NUREG-1437
Supplement 17

Generic Environmental Impact Statement for License Renewal of Nuclear Plants

Supplement 17

**Regarding
Dresden Nuclear Power Station, Units 2 and 3**

Final Report

**U.S. Nuclear Regulatory Commission
Office of Nuclear Reactor Regulation
Washington, DC 20555-0001**

Abstract

The U.S. Nuclear Regulatory Commission (NRC) considered the environmental impacts of renewing nuclear power plant operating licenses (OLs) for a 20-year period in its *Generic Environmental Impact Statement for License Renewal of Nuclear Plants* (GEIS), NUREG-1437, Volumes 1 and 2, and codified the results in Title 10 of the Code of Federal Regulations Part 51. In the GEIS (and its Addendum 1), the staff identifies 92 environmental issues and reaches generic conclusions related to environmental impacts for 69 of these issues that apply to all plants or to plants with specific design or site characteristics. Additional plant-specific review is required for the remaining 23 issues. These plant-specific reviews are to be included in a supplement to the GEIS.

This supplemental environmental impact statement (SEIS) has been prepared in response to an application submitted to the NRC by the Exelon Generation Company, LLC (Exelon) to renew the OLs for Dresden Nuclear Power Station, Units 2 and 3, for an additional 20 years under 10 CFR Part 54. This SEIS includes the NRC staff's analysis that considers and weighs the environmental impacts of the proposed action, the environmental impacts of alternatives to the proposed action, and mitigation measures available for reducing or avoiding adverse impacts. It also includes the staff's recommendation regarding the proposed action and responses to comments received on the draft SEIS.

With regard to the 69 issues for which the GEIS reached generic conclusions, neither Exelon nor the staff has identified information that is both new and significant for any of the issues that apply to Dresden Units 2 and 3. In addition, the staff determined that information provided during the scoping and the draft SEIS comment processes did not call into question the generic conclusions in the GEIS. Therefore, the staff concludes that the impacts of renewing the OLs will not be greater than impacts identified for these issues in the GEIS. For each of these issues, the staff's conclusion in the GEIS is that the impact is of SMALL[(a)] significance (except for collective off-site radiological impacts from the fuel cycle and from high-level waste and spent fuel, which were not assigned a single significance level).

Regarding the remaining 23 issues, those that apply to Dresden Units 2 and 3 are addressed in this SEIS. For each applicable issue, the staff concludes that the significance of the potential environmental impacts of renewal of the OLs is SMALL. The staff also concludes that additional mitigation measures are not likely to be sufficiently beneficial as to be warranted. The staff determined that information provided during the public comment period did not identify any new issue that requires site-specific assessment.

(a) Environmental effects are not detectable or are so minor that they will neither destabilize nor noticeably alter any important attribute of the resource.

The NRC staff's recommendation is that the Commission determine that the adverse environmental impacts of license renewal for Dresden Units 2 and 3 are not so great that preserving the option of license renewal for energy-planning decisionmakers would be unreasonable. This recommendation is based on (1) the analysis and findings in the GEIS; (2) the Environmental Report submitted by Exelon; (3) consultation with Federal, State, and local agencies; (4) the staff's own independent review; and (5) the staff's consideration of public comments.

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Executive Summary

By letter dated January 3, 2003, the Exelon Generation Company, LLC (Exelon) submitted an application to the U.S. Nuclear Regulatory Commission (NRC) to renew the operating licenses (OLs) for Dresden Units 2 and 3 for an additional 20-year period. If the OLs are renewed, State regulatory agencies and Exelon will ultimately decide whether the two units will continue to operate based on such factors as the need for power or other matters within the State's jurisdiction or the purview of the owners. If the OLs are not renewed, then the units must be shut down at or before the expiration dates of the current OLs, which are December 22, 2009, for Unit 2, and January 12, 2011, for Unit 3.

Section 102 of the National Environmental Policy Act (NEPA) (42 USC 4321) directs that an environmental impact statement (EIS) is required for major Federal actions that significantly affect the quality of the human environment. The NRC has issued regulations implementing Section 102 of NEPA in 10 CFR Part 51. Part 51 identifies licensing and regulatory actions that require an EIS. In 10 CFR 51.20(b)(2), the Commission requires preparation of an EIS or a supplement to an EIS for renewal of a reactor OL; 10 CFR 51.95(c) : that the EIS prepared at the OL renewal stage will be a supplement to the *Generic Environmental Impact Statement for License Renewal of Nuclear Plant*s (GEIS), NUREG-1437, Volumes 1 and 2.[a]

Upon acceptance of the Exelon application, the NRC staff began the environmental review process described in 10 CFR Part 51 by publishing in the Federal Register, a notice of intent to prepare an EIS and conduct scoping. The staff visited the Dresden site in March 2003 and held two public scoping meetings on April 10, 2003, in Morris, Illinois. In preparing this supplemental environmental impact statement (SEIS) for Dresden Units 2 and 3, the staff reviewed the Exelon Environmental Report (ER) and compared it to the GEIS, consulted with other agencies, conducted an independent review of the issues following the guidance set forth in the *Standard Review Plans for Environmental Reviews for Nuclear Power Plants, NUREG-1555, Supplement 1: Operating License Renewal*, and considered the public comments deemed within the scope of the environmental review. The public comments received during the scoping process and the NRC staff's response to the comments are provided in Appendix A, Part 1, of this SEIS.

The draft SEIS was published in December 2003. In January 2004, the staff held two public meetings in Morris, Illinois, to describe the preliminary results of the NRC environmental review, answer questions, and provide members of the public with information to assist them in

(a) The GEIS was originally issued in 1996. Addendum 1 to the GEIS was issued in 1999. Hereafter, all references to the "GEIS" include the GEIS and its Addendum 1.

formulating comments on the SEIS. When the comment period ended, the staff considered and dispositioned all of the comments received. These comments are addressed in Appendix A, Part II, of this SEIS.

This SEIS includes the NRC staff's analysis that considers and weighs the environmental effects of the proposed action, the environmental impacts of alternatives to the proposed action, and mitigation measures for reducing or avoiding adverse effects. It also includes the staff's recommendation regarding the proposed action.

The Commission has adopted the following statement of purpose and need for license renewal from the GEIS:

> The purpose and need for the proposed action (renewal of an operating license) is to provide an option that allows for power generation capability beyond the term of a current nuclear power plant operating license to meet future system generating needs, as such needs may be determined by State, utility, and, where authorized, Federal (other than NRC) decision makers.

The evaluation criterion for the staff's environmental review, as defined in 10 CFR 51.95(c)(4) and the GEIS, is to determine:

> . . . whether or not the adverse environmental impacts of license renewal are so great that preserving the option of license renewal for energy planning decision makers would be unreasonable.

Both the statement of purpose and need and the evaluation criterion implicitly acknowledge that there are factors, in addition to license renewal, that will ultimately determine whether an existing nuclear power plant continues to operate beyond the period of the current OL.

NRC regulations (10 CFR 51.95[c][2]) contain the following statement regarding the content of SEISs prepared at the license renewal stage:

> The supplemental environmental impact statement for license renewal is not required to include discussion of need for power or the economic costs and economic benefits of the proposed action or of alternatives to the proposed action except insofar as such benefits and costs are either essential for a determination regarding the inclusion of an alternative in the range of alternatives considered or relevant to mitigation. In addition, the supplemental environmental impact statement prepared at the license renewal stage need not discuss other issues not related to the environmental effects of the proposed action and the alternatives, or any aspect of the storage of spent fuel for the

facility within the scope of the generic determination in § 51.23(a) ["Temporary storage of spent fuel after cessation of reactor operation–generic determination of no significant environmental impact"] and in accordance with § 51.23(b).

