intent To Conduct Scoping Process and Prepare Environmental Impact Statement." Notice; public scoping meeting and request for comment, *Federal Register*, Nuclear Regulatory Commission. TN10783.

National Environmental Policy Act of 1969 (NEPA), as amended. 42 U.S.C. § 4321 et seq. TN661.

NRC (U.S. Nuclear Regulatory Commission).2024. Memorandum from T. Tran, Environmental Project Manager Environmental Project Management Branch 1 Division of Rulemaking, Environmental, and Financial Support Office of Nuclear Material Safety and Safeguards, to S. Koenick, Chief, Environmental Project Management Branch 1 Division of Rulemaking, Environmental, and Financial Support Office of Nuclear Material Safety and Safeguard, dated October 23, 2024, regarding "Meeting Summary: Dresden Scoping Public Meetings to Receive

Public Comments (EPID Number: L-2024-Sle-0002) (Docket Numbers: 50-237 AND 50-249)." Washington, D.C. ADAMS Accession No. ML24292A055. TN11870.

NRC (U.S. Nuclear Regulatory Commission).2025. Letter from S. Koenick, Chief, Environmental Project Management Branch 1, Division of Rulemaking, Environment, and Financial Support, Office of Nuclear Material Safety and Safeguards, to C.D. Wilson, Director, License Renewal, Constellation Energy Generation, LLC, dated February 13, 2025, regarding "Issuance of Environmental Scoping Summary Report Associated with the U.S. Nuclear Regulatory Commission Staff's Review of the Dresden Nuclear Power Station, Unit 2 and 3, License Renewal Application (EPID Number: L-2024- SLE-0002) (Docket Numbers: 50-237 AND 50-249)." Washington, D.C. ADAMS Accession No. ML25007A107. TN11463.

APPENDIX B

APPLICABLE LAWS, REGULATIONS, AND OTHER REQUIREMENTS

There are several Federal laws and regulations that affect environmental protection, health, safety, compliance, and consultation at every U.S. Nuclear Regulatory Commission (NRC, the Commission)-licensed nuclear power plant. Some of these laws and regulations require permits by or consultations 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 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.

The Atomic Energy Act of 1954, as amended (AEA) (TN663) and the Energy Reorganization Act of 1974, as amended (TN4466), give the NRC the licensing and regulatory authority for commercial nuclear energy use. They allow the NRC to establish dose and concentration limits for protection of workers and the public for activities under NRC jurisdiction. The NRC implements its responsibilities under the AEA through regulations set forth in Title 10, "Energy," of the *Code of Federal Regulations* (CFR). The AEA also authorizes the NRC to enter into an agreement with any State that allows the State to assume regulatory authority for certain activities (see 42 *United States* Code [U.S.C.] 2021-TN10029). A State that enters into such an agreement with the NRC is called an Agreement State, which assumes regulatory responsibility over certain byproducts, sources, and quantities of special nuclear materials not sufficient to form a critical mass. The Illinois Emergency Management Agency and Office of Homeland Security administers the Illinois State Program.

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 protection of air, surface water, and groundwater. State legislation may address solid waste management programs, locally rare or endangered species, and historic and cultural resources.

The U.S. Environmental Protection Agency has the primary responsibility to administer the Clean Water Act, as amended (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 or Tribal agencies, as long as the State program is at least as stringent as the Federal program. U.S. Environmental Protection Agency has delegated the authority to issue NPDES permits to the Illinois Environmental Protection Agency.

B.1 Federal and State Requirements

Dresden Nuclear Power Station, Units 2 and 3 (DNPS), is subject to various Federal and State requirements. Table B-1 lists the principal Federal and State regulations and laws that are used or mentioned in this supplemental environmental impact statement for DNPS.

Table B-1 Federal and State Requirements

Category Law or Regulation	Requirements
Current Operating License and License Renewal Atomic Energy Act, 42 U.S.C. 2011 et seq.	The AEA of 1954, as amended, and the Energy Reorganization Act of 1974 (42 U.S.C. 5801 et seq.) give the NRC the licensing and regulatory authority for nuclear energy uses within the commercial sector. They give the NRC responsibility for licensing and regulating commercial uses of atomic energy and allows the NRC to establish dose and concentration limits for protection of workers and the public for activities under NRC jurisdiction. The NRC implements its responsibilities under the AEA through regulations set forth in Title 10 of the CFR.
Current Operating License and License Renewal National Environmental Policy Act of 1969, 42 U.S.C. 4321 et seq.	NEPA, as amended, requires Federal agencies to integrate environmental values into their decision-making process by considering the environmental impacts of proposed Federal actions and reasonable alternatives to those actions. NEPA establishes policy, sets goals (in Section 101), and provides means (in Section 102) for carrying out the policy. NEPA Section 102(2) contains action-forcing provisions to ensure that Federal agencies follow the letter and spirit of the Act. For major Federal actions significantly affecting the quality of the human environment, Section 102(2)(C) of NEPA requires Federal agencies to prepare a detailed statement that includes the environmental impacts of the proposed action and other specified information.
Current Operating License and License Renewal 10 CFR Part 20	Regulations in 10 CFR Part 20, "Standards for Protection Against Radiation," establish standards for protection against ionizing radiation resulting from activities conducted under licenses issued by the NRC. These regulations are issued under the Atomic Energy Act of 1954, as amended, and the Energy Reorganization Act of 1974, as amended. The purpose of these regulations is to control the receipt, possession, use, transfer, and disposal of licensed material by any licensee in such a manner that the total dose to an individual (including doses resulting from licensed and unlicensed radioactive material and from radiation sources other than background radiation) does not exceed the standards for protection against radiation prescribed in the regulations in this part.
Current Operating License and License Renewal 10 CFR Part 50	Regulations in 10 CFR Part 50, "Domestic Licensing of Production and Utilization Facilities," are NRC regulations issued under the Atomic Energy Act, as amended, and Title II of the Energy Reorganization Act of 1974, to provide for the licensing of production and utilization facilities, including power reactors.
Current Operating License and License Renewal 10 CFR Part 51	Regulations in 10 CFR Part 51, "Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions," contain the NRC's regulations that implement NEPA.
Current Operating License and License Renewal 10 CFR Part 54	NRC regulations in 10 CFR Part 54, "Requirements for Renewal of Operating Licenses for Nuclear Power Plants," govern the issuance of renewed operating licenses and renewed combined licenses for nuclear power plants licensed under Sections 103 or 104b of the AEA, as amended, and Title II of the Energy Reorganization Act of 1974. The regulations focus on managing adverse effects of aging. The rule is intended to ensure that important systems, structures, and components will continue to perform their intended functions during the period of extended operation.

Table B-1 Federal and State Requirements (Continued)

Category Law or Regulation	Requirements
Air Quality Protection Clean Air Act, 42 U.S.C. 7401 et seq.	The CAA is intended to “protect and enhance the quality of the Nation’s air resources so as to promote the public health and welfare and the productive capacity of its population.” The CAA establishes regulations to ensure maintenance of air quality standards and authorizes individual States to manage permits. Section 118 of the CAA requires each Federal agency, with jurisdiction over properties or facilities engaged in any activity that might result in the discharge of air pollutants, to comply with all Federal, State, inter-State, and local requirements with regard to the control and abatement of air pollution. Section 109 of the CAA directs the EPA to set NAAQS for criteria pollutants. The EPA has identified and set NAAQS for the following criteria pollutants: particulate matter, sulfur dioxide, carbon monoxide, ozone, nitrogen dioxide, and lead. Section 111 of the CAA requires the establishment of national performance standards for new or modified stationary sources of atmospheric pollutants. Section 160 of the CAA requires that specific emission increases must be evaluated before permit approval to prevent significant deterioration of air quality. Section 112 requires specific standards for release of hazardous air pollutants (including radionuclides). These standards are implemented through plans developed by each State and approved by the EPA. The CAA requires sources to meet standards and obtain permits to satisfy those standards. Nuclear power plants may be required to comply with the CAA Title V, Sections 501–507, for sources subject to new source performance standards or sources subject to National Emission Standards for Hazardous Air Pollutants. EPA regulates the emissions of air pollutants using 40 CFR Parts 50 to 99.
Water Resources Protection Clean Water Act, 33 U.S.C. 1251 et seq., and the NPDES (40 CFR 122)	The CWA was enacted to “restore and maintain the chemical, physical, and biological integrity of the Nation’s water.” The Act requires all branches of the Federal Government with jurisdiction over properties or facilities engaged in any activity that might result in a discharge or runoff of pollutants to surface waters, to comply with Federal, State, inter-State, and local requirements. As authorized by the CWA, the NPDES permit program controls water pollution by regulating point sources that discharge pollutants into waters of the United States. The NPDES program requires all facilities that discharge pollutants from any point source into waters of the United States to obtain an NPDES permit. A nuclear power plant may also participate in the NPDES General Permit for Industrial Stormwater due to stormwater runoff from industrial or commercial facilities to waters of the United States. EPA is authorized under the CWA to directly implement the NPDES program; however, EPA has authorized many States to implement all or parts of the national program. Section 401 of the CWA requires States to certify that the permitted discharge would comply with all limitations necessary to meet established State water quality standards, treatment standards, or schedules of compliance. The USACE is the lead agency for enforcement of CWA wetland requirements (33 CFR Part 320, “General Regulatory Policies”). Under Section 401 of the CWA, EPA or a delegated State agency has the authority to review and approve,

Table B-1 Federal and State Requirements (Continued)

Category Law or Regulation	Requirements
	condition, or deny all permits or licenses that might result in a discharge to waters of the State, including wetlands.
Water Resources Protection Coastal Zone Management Act of 1972, as amended (16 U.S.C. 1451 et seq.)	Congress enacted the CZMA in 1972 to address the increasing pressures of over-development upon the Nation's coastal resources. The National Oceanic and Atmospheric Administration administers the Act. The CZMA encourages States to preserve, protect, develop, and, where possible, restore or enhance valuable natural coastal resources such as wetlands, floodplains, estuaries, beaches, dunes, barrier islands, and coral reefs, as well as the fish and wildlife using those habitats. Participation by States is voluntary. To encourage States to participate, the CZMA makes Federal financial assistance available to any coastal State or territory, including those on the Great Lakes, as long as the State or territory is willing to develop and implement a comprehensive coastal management program.
Water Resources Protection Wild and Scenic Rivers Act, 16 U.S.C. 1271 et seq.	The Wild and Scenic Rivers Act created the National Wild and Scenic Rivers System, which was established to protect the environmental values of free-flowing streams from degradation by impacting activities, including water resources projects.
Waste Management and Pollution Prevention Resource Conservation and Recovery Act, 42 U.S.C. 6901 et seq	The RCRA requires EPA to define and identify hazardous waste; establish standards for its transportation, treatment, storage, and disposal; and require permits for persons engaged in hazardous waste activities. Section 3006, "Authorized State Hazardous Waste Programs" (42 U.S.C. 6926), allows States to establish and administer these permit programs with EPA approval. EPA regulations implementing RCRA are found in 40 CFR Parts 260 through 283. Regulations imposed on a generator or on a treatment, storage, and/or disposal facility vary according to the type and quantity of material or waste generated, treated, stored, and/or disposed. The method of treatment, storage, and/or disposal also impacts the extent and complexity of the requirements.
Waste Management and Pollution Prevention Pollution Prevention Act, 42 U.S.C. 13101 et seq.	The Pollution Prevention Act establishes a national policy for waste management and pollution control that focuses first on source reduction, then on environmental issues, safe recycling, treatment, and disposal.
Protected Species Endangered Species Act, 16 U.S.C. 1531 et seq	The ESA was enacted to prevent the further decline of endangered and threatened species and to restore those species and their critical habitats. Section 7, "Interagency Cooperation," of the Act requires Federal agencies to consult with the FWS or the NMFS on Federal actions that may affect listed species or designated critical habitats.
Protected Species Magnuson–Stevens Fishery Conservation and Management Act, 16 U.S.C. 1801 et seq.	The Magnuson–Stevens Fishery Conservation and Management Act, as amended, governs marine fisheries management in U.S. Federal waters. The Act created eight regional fishery management councils and includes measures to rebuild overfished fisheries, protect essential fish habitat, and reduce bycatch. Under Section 305 of the Act, Federal agencies are required to consult with the National Marine Fisheries Service for any Federal actions that may adversely affect essential fish habitat.
Historic Properties	The National Historic Preservation Act was enacted to create a national historic preservation program, including the National

Table B-1 Federal and State Requirements (Continued)

Category Law or Regulation	Requirements
National Historic Preservation Act, 54 U.S.C. 100101 et seq. (formerly 16 U.S.C. 470 et seq.)	Register of Historic Places and the ACHP. Section 106 of the Act requires Federal agencies to take into account the effects of their undertakings on historic properties. The Advisory Council on Historic Preservation regulations implementing Section 106 of the Act are found in 36 CFR Part 800, "Protection of Historic Properties." The regulations call for public involvement in the Section 106 consultation process, including involvement from Indian Tribes and other interested members of the public, as applicable.

ACHP = Advisory Council on Historic Preservation; AEA = Atomic Energy Act; CAA = Clean Air Act; CFR = *Code of Federal Regulations*; CWA = Clean Water Act; CZMA = Coastal Zone Management Act; EPA = U.S. Environmental Protection Agency; ESA = Endangered Species Act of 1973, as amended; FWS = U.S. Fish and Wildlife Service; NAAQS = National Ambient Air Quality Standards; NEPA = National Environmental Policy Act; NMFS = National Marine Fisheries Service; NPDES = National Pollutant Discharge Elimination System; NRC = U.S. Nuclear Regulatory Commission; RCRA = Resource Conservation and Recovery Act; U.S.C. = *United States Code*; USACE = U.S. Army Corps of Engineers.

B.2 Operating Permits and Other Requirements

Table B-2 lists the permits and licenses issued by Federal, State, and local authorities for operational activities at DNPS, as identified in Constellations Energy Generation, LLC's, environmental report (CEG 2024-TN11347) and updated in response to the NRC staff's request for additional information and/or request for confirmation of information (CEG 2025-TN11341).

Table B-2 Operating Permits and Other Requirements

Permit	Responsible Agency	Number	Expiration Date	Authorized Activity
Operating license for DNPS Unit 2	NRC	DPR-19	12/22/29	Operation of DNPS Unit 2
Operating license for DNPS Unit 3	NRC	DPR- 25	01/12/31	Operation of DNPS Unit 3
CWA Section 401 water quality certification	EPA/IEPA	N/A	N/A	Discharge into waters of the United States, permitted under the Illinois NPDES permit
Hazardous waste shipment permit	DOT	051022550113EG	06/30/2025	Hazardous material shipment
License to ship radioactive material	TDEC	T-IL001-L23	12/31/2024 (renewed annually)	Shipment of radioactive material to a licensed disposal/processing facility in Tennessee
General site access permit for radioactive waste disposal	UDEQ	0110000029	03/18/2025 (renewed annually)	Delivery of radioactive waste to a land disposal facility in Utah

Table B-2 Operating Permits and Other Requirements (Continued)

Permit	Responsible Agency	Number	Expiration Date	Authorized Activity
Hazardous waste generator registration	IEPA	ILD000665489	09/01/2025	Authorizes facility to operate as a hazardous waste generator
NPDES permit	IEPA	IL0002224	08/31/2021 (administratively extended)	Discharges of stormwater, wastewater, and treated water to waters of the State
NPDES permit	IEPA	1LG870020	09/30/2027	Pesticide application point-source discharges
Air emission permit	IEPA	063806AAC	03/31/2024 (administratively extended)	Operate air emission sources: 2 natural gas-fired auxiliary boilers 1 and 2 with distillate oil back-up, 5 large diesel-powered emergency generators, 54 cooling tower cells and gasoline storage and handling
Dam maintenance permit	IDNR	DS 2000233	N/A	Authorized to operate and maintain the DNPS cooling pond dam
Water system permit	IDPH and SDWA	Water System No. IL3083196	N/A	Non-transient, non-community water system
Public water supply permit	IDPH	Operator ID 21818	12/31/2026	Operate non-transient, non- community public water system
Open burn permit	IEPA	43083	02/23/2025	Open burn for firefighter training

DNPS= Dresden Nuclear Power Station, Unit 1; DOT = U.S. Department of Transportation; EPA = U.S. Environmental Protection Agency; IEPA = Illinois Environmental Protection Agency; IDPH = Illinois Environmental Protection Agency; NRC = U.S. Nuclear Regulatory Commission; SDWA = Safe Drinking Water Act; TDEC = Tennessee Department of Environment and Conservation; UDEQ = Utah Department of Environmental Quality.