The GEIS contains the results of a systematic evaluation of the consequences of renewing an OL and operating a nuclear power plant for an additional 20 years. It evaluates 92 environmental issues using the NRC's three-level standard of significance — SMALL, MODERATE, or LARGE — developed using the Council on Environmental Quality guidelines. The following definitions of the three significance levels are set forth in footnotes to Table B-1 of 10 CFR Part 51, Subpart A, Appendix B:

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.

For 69 of the 92 issues considered in the GEIS, the analysis in the GEIS reached the following conclusions:

(1) The environmental impacts associated with the issue have been determined to 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.

(2) A single significance level (i.e., SMALL, MODERATE, or LARGE) has been assigned to the impacts (except for collective off-site radiological impacts from the fuel cycle and from high-level waste and spent fuel disposal).

(3) 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 not likely to be sufficiently beneficial to warrant implementation.

These 69 issues were identified in the GEIS as Category 1 issues. In the absence of new and significant information, the staff relied on conclusions as amplified by supporting information in the GEIS for issues designated as Category 1 in Table B-1 of 10 CFR Part 51, Subpart A, Appendix B.

Of the 23 issues that do not meet the criteria set forth above, 21 are classified as Category 2 issues requiring analysis in a plant-specific supplement to the GEIS. The remaining two issues, environmental justice and chronic effects of electromagnetic fields, were not categorized. Environmental justice was not evaluated on a generic basis and must be addressed in a plant-specific supplement to the GEIS. Information on the chronic effects of electromagnetic fields was not conclusive at the time the GEIS was prepared.

This SEIS documents the staff's evaluation of all 92 environmental issues considered in the GEIS. The staff considered the environmental impacts associated with alternatives to license renewal and compared the environmental impacts of license renewal and the alternatives. The alternatives to license renewal that were considered include the no-action alternative (not renewing the OLs for Dresden Units 2 and 3) and alternative methods of power generation. Based on projections made by the U.S. Department of Energy's Energy Information Administration, gas- and coal-fired generation appear to be the most likely power generation alternatives if the power from Units 2 and 3 is replaced. These alternatives are evaluated in detail, assuming that the replacement power generation plant is located either at the Dresden site or some other unspecified alternate location.

Exelon and the staff have established independent processes for identifying and evaluating the significance of any new information on the environmental impacts of license renewal. Neither Exelon nor the staff has identified information that is both new and significant related to Category 1 issues that would call into question the conclusions in the GEIS. Similarly, neither Exelon, the scoping process, nor the staff has identified any new issue applicable to Dresden Units 2 and 3 that has a significant environmental impact. Therefore, the staff relies upon the conclusions of the GEIS for all of the Category 1 issues applicable to Dresden Units 2 and 3.

Exelon's license renewal application presents an analysis of the Category 2 issues that are applicable to Dresden Units 2 and 3, plus environmental justice. The staff has reviewed the Exelon analysis for each issue and has conducted an independent review of each issue. Two Category 2 issues are not applicable because they are related to plant design features or site characteristics not found at Dresden. Four Category 2 issues are not discussed in this SEIS because they are specifically related to refurbishment. Exelon has stated that its evaluation of structures and components, as required by 10 CFR 54.21, did not identify any major plant refurbishment activities or modifications as necessary to support the continued operation of Dresden Units 2 and 3 for the license renewal period. In addition, any replacement of components or additional inspection activities are within the bounds of normal plant component replacement and, therefore, are not expected to affect the environment outside of the bounds of the plant operations evaluated in the U.S. Atomic Energy Commission's 1973 *Final Environmental Statement Related to the Operation of Dresden Nuclear Power Station Units 2 and 3*.

Fifteen Category 2 issues related to operational impacts and postulated accidents during the renewal term, as well as environmental justice and chronic effects of electromagnetic fields, are discussed in detail in this SEIS. For all 15 Category 2 issues and environmental justice, the staff concludes that the potential environmental effects are of SMALL significance in the context of the standards set forth in the GEIS. In addition, the staff determined that appropriate Federal health agencies have not reached a consensus on the existence of chronic adverse effects from electromagnetic fields. Therefore, no further evaluation of this issue is required. For severe accident mitigation alternatives (SAMAs), the staff concludes that a reasonable, comprehensive effort was made to identify and evaluate SAMAs. Based on the staff's review of the SAMAs for Dresden Units 2 and 3 and the plant improvements already made, the staff concludes that two of the candidate SAMAs are potentially cost-beneficial. However, these SAMAs do not relate to adequately managing the effects of aging during the period of extended operation. Therefore, they do not need to be implemented as part of license renewal pursuant to 10 CFR Part 54.

Mitigation measures were considered for each Category 2 issue. Current measures to mitigate the environmental impacts of plant operation were found to be adequate, and no additional mitigation measures were deemed sufficiently beneficial to be warranted.

If the Dresden OLs are not renewed and the units cease operation on or before the expiration of their current OLs, then the adverse impacts of likely alternatives will not be smaller than those that would have been associated with continued operation of Dresden Units 2 and 3. The impacts may, in fact, be greater in some areas.

The recommendation of the NRC staff is that the Commission determine that the adverse environmental impacts of license renewal for Dresden Units 2 and 3 are not so great that preserving the option of license renewal for energy-planning decisionmakers would be unreasonable. This recommendation is based on (1) the analysis and findings in the GEIS; (2) the ER submitted by Exelon; (3) consultation with other Federal, State, and local agencies; (4) the staff's own independent review; and (5) the staff's consideration of the public comments.

Abbreviations/Acronyms

°	degree
μ	micro
μCi	microcurie(s)
μCi/mL	microcurie(s) per milliliter
μGy	microgray(s)
μmho(s)	micromho(s)
μmho/cm	micromho per centimeter
μm	micrometer(s)
μSv	microsievert(s)
ac	acre(s)
A/C	air conditioner
AC	alternating current
ACC	averted cleanup and decontamination cost
A.D.	anno Domini
ADAMS	Agencywide Documents Access and Management System
AEA	Atomic Energy Act of 1954
AEC	U.S. Atomic Energy Commission
AQCR	air quality control region
ATWS	anticipated transient without scram
BC	before Christ
Bq	becquerel(s)
Bq/mL	becquerel(s) per milliliter
Btu	British thermal unit(s)
Btu/ft^3	British thermal unit(s) per cubic foot
Btu/kWh	British thermal unit(s) per kilowatt hour
BWR	boiling water reactor
BWROG	Boiling Water Reactor Owners Group
C	Celsius
CAA	Clean Air Act
CCSW	containment cooling service water
CDF	core damage frequency
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
Ci	curie(s)
Ci/L	curies per liter

Ci/mL	curies per milliliter
cm	centimeter(s)
cm/s	centimeter(s) per second
CMSA	Consolidated Metropolitan Statistical Area
ComEd	Commonwealth Edison
CST	condensate storage tank
CWA	Clean Water Act
DAW	dry active waste
DBA	design-basis accident
DC	direct current
DOE	U.S. Department of Energy
DOT	U.S. Department of Transportation
DSM	demand-side management
EOP	emergency operating procedure
EIA	Energy Information Administration (of DOE)
EIS	environmental impact statement
ELF-EMF	extremely low frequency-electromagnetic field
EPA	U.S. Environmental Protection Agency
EPRI	Electric Power Research Institute
EPU	extended power uprate
ER	Environmental Report
ESA	Endangered Species Act
ESRP	*Standard Review Plans for Environmental Reviews for Nuclear Power Plants, Supplement 1: Operating License Renewal*
F	Fahrenheit
FAA	Federal Aviation Administration
FES	final environmental statement
FR	*Federal Register*
FSAR	final safety analysis report
ft	foot (feet)
ft/s	foot (feet) per second
ft^3	cubic foot (feet)
ft^3/s	cubic foot (feet) per second
ft^3/yr	cubic foot (feet) per year
FWS	U.S. Fish and Wildlife Service
g	unit measure of ground acceleration
gal	gallon(s)

gal/s gallon(s) per second
GEIS *Generic Environmental Impact Statement for License Renewal of Nuclear Plants*, NUREG-1437
gpd gallon(s) per day
gpm gallon(s) per minute
Gy gray(s)

ha hectare(s)
HCLPE high confidence low probability of failure
HEP human error probability
HEPA high-efficiency particulate air (filter)
HIC high-integrity container
HLW high-level waste
hr hour(s)
Hz Hertz

IDNR Illinois Department of Natural Resources
IDPH Illinois Department of Public Health
IHPA Illinois Historic Preservation Agency
IEPA Illinois Environmental Protection Agency
IHPA Illinois Historic Preservation Agency
in. inch(es)
IPCB Illinois Pollution Control Board
IPE individual plant examination
IPEEE individual plant examination of external events
IRSF interim radioactive waste storage facility
ISFSI independent spent fuel storage installation
ISLOCA interfacing systems loss-of-coolant accident

J joule(s)

km kilometer(s)
km^2 square kilometer(s)
km^3 cubic kilometer(s)
kV kilovolt(s)
kW kilowatt(s)
kWh kilowatt hour(s)
kWh (e) kilowatt hour(s) electric
kWh/m^2 kilowatt hour(s) per square meter

L liter(s)

L/d	liter(s) per day
L/min	liter(s) per minute
L/s	liter(s) per second
lb	pound(s)
lb/MWh	pound(s) per megawatt hour
LLC	Limited Liability Corporation
LLW	low-level waste
LOCA	loss-of-coolant accident
LOOP	loss of offsite power
LOS	level of service
LPCI	low pressure coolant injection
m	meter(s)
m/s	meter(s) per second
m^2	square meter(s)
m^3	cubic meter(s)
m^3/d	cubic meter(s) per day
m^3/s	cubic meter(s) per second
m^3/yr	cubic meter(s) per year
mA	milliampere(s)
MACCS2	MELCOR Accident Consequence Code System 2
MBLOCA	medium break low-of-coolant accident
MBq	megabecquerel(s)
MBq/L	megabecquerel(s) per liter
mGy	milligray(s)
mi	mile(s)
min	minute(s)
mL	milliliter(s)
mm	millimeter(s)
mph	mile(s) per hour
mrad	millirad(s)
mrem	millirem(s)
mrem/hr	millirem(s) per hour
mrem/yr	millirem(s) per year
MSA	Metropolitan Statistical Area
MSIV	main steam isolation valve
msl	mean seal level
mSv	millisievert(s)
mSv/yr	millisievert(s) per year
MT	metric ton(s) (or tonne[s])
MT/yr	metric ton(s) (or tonne[s]) per year

MTU	metric ton(s) (or tonne[s])-uranium
MW	megawatt(s)
MWd/MTU	megawatt-day(s) per metric ton (or tonne) of uranium
MW(e)	megawatt(s) electric
MWh	megawatt hour(s)
MW(t)	megawatt(s) thermal
NA	not applicable
NAS	National Academy of Sciences
NEPA	National Environmental Policy Act of 1969
NESC	National Electric Safety Code
ng	nanogram(s)
ng/J	nanogram(s) per joule
NHPA	National Historic Preservation Act
NIEHS	National Institute of Environmental Health Sciences
NO_x	nitrogen oxide(s)
NPDES	National Pollutant Discharge Elimination System
NPS	National Park Service
NRC	U.S. Nuclear Regulatory Commission
NREL	National Renewable Energy Laboratory
NRHP	National Register of Historic Places
NWPPC	Northwest Power Planning Council
ODCM	*Offsite Dose Calculation Manual*
OL	operating license
PARS	publicly available records
pCi	picocurie(s)
pCi/L	picocurie(s) per liter
PM_{10}	particulate matter, 10 μm or less in diameter
$PM_{2.5}$	particulate matter, 2.5 μm or less in diameter
PMSA	Primary Metropolitan Statistical Area
PSD	prevention of significant deterioration
psi	pounds per square inch
psig	pounds per square inch above atmospheric pressure
rem	special unit of dose equivalent, equal to 0.01 sievert
REMP	radiological environmental monitoring program
ROW	right(s) of way
RPV	reactor pressure vessel
RWPB	radioactive-waste-processing building

s	second(s)
SAMA	severe accident mitigation alternative
SAR	safety analysis report
SBLC	standby liquid control
SBLOCA	small break loss-of-coolant accident
SBO	station blackout
SEIS	supplemental environmental impact statement
SER	safety evaluation report
SGTR	steam-generator tube rupture
SHPO	State Historic Preservation Office
SIP	state implementation plan
SO_2	sulfur dioxide
SO_x	sulfur oxide(s)
Sv	sievert(s), special unit of dose equivalent
TEDE	total effective dose equivalent
TLD	thermoluminescent dosimeter
UFSAR	updated final safety analysis report
U.S.	United States
USBC	U.S. Bureau of the Census
USC	United States Code
USDA	U.S. Department of Agriculture
USFS	U.S. Forest Service
USGS	U.S. Geologic Survey
V	volt(s)
VOC	volatile organic compound
yr	year(s)

1.0 Introduction

Under the U.S. Nuclear Regulatory Commission's (NRC's) environmental protection regulations in Title 10 of the Code of Federal Regulations (CFR) Part 51, which implement the National Environmental Policy Act (NEPA), renewal of a nuclear power plant operating license (OL) requires the preparation of an environmental impact statement (EIS). In preparing the EIS, the NRC staff is required first to issue the statement in draft form for public comment and then issue a final statement after considering public comments on the draft. To support the preparation of the EIS, the staff has prepared a *Generic Environmental Impact Statement for License Renewal of Nuclear Plants* (GEIS), NUREG-1437, Volumes 1 and 2 (NRC 1996; 1999).[a] The GEIS is intended to (1) provide an understanding of the types and severity of environmental impacts that may occur as a result of license renewal of nuclear power plants under 10 CFR Part 54, (2) identify and assess the impacts expected to be generic to license renewal, and (3) support 10 CFR Part 51 to define the number and scope of issues that need to be addressed by the applicants in plant-by-plant renewal proceedings. Use of the GEIS guides the preparation of complete plant-specific information in support of the OL renewal process.