Sources: CEG 2024-TN11347, CEG 2025-TN11341.

B.3 References

42 U.S.C. § 2021 et seq. U.S. Code Title 42, Public Health and Welfare, Section 2021, “Cooperation with States.” TN10029.

Atomic Energy Act of 1954. 42 U.S.C. § 2011 et seq. Public Law 112-239, as amended. TN663.

CEG (Constellation Energy Generation, LLC). 2024. *Appendix E, Applicant’s Environmental Report, Subsequent Operating License Renewal Stage, Dresden Nuclear Power Station*. Kennett Square, Pennsylvania. February. ADAMS Accession No. ML24108A011. TN11347.

CEG (Constellation Energy Generation, LLC). 2025. Letter from C.D. Wilson, Director, License Renewal, to NRC Document Control Desk, dated February 3, 2025, regarding “Renewed Facility Operating License Nos. DPR-19 & DPR-25, NRC Docket Nos. 50-237 & 50-249, Dresden Nuclear Power Station, Units 2 and 3, Subsequent License Renewal Environmental Review, Responses to NRC Requests for Confirmation of Information (RCIs) and Requests for Additional Information (RAIs).” RS-25-002, Kennett Square, Pennsylvania. ADAMS Accession No. ML25034A107. TN11341.

Energy Reorganization Act of 1974, as amended. 42 U.S.C. § 5801 et seq. TN4466.

Federal Water Pollution Control Act of 1972 (commonly referred to as the Clean Water Act). 33 U.S.C. § 1251 et seq. TN662.

APPENDIX C

CONSULTATION CORRESPONDENCE

C.1 Endangered Species Act Section 7 Consultation

As a Federal agency, the U.S. Nuclear Regulatory Commission (NRC, the Commission) must comply with the Endangered Species Act of 1973, as amended (ESA) (TN1010), as part of any action authorized, funded, or carried out by the agency. In this case, the proposed agency action is whether to issue subsequent renewed licenses for the continued operation of Dresden Nuclear Power Station, Units 2 and 3 (DNPS). The proposed action would authorize Constellation Energy Generation, LLC to operate DNPS for an additional 20 years beyond the terms of the current renewed operating licenses. Under Section 7 of the ESA, the NRC must consult with the U.S. Fish and Wildlife Service (FWS) and the National Marine Fisheries Service (NMFS) ("the Services" [collectively] or "Service" [individually]), as appropriate, to ensure that the proposed action is 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.

C.1.1 Federal Agency Obligations under Section 7 of the Endangered Species Act

The ESA and the regulations that implement ESA Section 7 at Title 50 of the *Code of Federal Regulations* (50 CFR) Part 402 (TN4312) describe the consultation process that Federal agencies must follow in support of agency actions. As part of this process, the Federal agency shall either request that the Services (1) provide a list of any listed or proposed species or designated or proposed critical habitats that may be present in the action area or (2) request that the Services concur with a list of species and critical habitats that the Federal agency has created (50 CFR 402.12(c)). If any such species or critical habitats may be present, the Federal agency prepares a biological assessment to evaluate the potential effects of the action and determine whether the species or critical habitats are likely to be adversely affected by the action (50 CFR 402.12(a); TN4459: 16 U.S.C. 1536(c)).

Biological assessments are required for any agency action that is a "major construction activity" (50 CFR 402.12(b)). 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 the National Environmental Policy Act of 1969, as amended (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)) (TN4312). 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)).

C.1.2 Biological Evaluation

Subsequent license renewal (SLR) does not require the preparation of a biological assessment because it is not a major construction activity. Nonetheless, the NRC staff must consider the impacts of its actions on federally listed species and designated critical habitats. In cases where the staff finds that license renewal "may affect" ESA-protected species or habitats, ESA Section 7 requires the NRC to consult with the relevant Service(s).

To support such consultations, the NRC staff have incorporated its analysis of the potential impacts of the proposed license renewal into Section 3.8 of this supplemental environmental impact statement (SEIS). The NRC staff refer to its ESA analysis as a "biological evaluation."

The NRC staff structured its evaluation in accordance with the Services' suggested biological assessment contents described at 50 CFR 402.12(f) (TN4312). Section 3.8.1describes the action area as well as the ESA-protected species and habitats potentially present in the action area. Section 3.8.2 also assesses the potential effects of the proposed DNPS license renewal on the ESA-protected species and habitats present in the action area and contains the NRC staff's effect determinations for each of those species and habitat. This section also addresses cumulative effects. Finally, Section 3.8.3 through Section 3.8.6 address the potential effects of the no-action alternative and the power replacement alternatives. The results of the NRC staff's analysis are summarized in Table C-1.

Table C-1 Effect Determinations for Federally Listed Species under U.S. Fish and Wildlife Service Jurisdiction

Species	Federal Status(a)	Potentially Present in the Action Area?	Effect Determination(b)	FWS Concurrence Date(c)
northern long-eared bat	FE	Yes	NLAA	TBD
Indiana bat	FE	Yes	NLAA	TBD
tricolored bat	FPE	Yes	NLAA	N/A
whooping crane	EXPN	Yes	NLAA	TBD
eastern massasauga rattlesnake	FT	Yes	NLAA	TBD
salamander mussel	FPE	Yes	NLAA	N/A
sheepnose mussel	FE	Yes	NLAA	TBD
sheepnose mussel critical habitat	FPD	Yes	NLAA	N/A
scaleshell mussel	FE	Yes	NLAA	TBD
Mead's milkweed	FT	Yes	NLAA	TBD
decurrent false aster	FT	No	NE	N/A
eastern prairie fringed orchid	FT	Yes	NLAA	TBD
lakeside daisy	FT	No	NE	N/A
leafy prairie clover	FT	No	NE	N/A
prairie bush clover	FT	No	NE	N/A
Hine's emerald dragonfly	FE	Yes	NLAA	TBD
monarch butterfly	FPT	Yes	NLAA	N/A
western regal fritillary	FPT	Yes	NLAA	N/A
rusty patched bumble bee	FE	Yes	NLAA	TBD

ESA = Endangered Species Act; EXPN = experimental population, non-essential; FPD = federally proposed designated (critical habitat); FE = federally endangered; FPE = proposed for Federal listing as endangered; FPT = proposed for Federal listing as threatened; FT = federally threatened; FWS = U.S. Fish and Wildlife Service; N/A = not applicable; NE = no effect; NLAA = may affect but is not likely to adversely affect; NRC = U.S. Nuclear Regulatory Commission; SEIS = supplemental environmental impact statement; TBD = to be determined.

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

(b) The NRC staff make 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) The ESA does not require Federal agencies to seek FWS concurrence for "no effect" determinations or for NLAA determinations for candidate and proposed species. For species whose FWS concurrence date is listed as N/A or TBD, the NRC will seek the FWS's concurrence following the issuance of this draft SEIS.

C.1.3 Chronology of Endangered Species Act Section 7 Consultation

C.1.3.1 Endangered Species Act Section 7 Consultation with the U.S. Fish and Wildlife Service

Following issuance of this draft SEIS, the NRC staff will seek the FWS' concurrence for the species for which the NRC determined that the proposed action of DNPS SLR may affect but is not likely to adversely affect (Table C-1) in accordance with 50 CFR 402.13(c) (TN4312). **Table** C-2 lists the correspondence between the NRC and the FWS pursuant to ESA Section 7 that has transpired to date.

Table C-2 Endangered Species Act Section 7 Consultation Correspondence with the U.S. Fish and Wildlife Service

Date	Description	ADAMS Accession No.[(a)]
February 7, 2025	Illinois-Iowa Ecological Services Field Office (FWS) to S. Healy (NRC), List of threatened and endangered species for proposed Dresden SLR	ML25038A068
February 7, 2025	Illinois-Iowa Ecological Services Field Office (FWS) to S. Healy (NRC), Northern long-eared bat and tricolored bat determination key results for proposed Dresden SLR	ML25077A181

ADAMS = Agencywide Documents Access and Management System; FWS = U.S. Fish and Wildlife Service; NRC = U.S. Nuclear Regulatory Commission.
(a) Access these documents through the NRC's ADAMS at http://adams.nrc.gov/wba/.

C.1.3.2 Endangered Species Act Section 7 Consultation with the National Marine Fisheries Service

As discussed in Section 3.8, no federally listed species or critical habitats under NMFS' jurisdiction occur within the action area. Therefore, the NRC staff did not engage the NMFS pursuant to ESA Section 7 for the proposed DNPS SLR.

C.2 Magnuson–Stevens Act Essential Fish Habitat Consultation

The NRC must comply with the Magnuson–Stevens Fishery Conservation and Management Act of 1976, as amended (MSA) (TN9966), for any actions authorized, funded, or undertaken, or proposed to be authorized, funded, or undertaken that may adversely affect any essential fish habitat (EFH) identified under the MSA. In Section 3.8, the NRC staff conclude that the NMFS has not designated any EFH under the MSA within the affected area and that the proposed DNPS SLR would have no effect on EFH. Thus, the MSA does not require the NRC to consult with the NMFS for the proposed action.

C.3 National Marine Sanctuaries Act Consultation

The National Marine Sanctuaries Act of 1966, as amended (TN4482), authorizes the Secretary of Commerce to designate and protect areas of the marine environment with special national significance due to their conservation, recreational, ecological, historical, scientific, cultural, archaeological, educational, or aesthetic qualities as national marine sanctuaries. Under Section 304(d) of the act, Federal agencies must consult with the National Oceanic and Atmospheric Administration's Office of National Marine Sanctuaries if a Federal action is likely to destroy, cause the loss of, or injure any sanctuary resources.

In Section 3.8, the NRC staff conclude that no coastal or marine waters or Great Lakes occur near DNPS and that the DNPS SLR would have no effect on sanctuary resources. Thus, the National Marine Sanctuaries Act of 1966, as amended does not require the NRC to consult with the National Oceanic and Atmospheric Administration for the proposed action.

C.4 National Historic Preservation Act Section 106 Consultation

The National Historic Preservation Act of 1966, as amended (NHPA) (TN4839), requires Federal agencies to consider the effects of their undertakings on historic properties and consult with applicable State and Federal agencies, Tribal groups, individuals, and organizations with a demonstrated interest in the undertaking before taking an action. Historic properties are defined as resources that are eligible for listing on the National Register of Historic Places. The NHPA Section 106 review process is outlined in regulations issued by the Advisory Council on Historic Preservation in 36 CFR Part 800, “Protection of Historic Properties” (TN513). In accordance with 36 CFR 800.8(c), “Use of the NEPA Process for Section 106 Purposes,” the NRC has elected to use the NEPA process to comply with its obligations under Section 106 of the NHPA.

Additionally, in accordance with the NRC’s January 9, 2017, Tribal Policy Statement (82 FR 2402-TN5500), the NRC invited State recognized Tribes to submit any comments or concerns on the scope of the environmental review.

Table C-3 lists the chronology of consultation and consultation documents related to the NRC’s NHPA Section 106 review of the proposed DNPS SLR. The NRC staff are required to consult with the noted agencies and organizations in accordance with the statutes listed above.

Table C-3 National Historic Preservation Act Correspondence

Date	Description	ADAMS Accession No.[(a)]
10/31/2024	NRC letter to J. Loichinger, ACHP – Request for Comments Regarding the Environmental Review of DNPS, Units 2 and 3, Subsequent License Renewal Application	ML24291A020
10/31/2024	NRC letter to C. Mayer, Illinois State Historic Preservation Office – Request to Initiate Section 106 Consultation for Subsequent License Renewal of Dresden Nuclear Power Station, Units 2 and 3	ML24291A027
11/01/2024	NRC letter to R. Blanchard, Tribal Chairman, Bad River Band of the Lake Superior Tribe – Request to Initiate Section 106 Consultation for Subsequent License Renewal of Dresden Nuclear Power Station, Units 2 and 3	ML24291A025
11/01/2024	NRC letter to W. Gravelle, Chairperson, Bay Mills Indian Community – Request to Initiate Section 106 Consultation for Subsequent License Renewal of Dresden Nuclear Power Station, Units 2 and 3	ML24303A146

Table C-3 National Historic Preservation Act Correspondence (Continued)

Date	Description	ADAMS Accession No.[(a)]
11/01/2024	NRC letter to C. Chavers, Chairwoman, Bois Forte Band of Chippewa Indians – Request to Initiate Section 106 Consultation for Subsequent License Renewal of Dresden Nuclear Power Station, Units 2 and 3	ML24303A020
11/01/2024	NRC letter to John Barrett, Chairman, Citizen Potawatomi Nation – Request to Initiate Section 106 Consultation for Subsequent License Renewal of Dresden Nuclear Power Station, Units 2 and 3	ML24303A051
11/01/2024	NRC letter to J.A. Crawford, Chairman, Forest County Potawatomi Community – Request to Initiate Section 106 Consultation for Subsequent License Renewal of Dresden Nuclear Power Station, Units 2 and 3	ML24303A069
11/01/2024	NRC letter to K. Meshigaud, Chairperson, Hannahville Indian Community – Request to Initiate Section 106 Consultation for Subsequent License Renewal of Dresden Nuclear Power Station, Units 2 and 3	ML24303A071
11/01/2024	NRC letter to J. Greendeer, President, Ho-Chuck Nation of Wisconsin – Request to Initiate Section 106 Consultation for Subsequent License Renewal of Dresden Nuclear Power Station, Units 2 and 3	ML24303A053
11/01/2024	NRC letter to T. Rhodd, Chairperson, Iowa Tribe of Kansas and Nebraska – Request to Initiate Section 106 Consultation for Subsequent License Renewal of Dresden Nuclear Power Station, Units 2 and 3	ML24303A135
11/01/2024	NRC letter to J. Keyes, Chairman, Iowa Tribe of Oklahoma – Request to Initiate Section 106 Consultation for Subsequent License Renewal of Dresden Nuclear Power Station, Units 2 and 3	ML24303A055
11/01/2024	NRC letter to Estavio Elizondo, Sr., Chairman, Kickapoo Traditional Tribe of Texas – Request to Initiate Section 106 Consultation for Subsequent License Renewal of Dresden Nuclear Power Station, Units 2 and 3	ML24303A043
11/01/2024	NRC letter to G. Cheatham, Chairwoman, Kickapoo Tribe of Indians of the Kickapoo Reservation in Kansas – Request to Initiate Section 106 Consultation for Subsequent License Renewal of Dresden Nuclear Power Station, Units 2 and 3	ML24303A047
11/01/2024	NRC letter to D. Kaskaske, Chairman, Kickapoo Tribe Oklahoma – Request to Initiate Section 106 Consultation for Subsequent License Renewal of Dresden Nuclear Power Station, Units 2 and 3	ML24303A024
11/01/2024	NRC letter to R. Gasco, Chairperson, Little Traverse Bay Bands of Odawa Indians – Request to Initiate Section 106 Consultation for Subsequent License Renewal of Dresden Nuclear Power Station, Units 2 and 3	ML24303A110
11/01/2024	NRC letter to B. Peters, Chairman, Match-e-be-nash-she-wish Band of Pottawatomi – Request to Initiate Section 106 Consultation for Subsequent License Renewal of Dresden Nuclear Power Station, Units 2 and 3	ML24303A017

Table C-3 National Historic Preservation Act Correspondence (Continued)