The Exelon Generation Company, LLC (Exelon) operates Dresden Units 2 and 3 in Illinois under OLs DPR-19 and DPR-25, which were issued by the NRC. These OLs will expire on December 22, 2009, for Unit 2, and on January 12, 2011, for Unit 3. On January 3, 2003, Exelon submitted an application to the NRC for renewal of the Dresden Units 2 and 3 OLs for an additional 20 years under the procedures in 10 CFR Part 54 (Exelon 2003a). Exelon is a *licensee* for the purposes of its current OLs and an *applicant* for the renewal of the OLs. Pursuant to 10 CFR 54.23 and 51.53(c), Exelon submitted an Environmental Report (ER) in which Exelon analyzed the environmental impacts associated with the proposed license renewal action, considered alternatives to the proposed license renewal action, considered alternatives to the proposed action, and evaluated mitigation measures for reducing adverse environmental effects (Exelon 2003b).

This report is the plant-specific supplement to the GEIS (the supplemental EIS [SEIS]) for the Exelon license renewal application. This SEIS is a supplement to the GEIS because it relies, in part, on the findings of the GEIS. The staff will also prepare a separate safety evaluation report in accordance with 10 CFR Part 54.

(a) The GEIS was originally issued in 1996. Addendum 1 to the GEIS was issued in 1999. Hereafter, all references to the "GEIS" include the GEIS and its Addendum 1.

1.1 Report Contents

The following sections of this introduction (1) describe the background for the preparation of this SEIS, including the development of the GEIS and the process used by the staff to assess the environmental impacts associated with license renewal, (2) describe the proposed Federal action to renew the Dresden Units 2 and 3 OLs, (3) discuss the purpose and need for the proposed action, and (4) present the status of Exelon's compliance with environmental quality standards and requirements that have been imposed by Federal, State, regional, and local agencies that are responsible for environmental protection.

The ensuing chapters of this SEIS closely parallel the contents and organization of the GEIS. Chapter 2 describes the site, power plant, and interactions of the plant with the environment. Chapters 3 and 4, respectively, discuss the potential environmental impacts of plant refurbishment and plant operation during the renewal term. Chapter 5 contains an evaluation of potential environmental impacts of plant accidents and includes consideration of severe accident mitigation alternatives (SAMAs). Chapter 6 discusses the uranium fuel cycle and solid waste management. Chapter 7 discusses decommissioning, and Chapter 8 discusses alternatives to license renewal. Finally, Chapter 9 summarizes the findings of the preceding chapters and draws conclusions about the adverse impacts that cannot be avoided; the relationship between short-term uses of the human environment and the maintenance and enhancement of long-term productivity; and the irreversible or irretrievable commitment of resources. Chapter 9 also presents the staff's recommendation with respect to the proposed license renewal action.

Additional information is included in appendices. Appendix A contains public comments received at the public meetings on the environmental review for license renewal and staff responses. Appendices B through H, respectively, consist of the following:

- The preparers of the supplement
- The chronology of the NRC staff's environmental review correspondence regarding this SEIS
- The organizations contacted during the development of this SEIS
- Exelon's permit compliance status (Table E-1) and copies of consultation correspondence prepared and sent during the evaluation process

- GEIS environmental issues that are not applicable to Dresden Units 2 and 3
- SAMAs Evaluation
- Correspondence incorporated into remarks at a public meeting on the draft SEIS.

1.2 Background

Use of the GEIS, which examines the possible environmental impacts that could occur as a result of renewing individual nuclear power plant OLs under 10 CFR Part 54, and the established license renewal evaluation process support the thorough evaluation of the impacts of renewal of OLs.

1.2.1 Generic Environmental Impact Statement

The NRC initiated a generic assessment of the environmental impacts associated with the license renewal term to improve the efficiency of the license renewal process by documenting the assessment results and codifying the results in the Commission's regulations. This assessment is provided in the GEIS, which serves as the principal reference for all nuclear power plant license renewal EISs.

The GEIS documents the results of the systematic approach taken to evaluate the environmental consequences of renewing the licenses of individual nuclear power plants and operating them for an additional 20 years. For each potential environmental issue, the GEIS (1) describes the activity that affects the environment, (2) identifies the population or resource that is affected, (3) assesses the nature and magnitude of the impact on the affected population or resource, (4) characterizes the significance of the effect for both beneficial and adverse effects, (5) determines whether the results of the analysis apply to all plants, and (6) considers whether additional mitigation measures would be warranted for impacts that would have the same significance level for all plants.

The NRC's standard of significance was established using the Council on Environmental Quality (CEQ) terminology for "significantly" (40 CFR 1508.27, which requires consideration of both "context" and "intensity"). Using the CEQ terminology, the NRC established three significance levels — SMALL, MODERATE, or LARGE. The definitions of the three significance levels are set forth in the footnotes to Table B-1 of 10 CFR Part 51, Subpart A, Appendix B, as follows:

> 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.

The GEIS assigns a significance level to each environmental issue, assuming that ongoing mitigation measures would continue.

The GEIS includes a determination of whether the analysis of the environmental issue could be applied to all plants and whether additional mitigation measures would be warranted. Issues are then assigned a Category 1 or a Category 2 designation. As set forth in the GEIS, **Category 1** issues are those that meet all of the following criteria:

(1) The environmental impacts associated with the issue have been determined to 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.

(2) A single significance level (i.e., SMALL, MODERATE, or LARGE) has been assigned to the impacts (except for collective off-site radiological impacts from the fuel cycle and from high-level waste and spent fuel disposal).

(3) 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 issues that meet the three Category 1 criteria, no additional plant-specific analysis is required in this SEIS unless new and significant information is identified.

Category 2 issues are those that do not meet one or more of the criteria of Category 1; and, therefore, additional plant-specific review for these issues is required.

In the GEIS, the staff assessed 92 environmental issues and determined that 69 qualified as Category 1 issues, 21 qualified as Category 2 issues, and 2 issues were not categorized. The latter 2 issues, environmental justice and chronic effects of electromagnetic fields, are to be addressed in a plant-specific analysis. Of the 92 issues, 11 related only to refurbishment, 6 only to decommissioning, 67 only to operation during the renewal term, and 8 apply to both refurbishment and operation during the renewal term. A summary of the findings for all 92 issues in the GEIS is codified in Table B-1 of 10 CFR Part 51, Subpart A, Appendix B.

1.2.2 License Renewal Evaluation Process

An applicant seeking to renew its OLs is required to submit an ER as part of its application (10 CFR 54.23). The license renewal evaluation process involves careful review of the applicant's ER and assurance that all new and potentially significant information not already addressed in or available during the GEIS evaluation is identified, reviewed, and assessed to verify the environmental impacts of the proposed license renewal.

In accordance with 10 CFR 51.53(c)(2) and (3), the ER submitted by the applicant must:

- Provide an analysis of the Category 2 issues in Table B-1 of 10 CFR Part 51, Subpart A, Appendix B in accordance with 10 CFR 51.53(c)(3)(ii)

- 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)(2), the ER does not need to:

- Consider the economic benefits and costs of the proposed action and alternatives to the proposed action except insofar as such benefits and costs are either (1) essential for making a determination regarding the inclusion of an alternative in the range of alternatives considered, or (2) relevant to mitigation

- Consider the need for power and other issues not related to the environmental effects of the proposed action and the alternatives

- Discuss any aspect of the storage of spent fuel within the scope of the generic determination in 10 CFR 51.23(a) in accordance with 10 CFR 51.23(b)

- Contain an analysis of any Category 1 issue unless there is significant new information on a specific issue–this is pursuant to 10 CFR 51.53(c)(3)(iii) and (iv).

New and significant information is (1) information that identifies a significant environmental issue not covered in the GEIS and codified in Table B-1 of 10 CFR Part 51, Subpart A, Appendix B; or (2) information that was not considered in the analyses summarized in the GEIS and that leads to an impact finding that is different from the finding presented in the GEIS and codified in 10 CFR Part 51.