Date	Description	ADAMS Accession No.[a]
11/01/2024	NRC letter to G. Kakkak, Chairwoman, Menominee Indian Tribe of Wisconsin – Request to Initiate Section 106 Consultation for Subsequent License Renewal of Dresden Nuclear Power Station, Units 2 and 3	ML24303A049
11/01/2024	NRC letter to D.G. Lankford, Chief, Miami Tribe of Oklahoma – Request to Initiate Section 106 Consultation for Subsequent License Renewal of Dresden Nuclear Power Station, Units 2 and 3	ML24303A030
11/01/2024	NRC letter to D. Rios, Chairperson, Nottawaseppi Huron Band of the Potawatomi – Request to Initiate Section 106 Consultation for Subsequent License Renewal of Dresden Nuclear Power Station, Units 2 and 3	ML24303A027
11/01/2024	NRC letter to J.R. Shotton, Chairman, Otoe-Missouria Tribe of Indians – Request to Initiate Section 106 Consultation for Subsequent License Renewal of Dresden Nuclear Power Station, Units 2 and 3	ML24303A060
11/01/2024	NRC letter to C. Harper, Chief, Peoria Tribe of Indians of Oklahoma – Request to Initiate Section 106 Consultation for Subsequent License Renewal of Dresden Nuclear Power Station, Units 2 and 3	ML24303A015
11/01/2024	NRC letter to M.J. Wesaw, Chair, Pokagon Band of Potawatomi Indians – Request to Initiate Section 106 Consultation for Subsequent License Renewal of Dresden Nuclear Power Station, Units 2 and 3	ML24303A089
11/01/2024	NRC letter to Joseph Rupnick, Chair, Prairie Band Potawatomi Nation – Request to Initiate Section 106 Consultation for Subsequent License Renewal of Dresden Nuclear Power Station, Units 2 and 3	ML24303A064
11/01/2024	NRC letter to T. Carnes, Chairperson, Sac and Fox Nation of Missouri in Kansas and Nebraska – Request to Initiate Section 106 Consultation for Subsequent License Renewal of Dresden Nuclear Power Station, Units 2 and 3	ML24303A134
11/01/2024	NRC letter to R. Carter, Principal Chief, Sac and Fox Nation of Oklahoma – Request to Initiate Section 106 Consultation for Subsequent License Renewal of Dresden Nuclear Power Station, Units 2 and 3	ML24303A099
11/01/2024	NRC letter to Vern Jefferson, Chairman, Sac and Fox Tribe of the Mississippi in Iowa – Request to Initiate Section 106 Consultation for Subsequent License Renewal of Dresden Nuclear Power Station, Units 2 and 3	ML24303A142
11/01/2024	NRC letter to B. Barnes, Chairman, Shawnee Tribe – Request to Initiate Section 106 Consultation for Subsequent License Renewal of Dresden Nuclear Power Station, Units 2 and 3	ML24303A013
11/01/2024	NRC letter to V. Kitcheyan, Chairwoman, Winnebago Tribe of Nebraska – Request to Initiate Section 106 Consultation for Subsequent License Renewal of Dresden Nuclear Power Station, Units 2 and 3	ML24303A144

Table C-3 National Historic Preservation Act Correspondence (Continued)

Date	Description	ADAMS Accession No.[(a)]
11/14/2024	Letter from the Kickapoo Traditional Tribe of Texas to T. Smith, NRC – Regarding Request to Initiate Section 106 Consultation for Subsequent License Renewal of Dresden Nuclear Power Station, Units 2 and 3	ML25044A005
11/19/2024	Letter from R. Mangum, ACHP– Regarding Request for Comments Concerning Subsequent License Renewal of Dresden Nuclear Power Station, Units 2 and 3	ML24324A320

ADAMS = Agencywide Documents Access and Management System; ACHP = Advisory Council on Historic Preservation; DNPS = Dresden Nuclear Power Station; NRC = U.S. Nuclear Regulatory Commission.
(a) Access these documents through the NRC's ADAMS at http://adams.nrc.gov/wba/.

C.5 References

36 CFR Part 800. *Code of Federal Regulations*, Title 36, *Parks, Forests, and Public Property*, Part 800, "Protection of Historic Properties." TN513.

50 CFR Part 402. *Code of Federal Regulations,* Title 50, *Wildlife and Fisheries*, Part 402, "Interagency Cooperation—Endangered Species Act of 1973, as amended." TN4312.

51 FR 19926. June 3, 1986. "Interagency Cooperation - Endangered Species Act of 1973, as amended." Final Rule, *Federal Register*, Fish and Wildlife Service, Interior; National Marine Fisheries Service, National Oceanic and Atmospheric Administration, Commerce. TN7600.

82 FR 2402. January 9, 2017. "Tribal Policy Statement." *Federal Register*, Nuclear Regulatory Commission. TN5500.

16 U.S.C. § 1536. Endangered Species Act, Section 7, "Interagency Cooperation." TN4459.

16 U.S.C. § 1801 et seq. U.S. Code Title 16, Conservation, Chapter 38, "Fishery Conservation and Management." TN9966.

54 U.S.C. § 306108 et seq. National Historic Preservation Act Section 106, "Effect of Undertaking on Historic Property." TN4839.

Endangered Species Act of 1973. 16 U.S.C. § 1531 et seq. TN1010.

FWS and NMFS (U.S. Fish and Wildlife Service and National Marine Fisheries Service). 1998. *Endangered Species Act Consultation Handbook, Procedures for Conducting Section 7 Consultation and Conference*. Washington, D.C. ADAMS Accession No. ML14171A801. TN1031.

National Environmental Policy Act of 1969 (NEPA), as amended. 42 U.S.C. § 4321 et seq. TN661.

National Marine Sanctuaries Act, as amended. 16 U.S.C. § 1431 et seq. TN4482.

APPENDIX D

CHRONOLOGY OF ENVIRONMENTAL REVIEW CORRESPONDENCE

This appendix contains a chronological listing of correspondence between the U.S. Nuclear Regulatory Commission (NRC, the Commission) and external parties as part of the agency's environmental review of the Dresden Nuclear Power Station, Units 2 and 3, subsequent license renewal application (SLRA). This appendix does not include consultation correspondence, or comments received during the scoping process. For a list and discussion of consultation correspondence, see Appendix C. For scoping comments, see Appendix A and the "Scoping Summary Report" (Agencywide Documents Access and Management System [ADAMS] Accession No. ML25007A107) (NRC 2025-TN11463). All documents are available electronically from the NRC's Public Electronic Reading Room found at: http://www.nrc.gov/reading-rm.html. From this site, the public can gain access to ADAMS, which provides text and image files of the NRC's public documents. The ADAMS accession number for each document is included in the following table.

D.1 Environmental Review Correspondence

Table D-1 lists the environmental review correspondence, by date, beginning with the request by Constellation Energy Generation, LLC to renew the operating license for Dresden Nuclear Power Station, Units 2 and 3.

Table D-1 Environmental Review Correspondence

Date	Correspondence Description	ADAMS Accession Number[(a)]
04/17/2024	Dresden Nuclear Power Station, Units 2 and 3, Application for Renewed Operating License	ML24108A008
04/30/2024	Dresden Nuclear Power Station, Units 2 and 3, Subsequent License Renewal Application	ML24108A010
04/30/2024	Dresden Nuclear Power Station, Units 2 and 3, Subsequent Operating License Renewal – Appendix E – Applicant's Environmental Report	ML24108A011
04/30/2024	Dresden Nuclear Power Station, Units 1, 2, and 3, 2023 Radioactive Effluent Release Report	ML24127A098
05/01/2024	Dresden SLRA - Receipt and Availability - Letter.	ML24092A341
05/02/2024	Dresden SLRA - Receipt and Availability - FRN.	ML24092A342
05/06/2024	News Release-24-034: NRC Makes Available Dresden Nuclear Power Station's Subsequent License Renewal Application	ML24142A122
06/14/2024	Dresden Nuclear Power Station, Units 2 and 3 - Notice of Acceptance and Opportunity for Hearing - Letter	ML24128A274
06/14/2024	07/11/2024 Environmental Scoping Meeting Related to the Dresden Nuclear Power Plant Subsequent License Renewal Application	ML24166A120
06/14/2024	07/09/2024 Environmental Scoping Meeting Related to the Dresden Nuclear Power Plant Subsequent License Renewal Application	ML24166A122

Table D-1 Environmental Review Correspondence (Continued)

Date	Correspondence Description	ADAMS Accession Number[(a)]
06/17/2024	Dresden Nuclear Power Station, Units 2 and 3 - Notice of Acceptance and Opportunity for Hearing - Federal Register Notice	ML24128A275
06/18/2024	Dresden Nuclear Power Station, Units 2 and 3 - Subsequent License Renewal Application Online Reference Portal	ML24131A062
06/18/2024	Dresden Nuclear Power Station, Units 2 and 3 - Aging Management Audit Plan Regarding the Subsequent License Renewal Application Review	ML24138A181
06/27/2024	News Release-24-053: NRC Announces Opportunity to Request a Hearing for the Dresden Subsequent License Renewal Application	ML24184B857
07/31/2024	Dresden Nuclear Power Station, Unit 2 & 3, NOI FRN	ML24155A099
08/02/2024	Dresden SLRA Schedule Letter	ML24184A171
08/05/2024	News Release-24-063: NRC Seeking Public Comment on Environmental Review of Dresden Subsequent License Renewal Application	ML24249A177
08/07/2024	Dresden Nuclear Power Station Unit 2 & 3 Scoping Power Point Presentation	ML24172A109
08/07/2024	08/20/2024 Environmental Scoping Meeting Related to the Dresden Nuclear Power Plant Subsequent License Renewal Application	ML24220A254
08/07/2024	08/20/2024 Environmental Scoping Meeting Related to the Dresden Nuclear Power Plant Subsequent License Renewal Application	ML24220A255
08/08/2024	Dresden Nuclear Power Station, Units 2 And 3 - Notice of Intent To Prepare An Environmental Impact Statement And Conduct Scoping Process (EPID L-2024-Sle-0002) (Docket Numbers: 50-237, And 50-249)	ML24157A079
08/10/2024	2024/08/10 - Comment (1) E-mail regarding Dresden SLR EIS Scoping	ML24226A483
08/14/2024	2024/08/14 - Comment (2) E-mail regarding Dresden SLR EIS Scoping	ML24232A004
08/20/2024	Transcript of Environmental Scoping Meeting related to the Dresden Nuclear Power Plant Subsequent License Renewal Application, 08-20-24, Afternoon, Pages 1-39	ML24250A065
08/20/2024	Transcript of Environmental Scoping Meeting Related to the Dresden Nuclear Power Plant Subsequent License Renewal Application, 8/20/2024 Evening, Pages 1-30	ML24250A066
08/23/2024	2024/08/23 - Comment (3) E-mail regarding Dresden SLR EIS Scoping	ML24248A075
09/02/2024	2024/09/02 - Comment (4) E-mail regarding Dresden SLR EIS Scoping	ML24248A077
09/04/2024	2024/09/04 - Comment (5) E-mail regarding Dresden SLR EIS Scoping	ML24249A070
09/04/2024	2024/09/04 - Comment (6) E-mail regarding Dresden SLR EIS Scoping	ML24249A072

Table D-1 Environmental Review Correspondence (Continued)

Date	Correspondence Description	ADAMS Accession Number[(a)]
09/23/2024	Dresden Nuclear Power Station, Units 2 And 3 - License Renewal Regulatory Audit Regarding the Environmental Review of The License Renewal Application (EPID L-2024-Sle-0002) (Docket Numbers: 50-237 And 50-249)	ML24253A094
12/10/2024	Dresden draft RCI/RAI email package to CEG	(PKG) ML24354A002; (AUDIT SUMMARY); ML24354A003; (E-MAIL); ML24354A004; (AUDIT REPORT); ML24354A005; (E-MAIL); ML24354A027
12/23/2024	Dresden draft audit RCI/RAI 12.23.2024	(PKG) ML24366A021; (CLEAN DRAFT) ML24336A027; (DRAFT) ML24366A031
12/26/2024	Dresden RCI/RAI email 12.26.2024 C. Wilson	(PKG) ML25007A016; (RAI) ML25007A018; (EMAIL) ML25007A019
01/23/2025	Email from CEG for Dresden confirming RCI/RAI response time	ML25027A030
02/03/2025	Dresden Nuclear Power, Units 2 and 3 - Subsequent License Renewal Environmental Review, Responses to NRC Requests for Confirmation of Information (RCIs) and Requests for Additional Information (RAIs); Enclosure 1 and Enclosure 2	(PKG) ML25034A108; (Cover) ML25034A109; (ENCLOSURE) ML25034A111
02/03/2025	Dresden Nuclear Power, Units 2 and 3 - Subsequent License Renewal Environmental Review, Responses to NRC Requests for Confirmation of Information (RCIs) and Requests for Additional Information (RAIs)	(PKG) ML25034A157; (COVER) ML25034A160; (ENCLOSURE) ML25034A158
02/14/2025	Dresden Scoping Summary Report Letter to C Wilson Re Environmental Scoping Summary Report for Dresden Dresden Scoping Summary Final	(PKG) ML25007A107; (LETTER) ML25007A111; (REPORT) ML25007A110
04/03/2025	Dresden Audit Report	ML25084A071

ADAMS = Agencywide Documents Access and Management System; CEG = Constellation Energy Generation, LLC; EIS = environmental impact statement; FRN = Federal Register Notice; GEIS = generic environmental impact statement; NOI = Notice of Intent; NRC = U.S. Nuclear Regulatory Commission; RAI = Request for Additional Information; RCI = Request for Confirmation of Information; SLR = subsequent license renewal; SLRA = subsequent license renewal application.

(a) Access these documents through the NRC's ADAMS at http://adams.nrc.gov/wba/.

APPENDIX E

AQUATIC ECOLOGY STUDIES FOR DRESDEN NUCLEAR POWER STATION

This appendix describes the methodology and major findings of aquatic ecological studies at the Dresden Nuclear Power Station (DNPS), Units 2 and 3 site. These studies comprise of several ecological characterization studies from the Dresden Long Term Aquatic Monitoring Study, including impingement studies (2005–2007 and 2017–2018), entrainment studies (2005–2006 and 2017–2018), and thermal demonstrations (2013–2014).

E.1 Ecological Characterization Studies

E.1.1 2014 Dresden Nuclear Power Station Aquatic Monitoring

In 2014, the DNPS licensee's contractor, EA Engineering, Science, and Technology, Inc. (EA Engineering), conducted an aquatic monitoring study at DNPS, the results of which were documented in a report titled *Dresden Nuclear Station Aquatic Monitoring Study 2014* (CEG 2025-TN11341: RAI AQU-06, EA Engineering 2015). Information presented in this section is derived from the 2014 study, unless otherwise indicated. The purpose of the 2014 DNPS aquatic monitoring study was to continue to gain data to support the DNPS Clean Water Act (CWA) 316(a) demonstration, as well as to characterize the aquatic environment around DNPS. The licensee's contractor, EA Engineering, conducted all DNPS aquatic monitoring surveys. The objectives of this study were: (1) determine fish species composition and abundance; (2) determine spatial trends for the composition, distribution, and abundance of aquatic species; (3) determine spatial fish patterns; and (4) determine taxa richness, density, and relative abundance of benthos (CEG 2025-TN11341).

From May to September 2014, EA Engineering conducted eight samplings in eight locations along 2.9 mi (4.7 km) of the Illinois River and in two locations on the Kankakee River for ten locations total (Table E-1). For fish sampling, electrofishing and seining were used. Electrofishing was conducted at 10 locations from 30 minutes past sunrise to 30 minutes prior to sunset in zones ranging from 1,000 to 1,600 ft (310 to 500 m) long. Seining was conducted at nine locations by using a 25 ft (7.6 m) by 6 ft (1.8 m) deep with 3/16 in. (4.8 mm) ace mesh. In areas where both seining and electrofishing occurred, seining would always occur first. Sample processing included counting, identification, measuring, and weighing fish samples. Fish were also observed for deformities using the deformities, erosions, lesions, and tumors anomalies.