In preparing to submit its application to renew the Dresden Units 2 and 3 OLs, Exelon developed a process to ensure that information not addressed in or available during the GEIS evaluation regarding the environmental impacts of license renewal for Dresden Units 2 and 3 would be properly reviewed before submitting the ER, and to ensure that such new and potentially significant information related to renewal of the licenses would be identified, reviewed, and assessed during the period of NRC review. Exelon reviewed the Category 1 issues that appear in Table B-1 of 10 CFR Part 51, Subpart A, Appendix B, to verify that the conclusions of the GEIS remained valid with respect to Dresden Units 2 and 3. This review was performed by personnel from Exelon and its support organization familiar with NEPA issues and the scientific disciplines involved in the preparation of a license renewal ER.

The NRC staff also has a process for identifying new and significant information. That process is described in detail in *Standard Review Plans for Environmental Reviews for Nuclear Power Plants, Supplement 1: Operating License Renewal* (ESRP), NUREG-1555, Supplement 1 (NRC 2000). The search for new information includes (1) a review of an applicant's ER and the process for discovering and evaluating the significance of new information; (2) a review of records of public comments; (3) a review of environmental quality standards and regulations; (4) coordination with Federal, State, and local environmental protection and resource agencies; and (5) a review of the technical literature. New information discovered by the staff is evaluated for significance using the criteria set forth in the GEIS. For Category 1 issues where new and significant information is identified, reconsideration of the conclusions for those issues is limited in scope to an assessment of the relevant new and significant information; the scope of the assessment does not include other facets of the issue that are not affected by the new information.

Chapters 3 through 7 discuss the environmental issues considered in the GEIS that are applicable to Dresden Units 2 and 3. At the beginning of the discussion of each set of issues, a table identifies the issues to be addressed and lists the sections in the GEIS where the issue is discussed. Category 1 and Category 2 issues are listed in separate tables. For Category 1 issues for which there is no new and significant information, the table is followed by a set of short paragraphs that state the GEIS conclusion codified in Table B-1 of 10 CFR Part 51, Subpart A, Appendix B, followed by the staff's analysis and conclusion. For Category 2 issues, in addition to the list of GEIS sections where the issue is discussed, the tables list the subparagraph of 10 CFR 51.53(c)(3)(ii) that describes the analysis required and the SEIS sections where the analysis is presented. The SEIS sections that discuss the Category 2 issues are presented immediately following the table.

The NRC prepares an independent analysis of the environmental impacts of license renewal and compares these impacts with the environmental impacts of alternatives. The evaluation of the Exelon license renewal application began with publication of a notice of acceptance for docketing and opportunity for a hearing in the *Federal Register* (67 FR 6810273 [NRC 2003a]) on March 4, 2003. The staff published a notice of intent to prepare an EIS and conduct scoping (68 FR 12386-12387 [NRC 2003b]) on March 14, 2003. Two public scoping meetings were held on April 10, 2003, in Morris, Illinois. Comments received during the scoping period were summarized in the *Environmental Impact Statement Scoping Process: Summary Report – Dresden Units 2 and 3, Illinois* (NRC 2003c), dated July 2003. Comments applicable to this environmental review are presented in Part I of Appendix A.

The staff followed the review guidance contained in the ESRP (NRC 2000). The staff and contractors retained to assist the staff visited the Dresden site on March 25, 2003, to gather information and to become familiar with the site and its environs. The staff also reviewed the comments received during scoping and consulted with Federal, State, regional, and local agencies. A list of the organizations consulted is provided in Appendix D. Other documents related to Dresden were reviewed and are referenced in this report.

On December 10, 2003, the NRC published a Notice of Availability of the draft SEIS in 68 FR 68955-68956 (NRC 2003d). A 75-day comment period began on the date of the publication of the U.S. Environmental Protection Agency Notice of Availability of the draft SEIS to allow members of the public to comment on the preliminary results of the NRC staff's review (68 FR 69400). During the comment period, two public meetings were held in Morris, Illinois, on January 13, 2004. During these meetings, the staff described the preliminary results of the NRC environmental review and answered questions to provide members of the public with information to assist them in formulating their comments. The comment period for the Dresden draft SEIS ended on February 24, 2004. Comments made during the 75-day comment period, including those made at the two public meetings, are presented in Part II of Appendix A of this SEIS. The NRC responses to those comments are also provided.

This SEIS presents the staff's analysis that considers and weighs the environmental effects of the proposed renewal of the Dresden OLs, the environmental impacts of alternatives to license renewal, and mitigation measures available for avoiding adverse environmental effects. Chapter 9, "Summary and Conclusions," provides the NRC staff's recommendation to the Commission on 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.

1.3 The Proposed Federal Action

The proposed Federal action is renewal of the OLs for Dresden Units 2 and 3 (Dresden Unit 1 has been shut down since 1984; the decommissioning of Unit 1 is outside the scope of this

SEIS). The Dresden nuclear plant is located on the banks of the Illinois River in Grundy County, Illinois. Chicago is the largest city within 80 km (50 mi) of Dresden Units 2 and 3.

The current OL for Unit 2 expires on December 22, 2009, and for Unit 3 on January 12, 2011. By letter dated January 3, 2003, Exelon submitted an application to the NRC (Exelon 2003a) to renew these OLs for an additional 20 years of operation (i.e., until December 22, 2029, for Unit 2, and until January 12, 2031, for Unit 3).

The plant has two boiling water reactors designed by General Electric Company. Each reactor has a design rating for a net electrical power output of 912 megawatts electric (MW[e]). The cooling systems can operate in either of two modes. In the indirect open-cycle mode, once-through cooling water from the Kankakee River is used to remove heat from the main (turbine) condensers via the circulating water system and from other auxiliary equipment via the service water system. The heated effluent is circulated through a cooling canal and pond before being discharged to the Illinois River. In the closed-cycle mode, heated effluent is circulated through mechanical draft cooling towers and then recycled through the condensers with limited make-up water withdrawn from the Kankakee River. Dresden produces enough electricity to supply the needs of 350,000 industries, commercial establishments, and residences.

1.4 The Purpose and Need for the Proposed Action

Although a licensee must have a renewed license to operate a reactor beyond the term of the existing OL, the possession of that license is just one of a number of conditions that must be met for the licensee to continue plant operation during the term of the renewed license. Once an OL is renewed, State regulatory agencies and the owners of the plant will ultimately decide whether the plant will continue to operate, based on such factors as the need for power or other matters within the jurisdiction of the State or the purview of the owners.

Thus, for license renewal reviews, the NRC has adopted the following definition of purpose and need from the GEIS Section 1.3 (NRC 1996):

> The purpose and need for the proposed action (renewal of an operating license) is to provide an option that allows for power generation capability beyond the term of a current nuclear power plant operating license to meet future system generating needs, as such needs may be determined by State, utility, and where authorized, Federal (other than NRC) decisionmakers.

This definition of purpose and need reflects the Commission's recognition that, unless there are findings in the safety review required by the Atomic Energy Act of 1954 (AEA 1954) or findings in the NEPA environmental analysis that would lead the NRC to reject a license renewal application, the NRC does not have a role in the energy planning decisions of State regulators and utility officials as to whether a particular nuclear power plant should continue to operate. From the perspective of the licensee and the State regulatory authority, the purpose of renewing an OL is to maintain the availability of the nuclear plant to meet system energy requirements beyond the current term of the plant's license.