From July to August 2014, Hester Dendy multiple plate samplers were utilized to sample benthos communities at six locations using Hester Dendy samplers and Ponar dredge samplers (CEG 2025-TN11341). Benthos samples were analyzed in a laboratory using EA Engineering's Macroinvertebrate Quality Control and Procedures Manual (CEG 2025-TN11341).

Physiochemical measurements such as dissolved oxygen (DO) and water temperature were gathered throughout the study and sampling periods at surface level and one-meter depth intervals until reaching the bottom of the sampling location. Habitat quality was evaluated using the Ohio Environmental Protection Agency's Qualitative Habitat Evaluation Index (QHEI) (CEG 2025-TN11341).

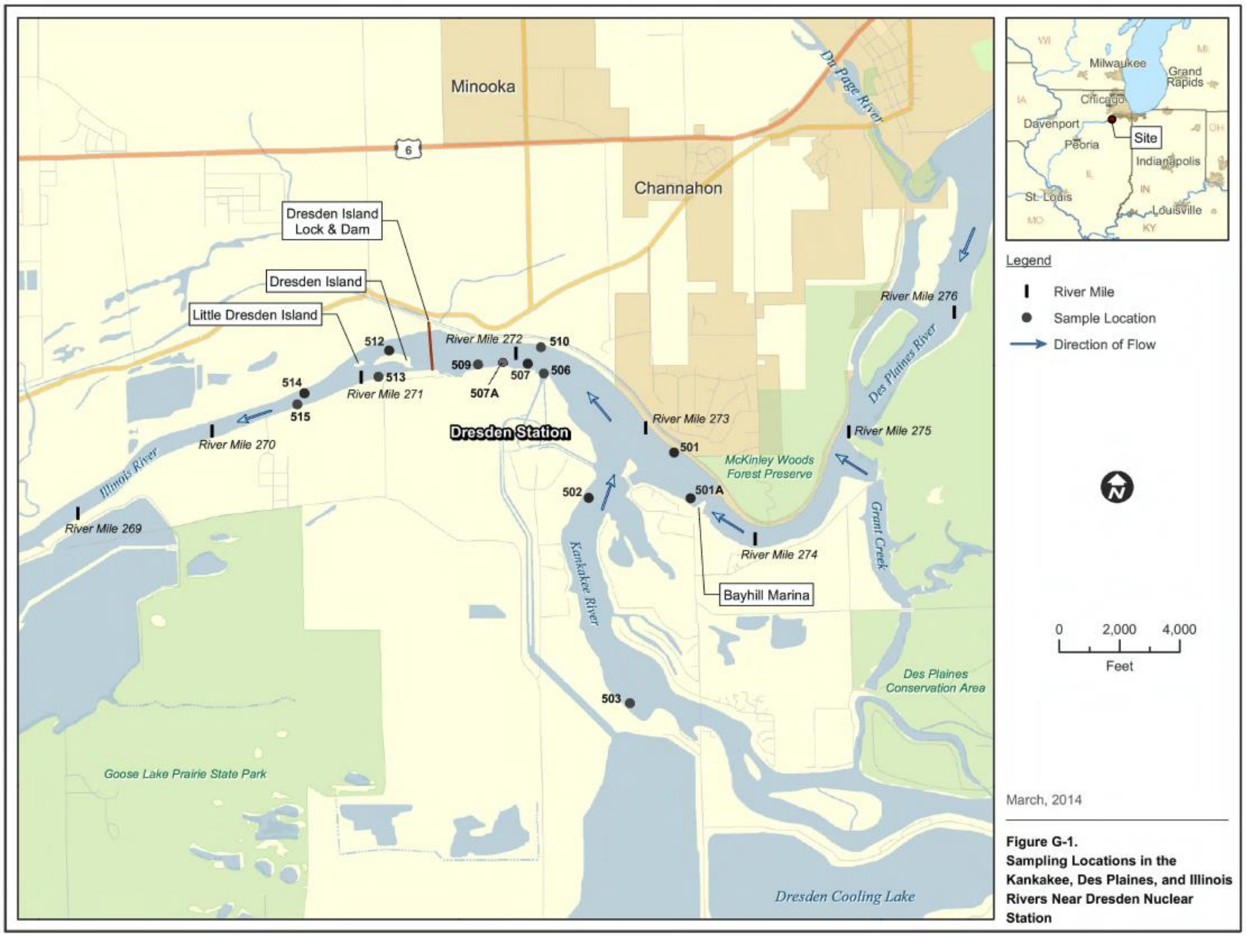

Figure E-1 2014 Dresden Nuclear Power Station Aquatic Monitoring Survey Sampling Locations. Source: CEG 2025-TN11341: RAI AQU-06, EA Engineering 2015.

A total of 120 gear efforts (64 electrofishing and 56 seining) occurred during the study period, catching 12,086 individual fish. A total of 71 fish species and 2 hybrids were represented during the study period. As stated by EA Engineering, "Numerically, the combined catch was dominated by spotfin shiner (17.5 percent), gizzard shad (15.4 percent), bluntnose minnow (7.3 percent), bullhead minnow (6.8 percent), and threadfin shad (6.6 percent). Eleven other species contributed 1.1 to 4.9 percent of total catch including bluegill, smallmouth bass, largemouth bass, and logperch. Collectively, the 19 most abundant species accounted for 91 percent of the numerical catch. Conversely, 40 species/taxa were represented by 10 or fewer individuals. By weight, the combined catch was dominated by channel catfish (20.9 percent), common carp (18.8 percent), freshwater drum (12.4 percent), smallmouth buffalo (11.5 percent), largemouth bass (5.2 percent), and smallmouth bass (4.7 percent). Fifteen species accounted for 91.7 percent of the total biomass" (CEG 2025-TN11341). In addition, 128 individuals of the State-endangered pallid shiner, two state-endangered Western sand darter, and eight individuals of state-threatened banded killfish were collected in the study. Several invasive species and exotic taxa were collected including threadfin shad, goldfish, common carp, carp x goldfish hybrid, grass carp, silver carp, golden shiner, western mosquitofish, white perch, *Lepomis* hybrid, and round goby. Invasive and exotic species accounted for 8.1 percent of total catch (CEG 2025-TN11341).

A total of 88 macroinvertebrate taxa were also collected in this study. The most common taxa groups include Chironomidae and Oligochaeta with 24 and 14 taxa, respectively. Data from this study supports the hypothesis that the benthic community in the Dresden Pool and downstream to the Dresden Island Lock and Dam is poor. Benthic taxa that are highly tolerant to stressors and pollutants, such as Oligochaeta, are predominantly located in the vicinity of DNPS. It was found that tolerant species such as *Nanocladius distinctus*, *Dicrotendipes simpsoni*, and *Glyptotendipes* were present in the Dresden Pool, but absent or in very small numbers downstream the Dresden Island Lock and Dam. In contrast, there were some less tolerant benthic taxa collected, such as Ephemeroptera and Trichoptera, that were collected in very low numbers. Substrate composition both upstream and downstream of the Dresden Pool were similar and consisted of silt, clay, and detritus.

Near the Dresden Pool, surface and mid-depth water temperatures ranged from 63.3°F (17.4°C) to 87.4°F (30.8°C), while downstream temperatures at the Dresden Island Lock and Dam ranged from 67.2°F (19.6°C) to 84°F (28.9°C). The mean Dresden Pool temperature was 79.0°F (26.1°C), while the mean downstream temperature was approximately 76.3°F (24.6°C). Dresden Pool DO concentrations ranged from 2.8 parts per million (ppm) to 14.7 ppm. From all data gathered, the mean upstream DO was 1.4 ppm higher than the mean downstream DO. Downstream of the Dresden Island Lock and Dam, DO concentrations ranged from 6.7 to 10.5 ppm.

Throughout the study, QHEI assessments were conducted at each electrofishing location and all locations were found to be categorized as fair or poor. When comparing this data to prior years, it confirmed that the aquatic habitat has changed minimally over time.

E.1.2 2013 Dresden Nuclear Power Station Aquatic Monitoring

In 2013, EA Engineering conducted an aquatic monitoring study at DNPS, the results of which were documented in a report titled *Dresden Nuclear Station Aquatic Monitoring Study 2013* (CEG 2025-TN11341: RAI AQU-06, EA Engineering 2014). Information presented in this section is derived from the 2013 study, unless otherwise indicated. The purpose and objective of this study are the same as discussed in Section E.1.1. Additionally, the materials and methods of this study are the same as discussed in Section E.1.1, except that instead of eight surveys conducted between May and September (as described in Section E.1.1), only three surveys were conducted (in July, August, and September). Additionally, the habitat quality was not analyzed utilizing the OEPA QHEI.

A total of 45 gear efforts, which included 24 electrofishing and 21 seining samples during the study period, caught 3,708 individual fish. A total of 50 fish species and one hybrid were collected during the study period. As stated by EA Engineering, “Numerically, the combined catch was dominated by spotfin shiner (24.8 percent), bluegill (14.0 percent), gizzard shad (11.5 percent), and bluntnose minnow (8.7 percent). Eleven other species contributed 1.0 to 6.1 percent of total catch including bullhead minnow, brook silverside, green sunfish, smallmouth bass, and largemouth bass. Collectively, the 15 most abundant species accounted for 91 percent of the numerical catch. Conversely, 28 species/taxa were represented by 10 or fewer individuals. By weight, the combined catch was dominated by gizzard shad (25.7 percent), channel catfish (13.8 percent), common carp (13.0 percent), and largemouth bass (9.2 percent). Thirteen species accounted for 96 percent of the biomass collected in 2013” (CEG 2025-TN11341). In addition, 34 State-endangered pallid shiner and two state-threatened banded killfish individuals were collected. Six invasive species and exotic taxa were collected during the 2013 aquatic monitoring survey which include threadfin shad, common carp, golden shiner, western mosquitofish, *Lepomis* hybrid, and round goby. Invasive and exotic species accounted for 3.5 percent of total catch.

A total of 63 macroinvertebrate taxa were collected in this study. The most common taxa groups include Chironomidae and Oligochaeta with 20 and 15 taxa, respectively. Data from this study supports the hypothesis that the benthic community in the Dresden Pool and downstream the Dresden Island Lock and Dam is poor. There were no significant differences in richness between the upstream and downstream Oligochaeta, Chironmoidae, and Pelecypoda. Upstream substrate contained more sand while downstream substrate contained more silt. The Dresden Pool contained a combination of silt, clay, and debris. Benthic taxa that are highly tolerant to stressors and pollutants, such as Oligochaeta, are predominantly located in vicinity of DNPS. It was found that tolerant species such as *Nanocladius distinctus*, *Dicrotendipes simpsoni*, and *Glyptotendipes* were present in the Dresden Pool, but absent or in very small numbers downstream of the Dresden Island Lock and Dam.

Near the Dresden Pool, surface and mid-depth water temperatures ranged from 78.4°F (25.8°C) to 87.1°F (30.6°C) while downstream the Dresden Island Lock and Dam ranged from 74.8°F (23.8°C) to 90.7°F (32.6°C). The mean Dresden Pool temperature was 84.0°F (28.9°C) while the mean downstream temperature was approximately 76.3°F (24.6°C). Dresden Pool DO concentrations ranged from 6.9 ppm to 12.4 ppm. Downstream of the Dresden Island Lock and Dam, DO concentrations ranged from 7.2 to 8.1 ppm.

E.1.3 2011 Dresden Nuclear Power Station Aquatic Monitoring

In 2011, EA Engineering conducted an aquatic monitoring study at DNPS, the results of which were documented in a report titled *Dresden Nuclear Station Aquatic Monitoring Study 2011* (CEG 2025-TN11341: RAI AQU-06, EA Engineering 2012). Information presented in this section is derived from the 2011 study, unless otherwise indicated. The purpose and objective of this study are the same as described in Section E.1.1. The materials and methods are the same as described in Section E.1.2.

A total of 120 gear efforts, which included 24 electrofishing and 21 seining samples during the study period, caught 3,259 individual fish. A total of 49 fish species and one hybrid were collected during the study period. As stated by EA Engineering, “Numerically, the combined catch was dominated by bluegill (20.3 percent), gizzard shad (15.9 percent), spotfin shiner (14.2 percent), bluntnose minnow (8.4 percent), largemouth bass (5.8 percent), and emerald shiner (5.3 percent). These six species comprised 70.0 percent of the combined catch by number. By weight, the combined catch was dominated by common carp (20.8 percent), largemouth bass (6.6 percent), gizzard shad (13.2 percent), channel catfish (13.2 percent), smallmouth buffalo (7.3 percent), and freshwater drum (6.6 percent). These six species comprised 77.7 percent of the combined catch by weight” (CEG 2025-TN11341). In addition, 11 State-endangered pallid shiner were collected. Five invasive species and exotic taxa were collected during the 2011 aquatic monitoring survey which include threadfin shad, common carp, western mosquitofish, *Lepomis* hybrid, and round goby. Invasive and exotic species accounted for 2.9 percent of total catch.

A total of 73 macroinvertebrate taxa were collected in this study. The most common taxa groups include Chironomidae and Oligochaeta with 20 and 17 taxa, respectively. Data from this study aligns with the benthic conclusions in Appendix E.1.1 and E.1.2.

Near the Dresden Pool, surface and mid-depth water temperatures ranged from 67.5°F (19.7°C) to 93.2°F (34.0°C) while downstream the Dresden Island Lock and Dam ranged from 76.1°F (24.5°C) to 92.8°F (33.8°C). The mean Dresden Pool temperature was 84.2°F (29.0°C) while the mean downstream temperature was approximately 76.3°F (29.6°C). Dresden Pool DO concentrations ranged from 6.3 ppm to 14.5 ppm. Downstream of the Dresden Island Lock and Dam, DO concentrations ranged from 7.2 to 8.1 ppm.

E.2 Impingement Studies

E.2.1 2017–2018 Impingement Characterization Study

As part of the DNPS CWA 316(b) demonstration, Constellation Energy Generation, LLC (CEG) or its contractor (EA Engineering), collected impingement data during the indirect open-cycle operation period (June 15 through September 30) to support the selection of Best Technology Available standards for impingement mortality at Title 40 of the *Code of Federal Regulations* (CFR) 125.94(c) (TN254). The results of this study were documented in a 2019 report prepared by EA Engineering titled *Impingement Characterization Report for Dresden Nuclear Power Station* (CEG 2025-TN11341: RAI AQU-06, EA Engineering 2019). The information presented in this section is derived from the 2019 report, unless otherwise indicated. The purpose of this study was to investigate the species composition of impinged organisms, determine any seasonal and diel patterns of impingement, examine impingement rates of susceptible fish, and assess the relationship between impingement rates and cooling water system operational parameters.

EA collected impingement samples during 24-hr sampling periods, biweekly from June 15 through September 30 for both 2017 and 2018 at the Units 2 and 3 screenhouse. Onsite personnel were responsible for monitoring the collection basket to prevent overflowing as well as rotating the traveling screens prior to the initiation of a new 24-hr sampling period. Researchers sorted fish and identified organisms by species and counted, measured, and weighed them.

A total of 37 species were collected during the 2017–2018 study (Table E-1). The three most impinged species were gizzard shad (*Dorosoma cepedianum*, 49.67 percent of fish collected), threadfin shad (*Dorosoma petenense*, 28.90 percent of fish collected), and channel catfish (*Ictalurus punctatus*, 9.29 percent of fish collected). Most fish collected were juveniles or small adults, which suggests that older and larger fish can swim away from the intake structure to avoid or escape impingement. The majority of the organisms collected were juveniles of larger species such as gizzard shad, channel catfish, and freshwater drum. Adults of other larger species such as minnows and trout-perch were also collected. In 2017, 78 percent of fish collected were 3.1 in. (80 mm) or smaller with only five percent measuring greater than 5.9 in. (150 mm). In 2018, 70 percent of fish collected were 3.3 in. (85 mm) or smaller with only two percent measuring greater than 4.7 in. (120 mm). Table E-1 summarizes the total catch and abundance of fish taxa collected during the study period(s).

Table E-1 Dresden Nuclear Power Station Number and Relative Abundance of Fish Taxa Collected During the 2017–2018 Impingement Characterization Study

Common Name	Scientific Name	Impinged 2017 (#)	Impinged 2017 (%)	Impinged 2018 (#)	Impinged 2018 (%)	Total (#)	Total (%)
-	*Clupeidae spp.*	8	0.41	-	-	8	0.06
-	*Dorosoma spp.*	6	0.31	-	-	6	0.05
-	*Moxostoma spp.*	-	-	5	0.05	5	0.04
-	*Ictiobinae spp.*	15	0.77	-	-	15	0.12
black crappie	*Pomoxis nigromaculatus*	5	0.26	6	0.06	11	0.09
bluegill	*Lepomis macrochirus*	28	1.44	51	0.48	79	0.63
bluntnose minnow	*Pimephales notatus*	-	-	11	0.10	11	0.08
brook silverside	*Labidesthes sicculus*	4	0.21	59	0.55	63	0.50
bullhead minnow	*Pimephales vigilax*	33	1.70	95	0.89	128	1.02
central mudminnow	*Umbra limi*	-	-	2	0.02	2	0.02
channel catfish	*Ictalurus punctatus*	189	9.73	975	9.21	1,164	9.29
common carp	*Cyprinus carpop*	11	0.57	1	0.01	12	0.10
emerald shiner	*Notropis atherinoides*	14	0.72	52	0.49	66	0.53
flathead catfish	*Pylodictis olivaris*	6	0.31	13	0.12	19	0.15
freshwater drum	*Aplodinotus grunniens*	26	1.34	31	0.29	57	0.45
ghost shiner	*Notropis buchanani*	10	0.51	10	0.09	20	0.16
gizzard shad	*Dorosoma cepedianum*	866	44.59	5,356	50.61	6,222	49.67
golden redhorse	*Moxostoma erythrurum*	5	0.26	-	-	5	0.04
golden shiner	*Notemigonus crysoleucas*	-	-	1	0.01	1	0.01
green sunfish	*Lepomis cyanellus*	-	-	10	0.09	10	0.08
largemouth bass	*Micropterus nigricans*	1	0.05	32	0.30	33	0.26
logperch	*Percina caprodes*	7	0.36	24	0.23	31	0.25
mimic shiner	*Notropis volucellus*	-	-	11	0.10	11	0.08
orangespotted sunfish	*Lepomis humilis*	3	0.15	-	-	3	0.02
pallid shiner	*Hybopsis amnis*	14	0.72	58	0.55	72	0.57
pirate perch	*Aphredoderus sayanus*	1	0.05	-	-	1	0.01

Table E-1 Dresden Nuclear Power Station Number and Relative Abundance of Fish Taxa Collected During the 2017–2018 Impingement Characterization Study (Continued)

Common Name	Scientific Name	Impinged 2017 (#)	Impinged 2017 (%)	Impinged 2018 (#)	Impinged 2018 (%)	Total (#)	Total (%)
rosyface shiner	*Notropis rubellus*	4	0.21	-	-	4	0.03
round goby	*Neogobius melanostomus*	20	1.03	3	0.03	23	0.18
shorthead redhorse	*Moxostoma macrolepidotum*	14	0.72	41	0.38	55	0.44
silver redhorse	*Moxostoma anisurum*	-	-	4	0.04	4	0.03
smallmouth bass	*Micropterus dolomieu*	4	0.21	23	0.21	27	0.21
spotfin shiner	*Cyprinella spiloptera*	2	0.10	15	0.14	17	0.13
spottail shiner	*Notropis hudsonius*	17	0.88	3	0.03	20	0.16
stonecat	*Noturus flavus*	8	0.41	11	0.10	19	0.15
threadfin shad	*Dorosoma petenense*	555	28.58	3,065	28.96	3,620	28.90
trout-perch	*Percopsis omiscopmaycus*	28	1.44	588	5.55	616	4.91
white bass	*Morone chrysops*	32	1.65	-	-	32	0.26
white crappie	*Pomoxis annularis*	5	0.26	8	0.08	13	0.10
yellow bass	*Morone mississippiensis*	-	-	27	0.25	27	0.21
yellow bullhead	*Ameiurus natalis*	**1**	0.05	-	-	1	0.01
Total	-	**1,942**	**100**	**10,583**	**100**	**12,525**	**100**

= number collected; % = relative abundance.
"-" denotes no data in table cell.
Source: CEG 2025-TN11341: RAI AQU-06, EA Engineering 2019.

The total catch from 2018 compared to 2017 is approximately five times greater. CEG believes this correlates with a marked reduction in later summer river flow in 2018. This likely led to higher concentrations of fish in a localized area, increasing their susceptibility to impingement and thus contributing to the elevated impingement results in 2018 (CEG 2025-TN11341). Table E-2 displays the estimated impingement of susceptible organisms during indirect open-cycle operation in 2017 and 2018. Gizzard shad (*Dorosoma cepedianum*), threadfin shad (*Dorosoma petenense*), and channel catfish (*Ictalurus punctatus*) comprised of over 88.1 percent of total impinged fish from 2017 to 2018. The total estimated impingement for both 2017 and 2018 was 165,087 fish individuals. Total estimated impingement biomass for 2017 was 1,199 pounds (lb) (544 kilograms [kg]) and 1,397 lb (634 kilograms [kg]) for 2018. Again, gizzard shad, threadfin shad, and channel catfish accounted for the majority of the biomass at 78 percent for 2017–2018.

Table E-2 Estimated Impingement During Indirect Open-Cycle Operation of Dresden Nuclear Power Station in 2017 and 2018

Common Name	Scientific Name	Impinged 2017 (#)[(a)]	Impinged 2017 (%)	Impinged 2018 (#)[(a)]	Impinged 2018 (%)	Total (#)[(b)]	Total (%)
bullhead minnow	*Pimephales vigilax*	423	1.68	1,248	0.89	1,672	1.01
channel catfish	*Ictalurus punctatus*	2,514	9.99	12,753	9.11	15,266	9.25
gizzard shad	*Dorosoma cepedianum*	11,319	44.97	71,366	51.01	82,865	50.09
other taxa	-	3,513	13.96	6,365	4.55	9,878	5.98
threadfin shad	*Dorosoma petenense*	7,026	27.92	40,456	28.91	47,482	28.76
trout-perch	*Percopsis omiscopmaycus*	376	1.49	7,729	5.52	8,104	4.91
Total	-	**25,171**	**100**	**139,916**	**100**	**165,087**	**100**

= number collected; % = relative abundance.
"-" denotes no data in table cell.
(a) Impingement estimates are calculated during indirect open-cycle operations (June 15 through September 30). Number represents the sum of all sampling extrapolation periods per taxa. Extrapolation period = (24 hours/sample duration) × days in extrapolation period.
(b) Equated by sum of 2017 # and 2018 #.
Source: CEG 2025-TN11341: RAI AQU-06, EA 2019.

DNPS operates in closed-cycle mode for 8.5 months annually, thus limiting the impingement of susceptible organisms. Closed-cycle operation reduces flow by approximately 93.2 percent compared to indirect open-cycle operations (3.5 months) (CEG 2025-TN11342: RAI AQU-06, AECOM 2016). The data from this study was submitted to the Illinois Environmental Protection Agency (IEPA) for best technology available determination in 2019.

E.2.2 2005–2007 Impingement Characterization Study

As part of the DNPS CWA 316(b) demonstration, CEG or its contractor (EA Engineering), collected impingement data biweekly from April 12, 2005 through March 30, 2007 to support the selection of Best Technology Available standards for impingement mortality at 40 CFR 125.94(c) (TN254). The results of this study were documented in a 2007 report prepared by EA Engineering titled *Impingement Mortality Characterization Study (2005-2007)* (CEG 2025-TN11341: RAI AQU-06, EA Engineering 2007). Information presented in this section is derived from the 2007 report, unless otherwise indicated. The purpose of this study was to investigate the species composition of impinged organisms, determine any seasonal and diel patterns of impingement, examine impingement rates of susceptible fish, and assess the relationship between impingement rates and cooling water system operational parameters.

EA Engineering collected impingement samples during 24-hr sampling periods biweekly from April 12, 2005 through March 30, 2007 at the Units 2 and 3 screenhouse. Because this study occurred over the entire year(s), the schedule had a total of 26 sampling events where eight were collected during indirect open-cycle (June 15 through September 30) and 18 were collected during indirect closed-cycle (October through June 14). Onsite personnel were responsible for monitoring the collection basket to prevent overflowing as well as rotating the traveling screens prior to the initiation of a new 24-hr sampling period. Researchers sorted fish and identified organisms by species and counted, measured, and weighed them.

A total of 44 fish taxa and 3 shellfish taxa were collected throughout the 2005–2007 impingement study. Of the 44 fish taxa collected, 37 were native species and 4 were unidentified or hybrid species. The four most impinged species were gizzard shad (*Dorosoma cepedianum*, 91.6 percent of fish collected), freshwater drum (*Aplodinotus grunniens*, 4.06 percent of fish collected), channel catfish (*Ictalurus punctatus*, 2.11 percent of fish collected), and blue gill (*Lepomis macrochirus,* 1.56 percent of fish collected) accounting for a total of 99.33 percent of total impingement. Most fish collected were juveniles or small adults, which suggests that older and larger fish can swim away from the intake structure to avoid or escape impingement. A majority of the organisms collected were juveniles of larger species such as gizzard shad, channel catfish, and freshwater drum. Adults of larger species such as minnows and trout-perch were also collected.

In year one, 77 percent of the most common fish collected (gizzard shad, freshwater drum, channel catfish, and blue gill) ranged in size from 40 mm (1.6 in.) to 199 mm (7.83 in.). In year two, 58 percent of the previously listed fish species collected were 40 mm (1.6 in.) to 199 mm (7.83 in.). Table E-3 summarizes the total catch and abundance of fish taxa collected during the study period(s).

Table E-3 Dresden Nuclear Power Station Number and Relative Abundance of Species Taxa Collected During the Year 1 (2005–2006) and Year 2 (2006–2007) Impingement Characterization Study

Type	Common Name	Scientific Name	Impinged Year 1 (#)	Impinged Year 2 (%)	Impinged Year 2 (#)	Impinged Year 2 (%)	Total (#)	Total (%)
Shellfish	giant floater	*Pyganodon grandis*	45	95.74	-	-	45	80.4
Shellfish	northern crayfish	*Faxonius virilis*	1	2.13	-	-	1	1.8
Shellfish	rusty crayfish	*Faxonius rusticus*	1	2.13	9	100	10	17.8
Shellfish	**Total**	**-**	**47**	**100**	**9**	**100**	**56**	**100**
Fish	-	*Mox stoma* spp.	1	0.00	-	-	1	0.00
Fish	-	Subfamily Ictiobinae	1	0.00	-	-	1	0.00
Fish	black bullhead	*Ameiurus melas*	-	-	1	0.00	1	0.00
Fish	black crappie	*Pomoxis nigromaculatus*	1	0.00	2	0.00	3	0.00
Fish	bluegill	*Lepomis macrochirus*	1,564	1.72	485	1.2	2,049	1.56
Fish	bluntnose minnow	*Pimephales notatus*	15	0.02	21	0.05	36	0.03
Fish	bullhead minnow	*Pimephales vigilax*	12	0.01	16	0.04	28	0.02
Fish	channel catfish	*Ictalurus punctatus*	1,433	1.57	1,343	3.33	2,776	2.11
Fish	common carp	*Cyprinus carpio*	27	0.03	9	0.02	36	0.03
Fish	creek chub	*Semotilus atromaculatus*	1	0.00	-	-	1	0.00
Fish	emerald shiner	*Notropis atherinoides*	77	0.08	112	0.28	189	0.14
Fish	fathead minnow	*Pimpephales promelas*	1	0.00	-	-	1	0.00
Fish	flathead catfish	*Pylodictis olivaris*	8	0.01	10	0.03	18	0.01
Fish	reshwater drum	*Aplodinotus grunniens*	3,126	3.42	2,216	5.5	5,342	4.06%

Table E-3 Dresden Nuclear Power Station Number and Relative Abundance of Species Taxa Collected During the Year 1 (2005–2006) and Year 2 (2006–2007) Impingement Characterization Study (Continued)

Type	Common Name	Scientific Name	Impinged Year 1 (#)	Impinged Year 2 (%)	Impinged Year 2 (#)	Impinged Year 2 (%)	Total (#)	Total (%)
Fish	gizzard shad	*Dorosoma cepedianum*	84,536	92.85	35,735	88.69	120,273	91.6
Fish	golden redhorse	*Moxostoma erythrurum*	3	0.00	3	0.01	6	0.00
Fish	golden shiner	*Notemigonus crysoleucas*	-	-	2	0.00	2	0.00
Fish	green sunfish	*Lepomis cyanellus*	45	0.05	18	0.04	63	0.05
Fish	hybrid sunfish	-	3	0.00	-	-	3	0.00
Fish	largemouth bass	*Micropterus nigricans*	8	0.01	1	0.00	9	0.01
Fish	logperch	*Percina caprodes*	2	0.00	1	0.00	3	0.00
Fish	longear sunfish	*Lepomis megalotis*	2	0.00	-	-	2	0.00
Fish	longnose gar	*Lepisosteus osseus*	6	0.01	1	0.00	7	0.01
Fish	mimic shiner	*Notropis volucellus*	-	-	1	0.00	1	0.00
Fish	orangespotted sunfish	*Lepomis humilis*	6	0.01	5	0.01	11	0.01
Fish	pallid shiner	*Hybopsis amnis*	1	0.00	-	-	1	0.00
Fish	quillback	*Carpiodes cyprinus*	1	0.00	-	-	1	0.00
Fish	rock bass	*Ambloplites rupestris*	3	0.00	-	-	3	0.00
Fish	round goby	*Neogobius melanostomus*	4	0.00	27	0.07	31	0.02
Fish	sauger	*Sander canadensis*	-	-	1	0.00	1	0.00
Fish	shorthead redhorse	*Moxostoma macrolepidotum*	2	0.00	2	0.00	4	0.00
Fish	skipjack herring	*Alosa chrysochloris*	13	0.01	18	0.04	31	0.02
Fish	smallmouth bass	*Micropterus dolomieu*	5	0.01	34	0.08	39	0.03
Fish	spotfin shiner	*Cyprinella spiloptera*	26	0.03	12	0.03	38	0.03
Fish	spottail shiner	*Notropis hudsonius*	11	0.01	7	0.02	18	0.01
Fish	spotted sucker	*Minytrema melanops*	1	0.00	-	-	1	0.00
Fish	threadfin shad	*Dorosoma petenense*	16	0.02	146	0.36	162	0.12
Fish	trout-perch	*Percopsis omiscopmaycus*	62	0.07	2	0.00	64	0.05
Fish	walleye	*Sander vitreus*	7	0.01	-	-	7	0.00
Fish	white bass	*Morone chrysops*	-	-	1	0.00	1	0.00
Fish	white crappie	*Pomoxis annularis*	8	0.01	12	0.03	20	0.01
Fish	white perch	*Morone americana*	-	-	51	0.13	51	0.04
Fish	yellow bass	*Morone mississippiensis*	8	0.01	-	-	8	0.00
Fish	yellow bullhead	*Ameiurus natalis*	4	0.00	1	0.00	5	0.00
Fish	**Total**	-	**91,046**	**100**	**40,294**	**100**	**131,370**	**100**

= number collected; % = relative abundance.
"-" denotes no data in table cell.
Sources: CEG 2025-TN11341: RAI AQU-06, EA Engineering 2007.

Estimated impingement results were calculated in the same manner discussed in Section E.2.1. In year one, it was estimated that 1.02 million fish (5,836 lb or 2,647 kg) were impinged during indirect open-cycle and 16,024 fish (514 lb or 233 kg) were impinged during the closed-cycle period. Whereas in year two, it was estimated that 181,274 fish (4,376 lb or 1,985 kg) were impinged during indirect open-cycle and 26,214 fish (1,129 lb or 512 kg) were impinged during the closed-cycle period. As expected, gizzard shad abundance varies by year, which accounted for the significant difference in impingement between year one and year two. CEG concluded that because the most common fish species impinged are those expected from power plant operation and because the common fish species impinged are seasonal schooling fish, DNPS should not be required to alter operational or structural changes in compliance with impingement performance standards of the U.S. Environmental Protection Agency.