1.5 Compliance and Consultations

Exelon is required to hold certain Federal, State, and local environmental permits, as well as meet relevant Federal and State statutory requirements. In the Dresden ER (Exelon 2003b), Exelon provided a list of the authorizations from Federal, State, and local authorities for current operations as well as environmental approvals and consultations associated with license renewal of the Dresden OLs. Authorizations and consultations relevant to the proposed OLs renewal actions are included in Appendix E.

The staff has reviewed the list and consulted with the appropriate Federal, State, and local agencies to identify any compliance or permit issues or significant environmental issues of concern to the reviewing agencies. These agencies did not identify any new and significant environmental issues. The ER (Exelon 2003b) states that Exelon is in compliance with applicable environmental standards and requirements for Dresden Units 2 and 3. The staff also has not identified any environmental issues that are both new and significant.

1.6 References

10 CFR Part 51. Code of Federal Regulations, Title 10, *Energy,* Part 51, "Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions."

10 CFR Part 54. Code of Federal Regulations, Title 10, *Energy,* Part 54, "Requirements for Renewal of Operating Licenses for Nuclear Power Plants."

40 CFR Part 1508. Code of Federal Regulations, Title 40, *Protection of Environment*, Part 1508, "Terminology and Index."

Atomic Energy Act (AEA) of 1954. 42 USC 2011, et seq.

Exelon Generation Company, LLC (Exelon). 2003a. *Application for Renewed Operating Licenses, Dresden Nuclear Power Station, Units 2 and 3*. Docket Nos. 50-237 and 50-249. Warrenville, Illinois.

Exelon Generation Company, LLC (Exelon). 2003b. *Applicant's Environmental Report — Operating License Renewal Stage, Dresden Nuclear Power Station, Units 2 and 3*. Docket Nos. 50-237 and 50-249. Warrenville, Illinois. January 2003.

National Environmental Policy Act, as amended (NEPA) of 1969. 42 USC 4321, et seq.

U.S. Nuclear Regulatory Commission (NRC). 1996. *Generic Environmental Impact Statement for License Renewal of Nuclear Plants*. NUREG-1437, Volumes 1 and 2, Washington, D.C. May 1996.

U.S. Nuclear Regulatory Commission (NRC). 1999. *Generic Environmental Impact Statement for License Renewal of Nuclear Plants Main Report*, "Section 6.3 – Transportation, Table 9.1, Summary of findings on NEPA issues for license renewal of nuclear power plants, Final Report." NUREG-1437, Volume 1, Addendum 1, Washington, D.C.

U.S. Nuclear Regulatory Commission (NRC). 2000. *Standard Review Plans for Environmental Reviews for Nuclear Power Plants, Supplement 1: Operating License Renewal*. NUREG-1555, Supplement 1, Washington, D.C.

U.S. Nuclear Regulatory Commission (NRC). 2003a. "Notice of Acceptance for Docketing of Application and Notice of Opportunity for a Hearing Regarding Renewal of Facility Operating License Nos. DPR-19 and DPR-25 for an Additional 20-Year Period." *Federal Register*. Vol. 68, No. 42, pp. 10273. March 4, 2003.

U.S. Nuclear Regulatory Commission (NRC). 2003b. "Notice of Intent to Prepare an Environmental Impact Statement and Conduct Scoping Process." *Federal Register*. Vol. 68, No. 50, pp. 12386-12387. March 14, 2003.

U.S. Nuclear Regulatory Commission (NRC). 2003c. *Environmental Impact Statement Scoping Process: Summary Report – Dresden Units 2 and 3, Morris, Illinois*. Washington, D.C.

U.S. Nuclear Regulatory Commission (NRC). 2003d. "Exelon Generation Company, LLC, Dresden Nuclear Power Station, Units 2 and 3; Notice of Availability of Draft Supplement 17 to Generic Environmental Impact Statement and Public Meeting for the License Renewal of Dresden Nuclear Power Station, Units 2 and 3." *Federal Register*. Vol. 68, No. 237, pp. 68955-68956. December 10, 2003.

2.0 Description of Nuclear Power Plant and Site and Plant Interaction with the Environment

The Exelon Generation Company, LLC's (Exelon's) Dresden Nuclear Power Station (Dresden) is located on the south bank of the Illinois River at the confluence of the Des Plaines and the Kankakee Rivers in Goose Lake Township, Grundy County, Illinois. The plant consists of three units. Units 2 and 3 are operating nuclear reactors and the subject of this action. Unit 1 was shut down in 1978 and decontaminated in 1984, including the removal of fuel from the reactor. Units 2 and 3 are boiling water reactors (BWRs) that produce steam that turns turbines to generate electricity. In addition to the nuclear reactors and their turbine buildings, the site features intake and discharge canals, a cooling pond and canals, auxiliary buildings, switch yards, an independent spent fuel storage installation (ISFSI), a training center, and river frontage leased from the State of Illinois. Approximately one-half of the cooling pond is in Wilmington Township, Will County; and the other half is in Goose Lake Township, Grundy County, Illinois. The plant and its environment are described in Section 2.1, and the plant's interaction with the environment is presented in Section 2.2.

2.1 Plant and Site Description and Proposed Plant Operation during the Renewal Term

Dresden Units 2 and 3 are located on the south bank of the Illinois River and the west bank of the Kankakee River at the point where the Kankakee and the Des Plaines Rivers join to form the Illinois River (U.S. Atomic Energy Commission [AEC] 1973). Dresden Units 2 and 3 are located on approximately 1012 ha (2500 ac) of Exelon-owned land in Grundy and Will counties, Illinois (Exelon 2003a). Exelon also leases an additional 7 ha (17 ac) of river frontage from the State of Illinois. The site is located approximately 72 km (45 mi) southwest of downtown Chicago, Illinois. The site is approximately 13 km (8 mi) east of Morris, Illinois, and 24 km (15 mi) southwest of Joliet, Illinois. No major metropolitan areas occur within 10 km (6 mi) of the site. The nearest town is Channahon, approximately 5 km (3 mi) northeast. Figures 2-1 and 2-2 show the site location and features within 80 km (50 mi) and 10 km (6 mi), respectively.

The region surrounding the Dresden site was identified in the *Generic Environmental Impact Statement for License Renewal of Nuclear Plants* (GEIS), NUREG-1437, Volumes 1 and 2 (NRC 1996; 1999)[a] as having a low population density. Dresden Units 2 and 3 employ a work force of about 1000 employees, of which 870 are permanent employees. Each unit is refueled on a 24-month cycle, which means one refueling at the site every year. During refueling outages, site employment increases by as many as 760 workers for temporary duty (typically, about 20 days).

(a) The GEIS was originally issued in 1996. Addendum 1 to the GEIS was issued in 1999. Hereafter, all references to the GEIS include the GEIS and its Addendum 1.