E.3 Entrainment Studies

E.3.1 2017–2018 Entrainment Characterization Study

EA Engineering conducted an entrainment study on behalf of Exelon Generation from April 2017 through September 2017 (88 samples) and March 2018 through September 2018 (92 samples) in connection with CWA Section 316(b) requirements. The results of this study were documented in a 2019 report prepared by EA titled *Entrainment Characterization Report for Dresden Nuclear Power Station* (CEG 2025-TN11341: RAI AQU-06, EA Engineering 2019). Information presented in this section is derived from the 2019 report, unless otherwise indicated. The purpose of the study was to evaluate the entrainment effects of DNPS' cooling water intake system and assess the available options to reduce entrainment. The target taxa for this study included all relevant fish species in the vicinity of DNPS. Supporting studies such as the Aquatic Monitoring Program (Appendix E.1) were used to support target taxa selection. Both the intake and discharge canal were sampled during the study. The purpose of sampling the discharge canal was to provide information on the live ichthyoplankton contribution from the DNPS cooling pond into the Illinois River.

Sampling frequency occurred bi-weekly in April and September and weekly in May, June, July, and August. Four diel periods were sampled which included 0000-0600, 0600-1200, 1200-1800, and 1800-000. Ichthyoplankton samples were collected using a pump which discharged the sample through a 0.5 m plankton net with a 0.013 in. (335 microns) mesh into a large tank. Each diel sample consisted of a 100 m^3 (3,532 ft^3) of water split between three depths (bottom, mid, and surface depth). A ⅜ in. (0.95 cm) mesh size strainer was added to the end of the suction hose to simulate entrainment through CEG's travelling screens. All samples were counted by taxon and life stage at the lowest taxonomic level possible. Table E-4 displays the results of the entrainment study categorized by the most common taxa.

Table E-4 Dresden Nuclear Power Station Number and Abundance of Common Taxa Entrained and Discharged from 2017–2018

Year	Taxa	Intake (#) (Entrain-ment)	Intake (%) (Entrain-ment)	Discharge (#)	Discharge (%)	Annual Total (#)	Annual Total (%)
2017	shad taxa[a]	184	4.00	1,475	66.20	1,659	24.50
2017	*Pimephales* spp. (+type)	67	1.50	27	1.20	94	1.40
2017	Subfamily Ictiobinae	240	5.30	112	5.00	352	5.20
2017	*Lepomis* spp.	12	0.30	107	4.80	119	1.80
2017	freshwater drum	3,633	79.80	187	8.40	3,820	56.40
2017	other identified taxa	231	5.10	208	9.30	439	6.50
2017	unidentified	183	4.00	111	5.00	294	4.30
2017	**Total**	**4,550**	**100.00**	**2,227**	**100.00**	**6,777**	**100.00**
2018	shad taxa[a]	2,204	37.20	11,164	88.70	13,368	72.20
2018	*Pimephales* spp. (+type)	88	1.50	36	0.30	124	0.70
2018	Subfamily Ictiobinae	274	4.60	92	0.70	366	2.00
2018	*Lepomis* spp.	118	2.00	94	0.70	212	1.10
2018	freshwater drum	2,417	40.80	877	7.00	3,294	17.80
2018	other identified taxa	557	9.40	215	1.70	772	4.20
2018	unidentified	272	4.60	108	0.90	380	2.10
2018	**Total**	**5,930**	**100.00**	**12,586**	**100.00**	**18,516**	**100.00**

= number collected; % = percent composition.
(a) Includes gizzard shad (*Dorosoma* spp.) and threadfin shad (Family Clupeidae).
Source: CEG 2025-TN11341: RAI AQU-06, EA Engineering 2019.

A total of 25,293 ichthyoplankton species were collected during entrainment and discharge canal sampling across both 2017 and 2018 sampling periods. The two most collected ichthyoplankton were the shad taxa category (59 percent of total collected) and freshwater drum (28 percent).

The top four dominant ichthyoplankton life stage entrained were as follows: (1) viable eggs (53 percent or 5,585 samples); (2) larvae (22.9 percent or 2,401 samples); (3) yolk sac larvae (14.8 percent or 1,550 samples); and if non-viable eggs could be excluded (4) post yolk-sac larvae (2.3 percent or 647 samples). EA Engineering found that eggs were predominantly sampled in the intake canal, while larvae were predominantly sampled in the discharge canal. The highest intake canal diel periods occurred from early and mid-June during the 0000-0600 diel period. In 2017, the entrainment densities were 815.8 and 832.8 ichthyoplankton per 3,532 ft^3 (100 m^3). The dominant taxa consisted of freshwater drum. In 2018, the entrainment density peaks were in late May and early June, with freshwater drum or shad dominating depending on the diel period.

Table E-5 Dresden Nuclear Power Station Comparison of Estimated Entrainment and Estimated Discharge of Ichthyoplankton, 2017–2018

Year	Taxa	Entrainment	Ichthyoplankton Discharge	Difference
2017	shad taxa[(a)]	3,172,583	9,755,133	-6,582,550
2017	*Pimephales* spp. (+type)	3,309,632	1,081,397	2,228,235
2017	Subfamily Ictiobinae	7,617,000	4,332,055	3,284,945
2017	*Lepomis* spp.	1,016,406	4,939,960	-3,923,554
2017	freshwater drum	106,060,808	2,075,035	103,985,773
2017	other identified taxa	12,646,859	14,031,783	-1,384,924
2017	unidentified	2,584,019	1,300,024	1,283,995
2017	**Total**	**136,407,307**	**37,515,387**	**98,891,920**
2018	shad taxa[(a)]	24,686,029	46,077,393	-21,391,364
2018	*Pimephales* spp. (+type)	4,390,060	1,435,205	2,954,855
2018	Subfamily Ictiobinae	2,655,774	2,745,642	-89,868
2018	*Lepomis* spp.	8,079,813	5,248,767	2,831,046
2018	freshwater drum	56,207,916	3,515,073	52,692,843
2018	other identified taxa	13,806,089	9,532,215	4,273,874
2018	unidentified	3,768,194	1,105,126	2,663,068
2018	**Total**	**113,593,875**	**69,659,421**	**43,934,454**

(a) Includes gizzard shad (*Dorosoma* spp.) and threadfin shad (Family Clupeidae).
Source: CEG 2025-TN11341: RAI AQU-06; EA 2019.

Entrainment estimates (Table E-5) were calculated by EA Engineering through calculating the density of entrained ichthyoplankton, diel period specific actual intake flow data, and with extrapolation period data. Refer to Section 4.6 of the entrainment study for more information on calculations.

EA Engineering estimated that total ichthyoplankton entrainment was 136.4 million in 2017 and 113.6 million in 2018 (Table E-5). The top entrainment estimates by diel were for the 0000-0600 and 0600-1200 periods which were 46.6 million and 69.2 million for 2017 and 53.8 million and 30.4 million for 2018, respectively. Combined, the 0000-0600 and 0600-1200 diel periods accounted for approximately 84.9 percent (2017) and 74.1 percent (2018) of entrainment during the study. EA Engineering found that approximately 79.5 percent (June 15 through July 15, 2017) and 71.6 percent (May 27 through June 2018) of entrainment occurred during the period leading to or during the period of DNPS operation of the cooling water intake in the indirect open-cycle mode.

The top two taxa entrained and sampled at the discharge are shad taxa and freshwater drum. Both shad taxa and freshwater drum were entrained in high numbers relative to the other taxa, but freshwater drum had relatively lower numbers in the discharge canal which indicate that this species could be more susceptible to entrainment losses at DNPS than shad taxa. The data from this study was submitted to the IEPA for best technology available determination in 2019.

E.3.2 2005–2007 Entrainment Characterization Study

EA Engineering conducted an entrainment study from mid-April through August in both 2005 and 2006 on behalf of Exelon Generation in connection with CWA 316(b) requirements. The results of this study were documented in a 2007 report prepared by EA Engineering, titled *Entrainment Characterization Study (2005-2007) Dresden Station* (CEG 2025-TN11341: RAI AQU-06, EA Engineering 2007). Information presented in this section is derived from the 2007 report, unless otherwise indicated. The purpose of this study was to evaluate the entrainment effects of DNPS' cooling water intake system and assess the available options to reduce entrainment. The target taxa for this study included all relevant fish species in the vicinity of DNPS. Supporting studies such as the Aquatic Monitoring Program (Appendix E.1) were used to support target taxa selection. Both the intake and discharge canal were sampled, similar to the 2017–2018 entrainment study. The purpose of sampling the discharge canal was to provide information on the ichthyoplankton contribution from the DNPS cooling pond into the Illinois River.

Sampling occurred weekly except during the month of June, when it occurred twice a week. Each 1,766 ft^3 (50 m^3) sample was collected by a towed 1.6 ft (0.5 m) net with a 335-micron (0.013 in.) mesh. River locations were collected mid-April through August, while canal locations were sampled mid-June through August. Four diel periods were sampled each 24-hr period which included 0000-0600, 0600-1200, 1200-1800, and 1800-000. Each diel sample contained water from near surface and near bottom of the intake canal and Kankakee River locations. In comparison, the discharge canal samples were taken at one depth but the sampling frequency was still four diel periods (2 night and 2 day collections) and two locations were sampled once a week. All samples were counted by taxon and life stage at the lowest taxonomic level possible. Table E-6 displays the results of the entrainment study.

Table E-6 Entrainment Study Number and Abundance of Ichthyoplankton Taxa at Dresden Nuclear Power Station Site, 2005–2006

Type	Common Name	Scientific Name	2005 (#)	2005 (%)	2006 (#)	2006 (%)
Fish Eggs	-	Family Clupeidae	12	0.04	-	-
Fish Eggs	-	Clupeidae	1	0	-	-
Fish Eggs	common carp	*Cyprinus carpio*	-	-	3	0.01
Fish Eggs	-	Family Cyprinidae/Catostomidae	295	0.87	235	0.67
Fish Eggs	freshwater drum	*Aplodinotus grunniens*	32,947	97.64	34,389	98.16
Fish Eggs	gizzard shad	*Dorosoma cepedianum*	1	0	-	-
Fish Eggs	-	Subfamily Ictiobinae	-	-	23	0.07
Fish Eggs	unidentified	-	489	1.45	382	1.09
Fish Eggs	**Total Fish Eggs**	**-**	**33,745**	**100**	**35,032**	**100**
Fish Larvae/Juveniles	-	*Alosa* spp.	2	0.02	2	0.01
Fish Larvae/Juveniles	-	Family Clupeidae	630	5.15	236	1.7
Fish Larvae/Juveniles	black crappie	*Pomoxis nigromaculatus*	1	0.01	-	-
Fish Larvae/Juveniles	bluntnose minnow	*Pimephales notatus*	6	0.05	1	0.01
Fish Larvae/Juveniles	brook silverside	*Labidesthes sicculus*	2	0.02	1	0.01
Fish Larvae/Juveniles	-	*Carpiodes* spp.	1	0.01	7,722	55.66
Fish Larvae/Juveniles	-	*Carpiodes* type	267	2.18	-	-
Fish Larvae/Juveniles	-	*Catostomidae* spp.	-	-	2	0.01

Table E-6 Entrainment Study Number and Abundance of Ichthyoplankton Taxa at Dresden Nuclear Power Station Site, 2005–2006 (Continued)

Type	Common Name	Scientific Name	2005 (#)	2005 (%)	2006 (#)	2006 (%)
Fish Larvae/Juveniles	-	*Catostominae* spp.	45	0.37	12	0.09
Fish Larvae/Juveniles	central stoneroller type	*Campostoma anomalum* type	-	-	2	0.01
Fish Larvae/Juveniles	channel catfish	*Ictalurus punctatus*	254	2.07	68	0.49
Fish Larvae/Juveniles	common carp	*Cyprinus carpio*	217	1.77	138	0.99
Fish Larvae/Juveniles	creek chub type	-	-	-	1	0.01
Fish Larvae/Juveniles	-	Cyprinid group A	818	6.68	418	3.01
Fish Larvae/Juveniles	-	Family Cyprinidae	604	4.93	728	5.25
Fish Larvae/Juveniles	darter species	-	70	0.57	326	2.35
Fish Larvae/Juveniles	-	*Dorosoma* spp.	-	-	4	0.03
Fish Larvae/Juveniles	emerald shiner	*Notropis atherinoides*	4	0.03	1	0.01
Fish Larvae/Juveniles	emerald shiner type	-	10	0.08	-	-
Fish Larvae/Juveniles	-	*Esox* spp.	-	-	1	0.01
Fish Larvae/Juveniles	-	*Etheostoma* spp.	-	-	14	0.1
Fish Larvae/Juveniles	flathead catfish	*Pylodictis olivaris*	-	-	2	0.01
Fish Larvae/Juveniles	freshwater drum	*Aplodinotus grunniens*	1,948	15.91	904	6.52
Fish Larvae/Juveniles	ghost shiner	*Notropis buchanani*	13	0.11	2	0.01
Fish Larvae/Juveniles	gizzard shad	*Dorosoma cepedianum*	3,632	29.67	2,113	15.23
Fish Larvae/Juveniles	golden redhorse	*Moxostoma erythrurum*	-	-	1	0.01
Fish Larvae/Juveniles	-	*Ictiobus* spp.	16	0.13	4	0.03
Fish Larvae/Juveniles	-	Subfamily Ictiobinae	97	0.79	218	1.57
Fish Larvae/Juveniles	johnny darter type	-	7	0.06	-	-
Fish Larvae/Juveniles	largemouth bass	*Micropterus nigricans*	2	0.02	-	-
Fish Larvae/Juveniles	-	*Lepomis* spp.	2,790	22.79	513	3.7
Fish Larvae/Juveniles	logperch	*Percina caprodes*	22	0.18	-	-
Fish Larvae/Juveniles	-	*Moxostoma* spp.	5	0.04	25	0.18
Fish Larvae/Juveniles	moxostoma/northern hog sucker	*Moxostoma* spp.	5	0.04	17	0.12
Fish Larvae/Juveniles	moxostoma/spotted sucker	*Moxostoma* spp.	13	0.11	2	0.01
Fish Larvae/Juveniles	northern hog sucker	*Hypentelium nigricans*	1	0.01	-	-
Fish Larvae/Juveniles	-	*Noturus* spp.	-	-	4	0.03
Fish Larvae/Juveniles	-	*Percina* spp.	-	-	1	0.01
Fish Larvae/Juveniles	-	*Percina* type	380	3.1	200	1.44
Fish Larvae/Juveniles	-	*Pimephales* spp.	-	-	1	0.01
Fish Larvae/Juveniles	pirate perch	*Aphredoderus sayanus*	-	-	2	0.01
Fish Larvae/Juveniles	-	*Pomoxis* spp.	18	0.15	5	0.04
Fish Larvae/Juveniles	quillback	*Carpiodes cyprinus*	-	-	1	0.01
Fish Larvae/Juveniles	rock bass	*Ambloplites rupestris*	1	0.01	4	0.03
Fish Larvae/Juveniles	round goby	*Neogobius melanostomus*	221	1.81	33	0.24
Fish Larvae/Juveniles	shoal chub	*Macrhybopsis hystoma*	1	0.01	-	-
Fish Larvae/Juveniles	silverside	-	-	-	1	0.01
Fish Larvae/Juveniles	slenderhead darter	*Percina phoxoxephala*	9	0.07	-	-
Fish Larvae/Juveniles	spottail shiner	*Notropis hudsonius*	1	0.01	-	-
Fish Larvae/Juveniles	spotted sucker	*Minytrema melanops*	4	0.03	3	0.02

Table E-6 Entrainment Study Number and Abundance of Ichthyoplankton Taxa at Dresden Nuclear Power Station Site, 2005–2006 (Continued)

Type	Common Name	Scientific Name	2005 (#)	2005 (%)	2006 (#)	2006 (%)
Fish Larvae/Juveniles	threadfin shad	*Dorosoma petenense*	40	0.33	52	0.37
Fish Larvae/Juveniles	trout-perch	*Percopsis omiscopmaycus*	13	0.11	-	-
Fish Larvae/Juveniles	unidentified	-	31	0.25	37	0.27
Fish Larvae/Juveniles	walleye	*Sander vitreus*	6	0.05	2	0.01
Fish Larvae/Juveniles	white bass	*Morone chrysops*	26	0.21	48	0.35
Fish Larvae/Juveniles	white sucker	*Catostomus commersonii*	8	0.07	-	-
Fish Larvae/Juveniles	yellow bass	*Morone mississippiensis*	-	-	2	0.01
Fish Larvae/Juveniles	yellow perch	*Perca flacescens*	1	0.01	-	-
Fish	**Total Fish Larvae/Juveniles**	**-**	**12,242**	**100**	**13,874**	**100**
Ichthyoplankton	**Total Ichthyoplankton**	**-**	**45,987**	**-**	**48,906**	**-**

\# = number collected; % = percent of column total; type = uncertain taxonomic identification.
Total Taxa collected in 2005 was 30, and in 2006 was 30.
"-" denotes no data in table cell.
Source: CEG 2025-TN11341: RAI AQU-06, EA Engineering 2007.

A total of 45,987 ichthyoplankton were collected in 2005 from all three locations (river, intake canal, and discharge canal), which was comprised of 30 taxa in comparison to 48,906 ichthyoplankton and 30 taxa in 2006 from all three locations. For both sampling years, five life stages of ichthyoplankton were collected (egg, yolk-sac larvae, post-yolk sac larvae, larvae, and juveniles) from 1,032 samples. Between both sampling years, gizzard shad, freshwater drum, and *Lepomis* were the most abundant and common taxa entrained at DNPS, except for 2006, which saw an increase in entrainment of *Carpiodes* spp. In the intake canal, freshwater drum were by far the most abundant at 58 percent in 2005 and 73.2 percent in 2006.

In both years, 98 percent of eggs collected across all three locations were from freshwater drum, and in the intake canal, freshwater drum eggs made up 95 to 98 percent of eggs across years. The entrainment study confirmed that the typical spawning period for a majority of the DNPS biological aquatic taxa is from April through August annually, with peak spawning from mid-May through mid-June. DNPS operates in closed-cycle for most of the year and switches to indirect open-cycle from June 15 through September.

The entrainment baseline was calculated based on the assumption that DNPS operated in open-cycle year-round. The 2005 entrainment baseline estimate was 506.6 million ichthyoplankton and the 2006 entrainment baseline estimate was 556.3 million ichthyoplankton. Actual entrainment estimates for DNPS were calculated under permitted cooling system operation, which includes operation in closed-cycle from April through June 14 and in indirect open-cycle from June 15 through August. The 2005 entrainment then became 111.9 million ichthyoplankton and 161.8 million ichthyoplankton in 2006, similar to the 2017–2018 entrainment estimates. Once permitted, cooling system operation was added to the estimated annual entrainment, a marked entrainment reduction of 71 of 78 percent occurred.

Forage fish accounted for approximately 16 percent and 20 percent of total ichthyoplankton entrained in the intake for 2005 and 2006, respectively. Based upon the results of this study, clupeids, cyprinids, *Lepomis*, and freshwater drum are anticipated to be the majority of future entrainment at DNPS. The results from the 2005–2006 DNPS entrainment study concluded that entrained ichthyoplankton at DNPS consisted primarily of forage fish with high reproduction potential, high mortality rates, and relatively low biological value. The results from this study indicate that entrainment from DNPS operation has low impact on the surrounding waterways and aquatic resources. The marked entrainment reduction estimate of 71 to 78 percent is in compliance with the July 2004 CWA 316(b) rule.

E.4 Thermal Studies

E.4.1 Dresden Nuclear Power Station CWA 316(a) Demonstration

CEG, or its contractors, have conducted local water temperature and biological monitoring studies for 46 years, compiled as part of the DNPS CWA 316(a) demonstration for alternate thermal limits (ATLs) for site operation (Exelon 2015-TN11871). Below, the biothermal assessment and thermal plume mapping and modeling objectives, methodology, and conclusions are described in detail.

2013–2014 Biothermal Assessment (Appendix B of the 316(a) Demonstration)

Commonwealth Edison (Edison), a contractor of CEG, conducted a predicative biothermal assessment from September 1971 through October 1974 during the months DNPS operated in indirect open-cycle (June 15 through September) to assess the impacts of thermal effluent on aquatic resources and found that the existing ATLs were “more stringent than necessary to assure the protection and propagation of a balanced, indigenous population of shellfish, fish, and wildlife.”

From 2013 through 2014, a second biothermal assessment was conducted by CEG, or its contractors, to assess whether the existing ATLs continue to satisfy CWA 316(a) requirements. Section 3.7.7.3.2 of CEG’s Environmental Report contains a summary of the purpose and methodology of the 2013–2014 biothermal assessment and is thus incorporated by reference (CEG 2024-TN11347).

The 12 Representative Important Species (RIS) selected for the 2013–2014 biothermal assessment included gizzard shad (*Dorosoma cepdianum*), common carp (*Cyprinus carpio*), golden redhorse (*Moxostoma erythrurum*), white sucker (*Catostomus commersonii*), channel catfish (*Ictalurus punctatus*), emerald shiner *(Notropis atherinoides*), smallmouth bass (*Micropterus dolomieu*), largemouth bass (*Micropterus salmoides*), bluegill (*Lepomis macrochirus*), black crappie (*Pomoxis nigromaculatus*), logperch (*Percina caprodes*), and freshwater drum (*Aplodinotus grunniens*). Sections 3.1.1, 3.1.2, and 3.1.3 of the 2013–2014 Biothermal Assessment describe the three scenarios of river conditions (normal temperatures, high temperatures, and extreme high temperatures) for the study and are thus incorporated by reference (Exelon 2015-TN11871: Appendix B).

Acute mortality was defined as temperature exposure to high temperatures for minutes to hours, whereas chronic mortality was defined as temperature exposure for 48 to 96 hours. During the study, it was predicted that RIS would not experience acute mortality unless the aquatic biota experience temperatures in the thermal plume above 95–99°F (35.0–37.2°C). Therefore, under normal operating conditions and the normal temperature scenario, no acute or chronic mortality is expected of RIS. Out of all the RIS, the white sucker is known to be the most susceptible to thermal changes in the aquatic environment. Under a conservative scenario where an acclimated temperature is 88°F (31.1°C), the threshold for chronic mortality of the white sucker is 90°F (32.2°C).

Table E-7 Representative Important Species with Known Acute and Chronic Mortality Data at Dresden Nuclear Power Station Site, 2013–2014

Common name	Scientific Name	Acute	Chronic
black crappie	*Pomoxis nigromaculatus*	X	X
bluegill	*Lepomis macrochirus*	X	X
channel catfish	*Ictalurus punctatus*	X	X
common carp	*Cyprinus carpio*	X	X
emerald shiner	*Notropis atherinoides*	X	X
freshwater drum	*Aplodinotus grunniens*	X	-
gizzard shad	*Dorosoma cepdianum*	-	X
golden redhorse	*Moxostoma erythrurum*	X	-
largemouth bass	*Micropterus salmoides*	X	-
logperch	*Percina caprodes*	X	-
smallmouth bass	*Micropterus dolomieu*	X	X
white sucker	*Catostomus commersonii*	X	X

"X" denotes known data, and "-" denotes no data.
Source: Exelon 2015-TN11871.

There are several mitigating factors discovered and discussed throughout the study to support the conclusion that thermal mortality to RIS is unlikely. First, daily changes (diurnal) in air temperature influence the temperature of the thermal plume. Second, areas upstream of the DNPS discharge contained relatively lower water temperatures and provide an area for aquatic biota to avoid the thermal plume. Additionally, the Dresden Pool provides deep water for aquatic biota to seek avoidance in deeper, cooler waters. Both scenarios allow aquatic biota to temporarily displace during times of elevated temperature from the thermal plume. Finally, excluding the white sucker, RIS are tolerant of chronic temperatures (95°F [35°C]) for extended periods of time. Extreme temperature scenarios are rare and short in duration, therefore reducing the risk of thermal mortality to susceptible RIS.

Avoidance measurement data collected from the study showed that gizzard shad, channel catfish, largemouth bass, smallmouth bass, and bluegill tolerated typical, warm, and extreme warm scenarios and therefore do not avoid the thermal plume. For RIS that exhibit avoidance measures, these species typically do so near the chronic mortality threshold. The study found that, "the DNS thermal plume would not be expected to cause avoidance… even at very low river flow conditions (1–4 percentile), high air temperatures (37.8°C [100°F]), and high DNS discharge temperatures (34.79°C [4.5°F]) (1–3 percentile)." (Exelon 2015-TN11871). Consequently, the study predicted that potential blockage for migration would not exist as the thermal plume would not interfere with aquatic biota movement within the surrounding aquatic environment. During spawning season, adverse effects to aquatic biota are minimal, as a majority of aquatic biota reproduction and spawning occurs during closed-cycle, prior to operation of indirect open-cycle (June 15 through September 30). Because DNPS operates in closed-cycle during the winter season when aquatic biota are more susceptible to cold shock, the risk is significantly reduced. Finally, the DNPS thermal plume is not expected to adversely affect the growth patterns of RIS due to a reduction in the thermal plume during primary growth periods in the spring when it operates in closed-cycle.

As a result of the DNPS CWA 316(a) Demonstration, on March 3, 2016, the Illinois Pollution Control Board (IPCB) approved ATLs for DNPS to discharge into the Illinois River. The IPCB found, “the monthly temperature standards set forth in 35 Ill. Adm. Code 302.211(e) shall apply to discharges from DNPS provided that during the period of June 15 through September 30, the temperature of the DNPS discharge shall not exceed 90°F (32°C) more than 10 percent of the time in the period and will never exceed 95°F (35°C) provided (1) discharges above 93°F (34°C) are allowed only when DNPS intake temperature is above 90°F (32.2°C), and (2) any single episode of such discharges does not exceed 24 hrs in duration” (IPCB 2016-TN11816).

2013–2014 Thermal Plume Mapping and Modeling Study (Appendix D of the 316(a) Demonstration)

CEG, or its contractors, conducted DNPS thermal plume mapping in 2013 and 2014 to gather data to develop a model to analyze plume configurations, such as during indirect open-cycle operation from June 15 through September 30 (Exelon 2015-TN11871: Appendix D). The thermal plume surveys were conducted on August 1 and 19, 2013, and September 18, 2014. Near surface temperatures were collected along a planned transect grid. Sampling occurred from 7,874 ft (2,400 m) and 7,710 ft (2,350 m) upstream the Des Plaines River and Kankakee River, respectively, as well as 3,281 ft (1,000 m) downstream of the discharge canal. Probes were utilized for gathering temperature data at depths of 1.5 ft (0.46 m) and 3.0 ft (0.91 m). A total of 38 vertical profiling stations were established to record water temperature. Additionally, bathymetric surveys were conducted on November 15 and 16, 2013 to further map the DNPS aquatic environment.

After gathering thermal and bathymetric data, researchers compiled, analyzed, and prepared the data prior to integration with the three-dimensional hydrothermal model (MIKE3). The model “[i]ncluded 1,530 cells with each cell divided in up to 12 vertical layers depending on depth. The upper three layers were confined to a maximum of 1.0 m depth. Below a 1.0 m depth, layer thickness increased from 0.5 m to 1.0 m in the deepest layer. The additional layers were added as necessary to extend the river bottom. The model domain included entrances to both the DNS intake and discharge canals” (IPCB 2016-TN11816).

The MIKE3 model was used to develop three hypothetical thermal plume scenarios: (1) 90°F (32.3°C); (2) 92°F (33.3°C); and (3) 94°F (34.4°C). Figure E-2 and Figure E-3 display the results of the 92°F (33.3°C) and 94°F (34.4°C) scenarios.

In conclusion, the three scenarios created with the MIKE3 model, comprised of the DNPS temperature and bathymetric data, displayed that the area where the thermal plume exists within the Dresden Pool maintains adequate temperatures to support aquatic biota in both typical and extreme summer conditions. Both temperatures are part of the approved ATLs above 90°F (32°C). The results of the thermal mapping and modeling study support the conclusions made within the 2013–2014 biothermal assessment.

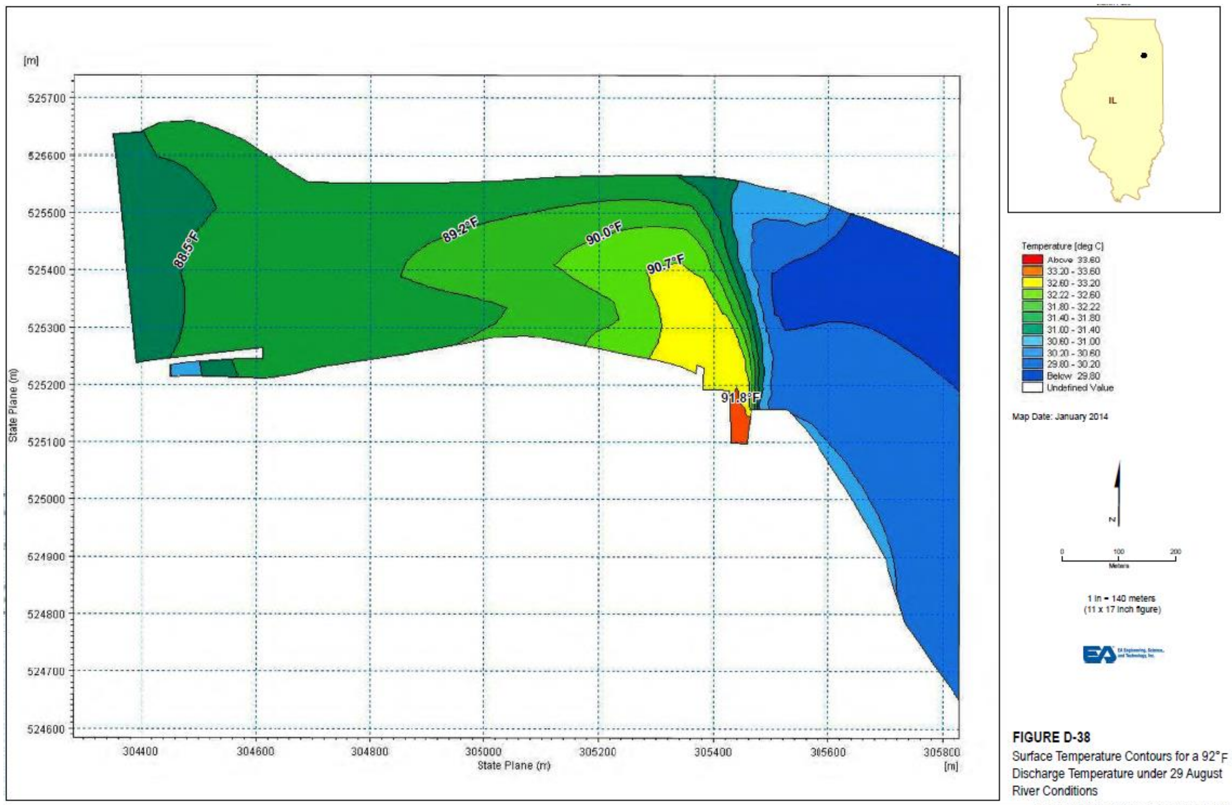

Figure E-2 Surface Temperature Contours for a 92°F Discharge Temperature under August 29, 2013 River Conditions in Dresden Pool. Source: IPCB 2016-TN11816.