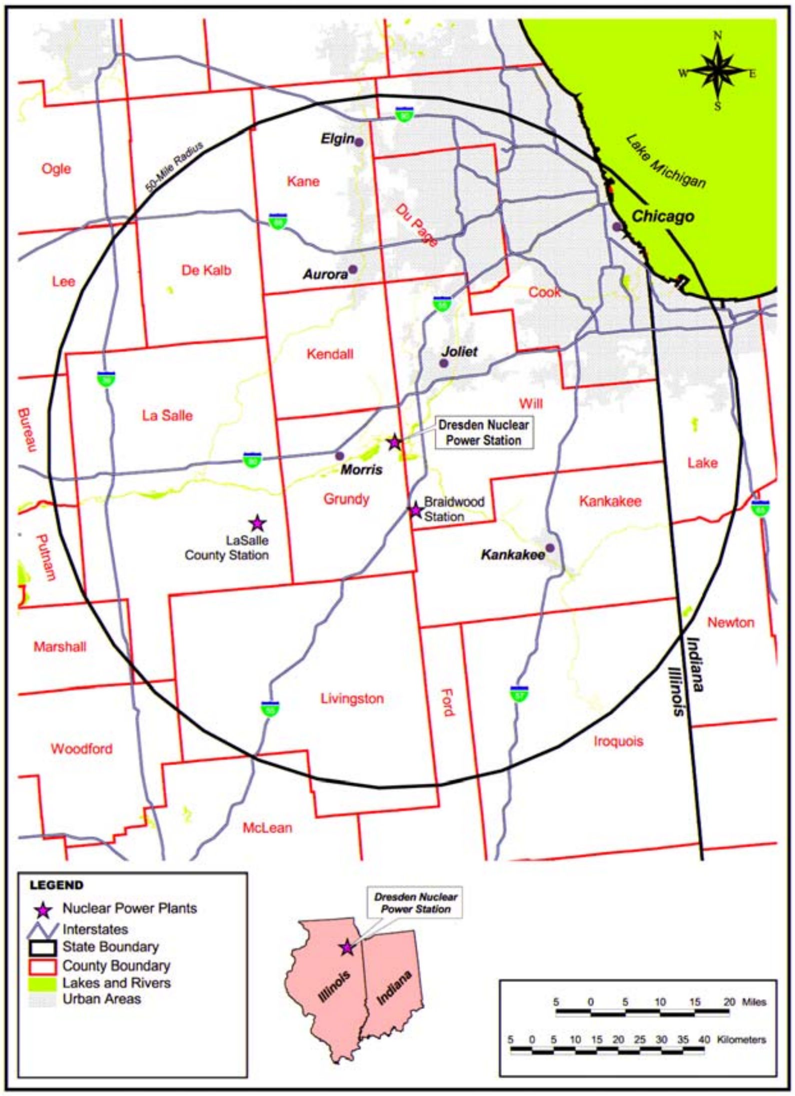


Figure 2-1. Location of Dresden Site, 80-km (50-mi) Region

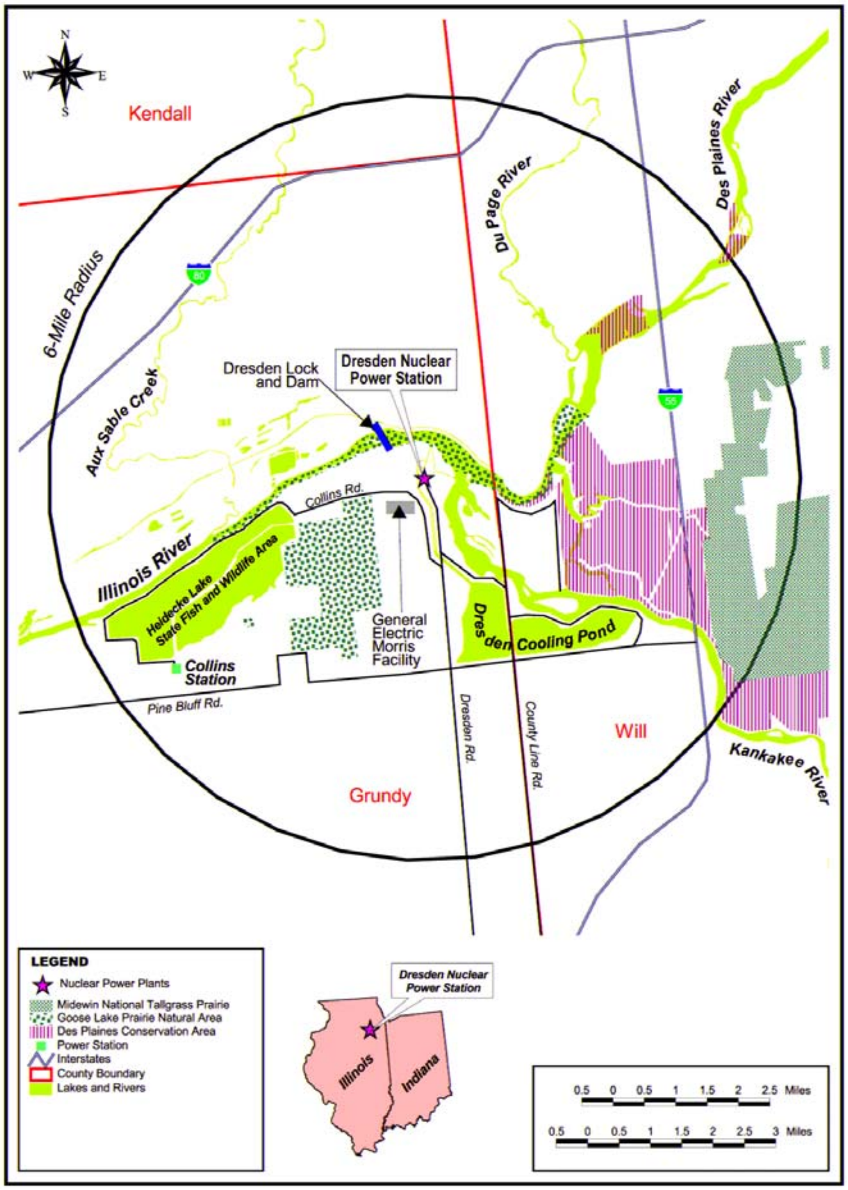


Figure 2-2. Location of Dresden Site, 10-km (6-mi) Region

2.1.1 External Appearance and Setting

The local terrain is level to gently undulating except for the Kankakee Bluffs just northeast of the site on the north bank of the Illinois River. The surrounding area is largely rural and is characterized by farmland, woodlands, and small residential communities. The site has an exclusion area boundary extending approximately 0.8 km (0.5 mi) around the plant (Exelon 2003a; NRC 1996).

The Goose Lake Prairie State Natural Area is located approximately 2 km (1 mi) southwest of the Dresden Units 2 and 3 turbine building. This 1027-ha (2537-ac) preserve contains open grasslands and prairie marshes (Exelon 2003a). Directly across the Kankakee River from the Dresden site is the Des Plaines Conservation Area. This 200-ha (500-ac) park offers a variety of recreation, including pheasant hunting. To the east of the Des Plaines Conservation Area is the Midewin National Tallgrass Prairie, a 6500-ha (16,000-ac) site formerly used as the Joliet Army Ammunition Plant. This area was transferred to the U.S. Forest Service (USFS) in 1997 and will be managed to restore, maintain, and enhance the prairie ecosystem. Figure 2-2 shows the location of these natural areas.

Industrial sites located near Dresden include the General Electric Morris (Illinois) Operation and the Midwest Generation Collins Station. Approximately 8 km (5 mi) southwest of the Dresden site is Heidecke Lake (a cooling pond for the Collins Station). Figure 2-2 shows the locations of these sites. The plant is visible from the surrounding areas, including the residences on the banks of Kankakee River.