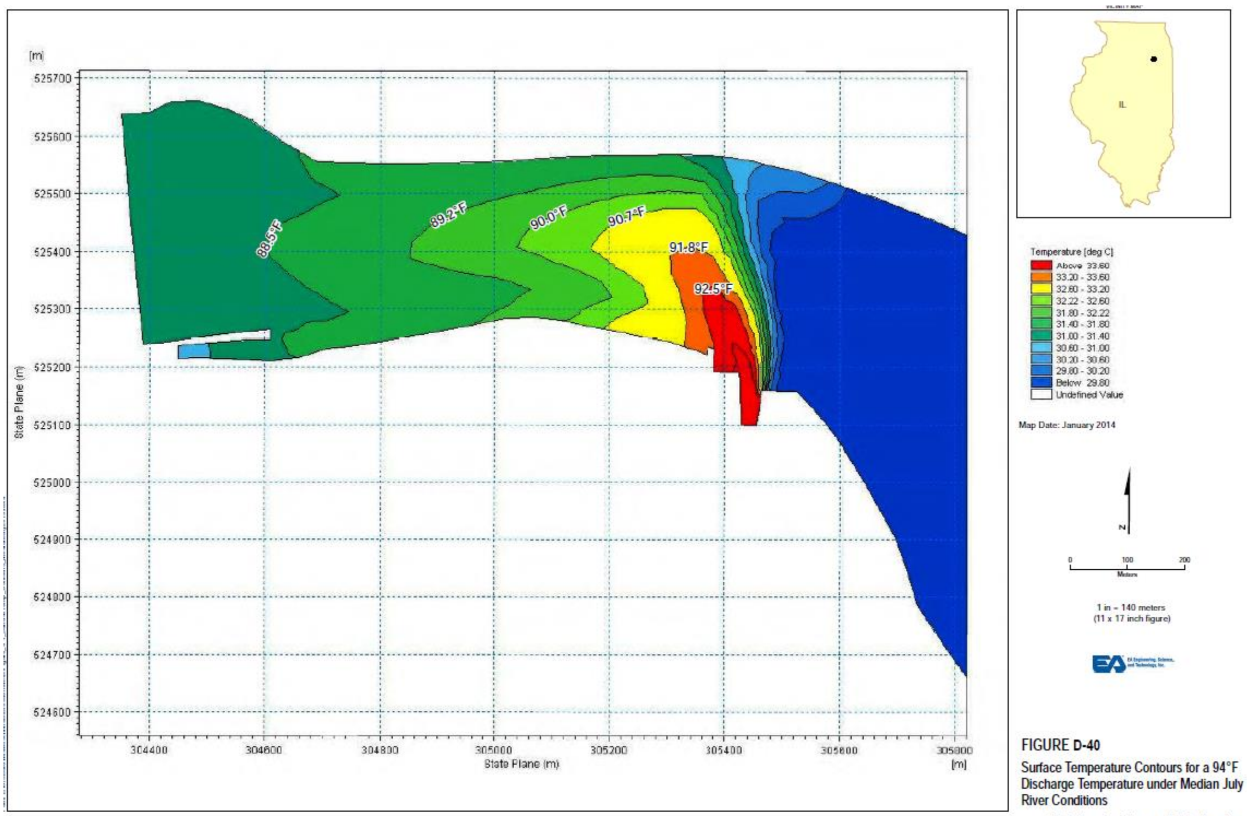

Figure E-3 Surface Temperature Contours for a 94°F Discharge Temperature under Median July River Conditions in Dresden Pool. Source: IPCB 2016-TN11816.

E.4.2 2014 Freshwater Mussel Survey

As part of the CWA 316(a) demonstration to support CEG's NPDES Permit No. IL0002224 renewal, EA Engineering, in conjunction with Lewis Environmental Consulting LLC., conducted an unionid mussel survey within the DNPS thermal plume in the Dresden Pool, as well as downstream of the Dresden Island Lock and Dam, to assess the impacts of thermal effects associated with DNPS operation. The results of this survey were documented in a 2015 report prepared by EA Engineering, titled *Freshwater Mussel Survey in the Illinois River near the Dresden Nuclear Station (RM 271-272.5)* (CEG 2025-TN11341: RAI AQU-06, EA Engineering 2015). Information presented in this section is derived from the 2015 report, unless otherwise indicated.

The mussel survey was conducted October 24 to 27, 2014, which included approximately 7,546 ft (2,300 m) of the Illinois River between river miles 271 and 272.5, just upstream and downstream of the DNPS discharge. Semi-quantitative transect sampling in conjunction with timed visual searches were used across a total of 30 transects where 24 qualitative samples were searched for a total of 15 minutes each. Each transect was further divided into 33 ft (10 m) by 3.3 ft (1 m) transects for search parameters. In addition to semi-quantitative sampling, qualitative sampling was conducted. Qualitative sampling consisted of, "searches between transects that focused on areas where substrate was favorable and/or interpolated from mussel data collected during the adjacent semi-quantitative surveys" (CEG 2025-TN11341: RAI AQU-06, EA Engineering 2015). A total of 24 qualitative samples were collected. EA Engineering collected information on mussel species, age, and size. In addition to collecting information on mussels, habitat information was also collected which included substrate type. As a precaution, EA Engineering submitted the appropriate information to U.S. Fish and Wildlife Service to obtain a permit for the study in the case a federally protected species was collected.

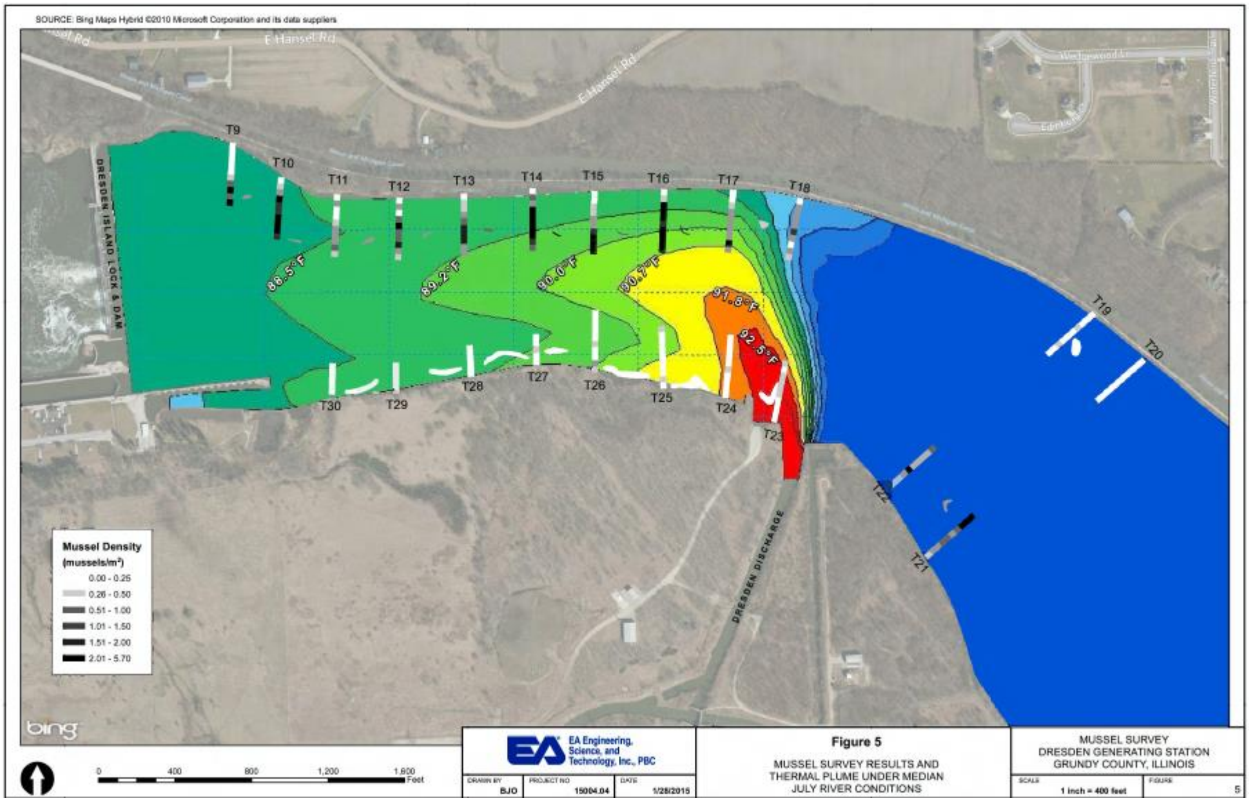

Figure E-4 Dresden Nuclear Power Station Mussel Survey Results and Thermal Plume Under Median July River Conditions with Mussel Survey Transects and Qualitative Search Areas. Source: CEG 2025-TN11341: RAI AQU-06, EA Engineering 2015.

Lewis Environmental Consulting, LLC conducted the survey dives under the direction of EA Engineering. All mussel species that were collected were measured on a boat and subsequently returned to the same location where they were found. For the habitat assessment, the diver visually evaluated the substrate according to the Wentworth scale. Figure E-4 displays the locations of the semi-quantitative and qualitative transects.

Throughout the entirety of the study, a total of 3,349 mussel individuals were collected from both the semi-quantitative and qualitative techniques. Table E-8 and Table E-9 display the results of the upstream and downstream collection. A total of 25 species were recorded. Two State-threatened mussels were collected which included the purple wartyback (five individuals) and the black sandshell (four individuals). Approximately one third of the collected mussels were juveniles. Upstream of the Dresden Island Lock and Dam had nearly double the number of juveniles. Substrate upstream of the Dresden Island Lock and Dam consisted primarily of silt, gravel, and sand while downstream consisted of gravel, sand, and cobble. The transect that contained the highest number of mussels was transect 23 (0.25 to 0.5 individuals per m^2) which is the transect closest to the discharge with the warmest effluent from DNPS. See Figure E-4 for all transects.

Table E-8 Species and Composition Results from Semi-Quantitative Technique at Dresden Nuclear Power Station, October 23–27, 2014

Common Name	Scientific Name	Total (#)	Total (%)	Downstream (#)	Downstream (%)	Upstream (#)	Upstream (%)
black sandshell*	*Ligumia recto*	4	0.2	3	0.4	1	0.1
creeper	*Strophitus undulatus*	6	0.3	3	0.4	3	0.2
deertoe	*Truncilla truncata*	45	2.0	25	3.7	20	1.2
elktoe	*Alasmidonta marginata*	2	0.1	1	0.1	1	0.1
fatmucket	*Lampsilis siliquoidea*	1	0.0	1	0.1	-	-
flutedshell	*Lasmigona costata*	13	0.6	6	0.9	7	0.4
fragile papershell	*Leptodea fragilis*	171	7.4	52	7.7	119	7.3
giant floater	*Pyganodon grandis*	23	1.0	-	-	23	1.4
lilliput	*Toxolasma parvum*	1	0.0	-	-	1	0.1
mapleleaf	*Quadrula quadrula*	127	5.5	54	8.0	73	4.5
mucket	*Actinonaias ligamentina*	247	10.7	157	23.3	90	5.5
paper pondshell	*Utterbackia imbecillis*	10	0.4	-	-	10	0.6
pimpleback	*Quadrula pustulosa*	80	3.5	51	7.6	29	1.8
pink heelsplitter	*Potamilus alatus*	186	8.1	58	8.6	128	7.9
pistolgrip	*Tritogonia verrucosa*	1	0.0	-	-	1	0.1
plain pocketbook	*Lampsilis cardium*	15	0.7	6	0.9	9	0.6
purple wartyback*	*Cyclonaias tuberculata*	5	0.2	4	0.6	1	0.1
threehorn wartyback	*Obliquaria reflexa*	37	1.6	21	3.1	16	1.0
threeridge	*Amblema plicata*	1272	55.2	222	32.9	1050	64.4
wabash pigtoe	*Fusconaia flava*	2	0.1	-	-	2	0.1
washboard	*Megalonaias nervosa*	42	1.8	6	0.9	36	2.2
white heelsplitter	*Lasmigona complanata*	14	0.6	4	0.6	10	0.6
yellow sandshell	*Lampsilis teres*	1	0.0	1	0.1	-	-
Total	**-**	**2,305**	**100**	**675**	**100**	**1,630**	**100**

= number collected; % = percent composition; * = State-threatened species.
"-" denotes no data in table cell.
Sources: CEG 2025-TN11341: RAI AQU-06, EA Engineering 2015.

Table E-9 Dresden Nuclear Power Station Species Composition Results from Qualitative Searches, October 23–27, 2014

Common Name	Scientific Name	Total (#)	Total (%)	Downstream (#)	Downstream (%)	Upstream (#)	Upstream (%)
creeper	*Strophitus undulatus*	2	0.20	-	-	2	0.30
deertoe	*Truncilla truncata*	23	2.20	16	6.30	7	0.90
fatmucket	*Lampsilis siliquoidea*	1	0.10	-	-	1	0.10
flutedshell	*Lasmigona costata*	5	0.50	1	0.40	4	0.50
fragile papershell	*Leptodea fragilis*	56	5.40	14	5.50	42	5.30
giant Floater	*Pyganodon grandis*	10	1.00	-	-	10	1.30
mapleleaf	*Quadrula quadrula*	75	7.20	24	9.50	51	6.40
mucket	*Actinonaias ligamentina*	26	2.50	11	4.30	15	1.90
paper pondshell	*Utterbackia imbecillis*	2	0.20	-	-	2	0.30
pimpleback	*Quadrula pustulosa*	40	3.80	15	5.90	25	3.20
pink heelsplitter	*Potamilus alatus*	76	7.30	23	9.10	53	6.70
pink Papershell	*Potamilus ohiensis*	1	0.10	-	-	1	0.10
pistolgrip	*Tritogonia verrucosa*	1	0.10	1	0.40	-	-
plain pocketbook	*Lampsilis cardium*	3	0.30	-	-	3	0.40
rock pocketbook	*Arcidens confragosus*	1	0.10	-	-	1	0.10
threehorn wartyback	*Obliquaria reflexa*	41	3.90	31	12.30	10	1.30
threeridge	*Amblema plicata*	661	63.30	110	43.50	551	69.70
wabash pigtoe	*Fusconaia flava*	3	0.30	2	0.80	1	0.10
washboard	*Megalonaias nervosa*	11	1.10	1	0.40	10	1.30
white heelsplitter	*Lasmigona complanata*	6	0.60	4	1.60	2	0.30
Total	-	**1,044**	**100**	**253**	**100**	**791**	**100**

= number collected; % = percent composition; * = State-threatened species.
"-" denotes no data in table cell.
Sources: CEG 2025-TN11341: RAI AQU-06, EA Engineering 2015.

E.5 References

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11. ABSTRACT (200 words or less)

The U.S. Nuclear Regulatory Commission (NRC, the Commission) staff prepared this supplemental environmental impact statement (SEIS) as part of its environmental review of Constellation Energy Generation, LLC’s application to renew the operating licenses for Dresden Nuclear Power Station, Units 2 and 3 (DNPS), for an additional 20 years. This SEIS evaluates the environmental impacts of the license renewal and alternatives to license renewal. The alternatives evaluated in detail were the replacement power alternatives of natural gas, a combination of renewable and natural gas, and the no-action alternative. The NRC staff’s preliminary recommendation is that the adverse environmental impacts of license renewal for DNPS are not so great that preserving the option of license renewal for energy-planning decisionmakers would be unreasonable. The NRC staff based its recommendation on the following: (1) the analysis and findings in NUREG-1437, *Generic Environmental Impact Statement for License Renewal of Nuclear Plants* (LR GEIS), (2) the environmental report submitted by Constellation Energy Generation, LLC, (3) the NRC staff’s consultation with Federal, State, Tribal, and local agencies, (4) the NRC staff’s independent environmental review, and (5) the NRC staff’s consideration of public comments received during the scoping process.

12. KEY WORDS/DESCRIPTORS (List words or phrases that will assist researchers in locating the report.)

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Supplement 17
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Generic Environmental Impact Statement for License Renewal of Nuclear Plants
Supplement 17, Second Renewal Regarding Subsequent License Renewal for
Dresden Nuclear Power Station, Units 2 and 3

May 2025