The geological location of the Dresden site within the Chicago metropolitan region is near the center of the Central Lowland Province, a glaciated lowland that stretches from the Appalachian Plateau on the east to the Great Plains on the west. The site is situated in a subdivision called the Kankakee Plain, which is a level to gently undulating plain that occupies the position of a basin between higher moraine country to the east and west. Low ridges, terraces, bars, and dunes locally rise above the general level. The elevation in the immediate vicinity of the site varies from 155 to 160 m (509 to 526 ft) above sea level. The only deviation is the Kankakee Bluffs, with elevations from 180 to 190 m (590 to 625 ft), located just northeast of the Dresden site on the north banks of the Illinois River.

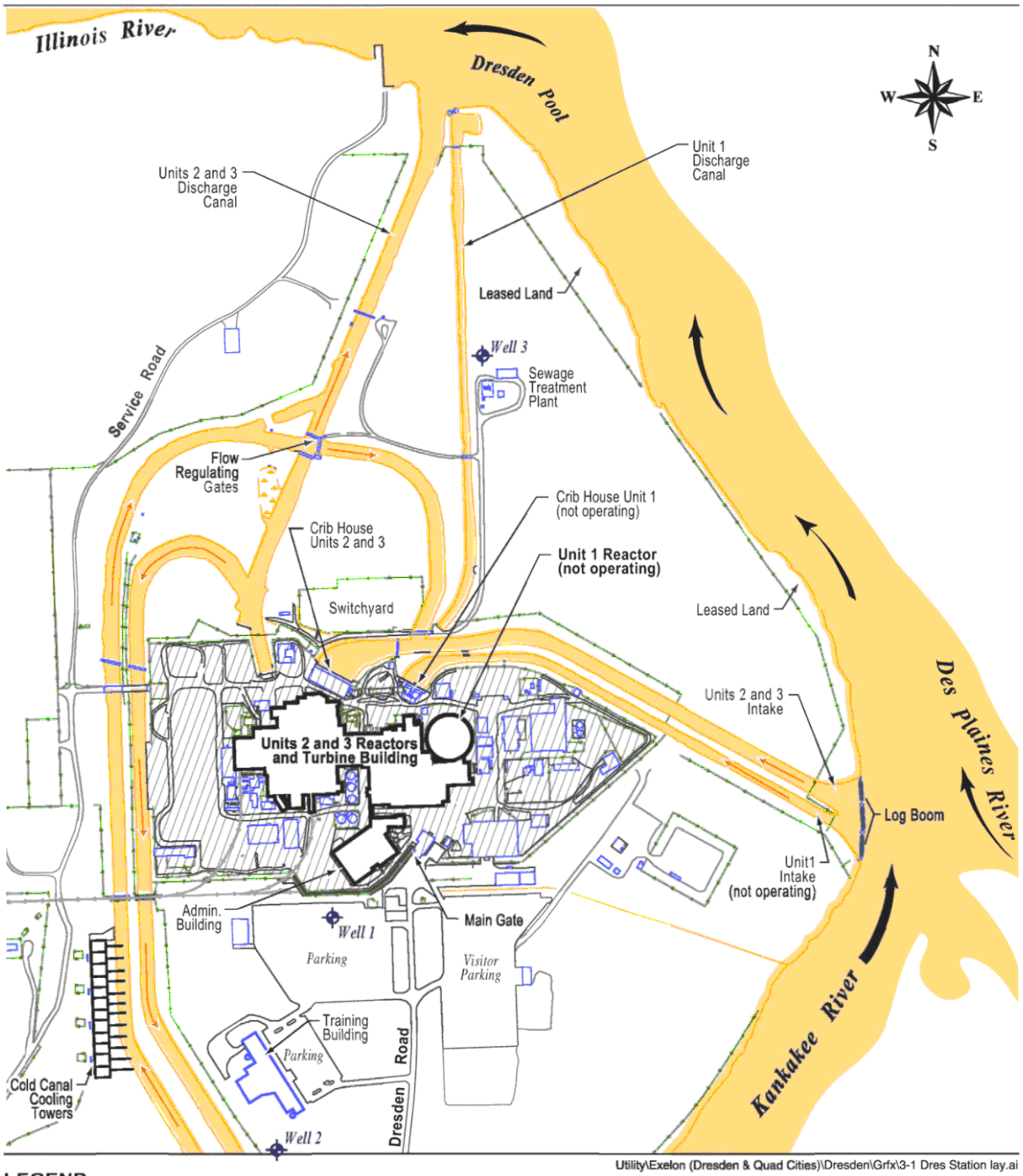
The upper layer of the bedrock varies across the region, being primarily of Silurian or Ordovician Period. The upper layer of the smaller portion, which includes the site, is of Pennsylvania Period. The rocks of the Pennsylvania system belong to the “Coal Measures” or strata associated with beds of coal. They consist primarily of fine-grained sandstone, clay, shale, and one or two seams of coal. The topsoil in the area of the site is typically 0.3 to 0.8 m (1 to 2.5 ft) thick, composed of black silt with some sand, clay, and organic material. Beneath the topsoil is dense, cohesive glacial till soils consisting of sandy silts with clay, and clayey silts with sand; this glacial till extends to the top of the bedrock, which ranges from 4 to 10 m (12 to 31 ft) below the surface (AEC 1973).

2.1.2 Reactor Systems

Dresden has two active nuclear reactor units (Units 2 and 3) as shown in Figure 2-3. Each unit includes a BWR and a steam-driven turbine generator that was manufactured by General Electric Company. Dresden Units 2 and 3 produce an output of 2957 megawatts thermal (MW[t]) each, and their design net electrical capacity is 912 megawatts electric (MW[e]) per unit. Unit 2 achieved commercial operation in June 1970, and Unit 3 in November 1971. In 2001, the net generating capacity of each Unit was increased by raising the maximum reactor core power level from 2527 MW(t) to 2957 MW(t), a 17 percent increase. As a result, the net electrical-generating capacity for each unit were increased from 809 MW(e) to 912 MW(e). An NRC-prepared Environmental Assessment and Finding of No Significant Impact concluded that there were no significant environmental impacts associated with the power uprate (NRC 2001a).

The nuclear steam supply system at Dresden Units 2 and 3 is typical of General Electric BWRs. The reactor core produces heat that boils the reactor water into steam which, after drying, is routed to the turbines. The steam yields its energy to turn the turbines, which are connected to the electrical generator. The nuclear fuel used at the plant is low enriched uranium dioxide with enrichments of 5 percent by weight uranium-235 and fuel burn-up levels less than 60,000 megawatt-days per metric ton uranium (MWd/MTU). NRC prepared an Environmental Assessment and Finding of No Significant Impact which concluded that there were no measurable environmental impacts associated with fuel enrichment up to 5 weight percent and burn-up levels to 60,000 MWd/MTU (NRC 2001a).

The primary containment for each unit consists of a drywell, a steel structure that encloses the reactor vessel and related piping, a toroidal-shaped pressure suppression chamber containing a large volume of water, and a vent system that connects the drywell to the suppression chamber. The primary containment is designed to condense steam released during a postulated loss-of-coolant accident (LOCA), to limit the release of fission products associated with such an accident, and to serve as a source of water for the emergency core cooling system. The containment is designed to withstand an internal pressure of 62 pounds per square inch (psi) above atmospheric pressure.



LEGEND

Railroad — Fence — Protected Area

Figure 2-3. Dresden Site Layout

The concrete reactor building, which houses the primary containment for both units, serves as a radiation shield and fulfills a secondary containment function. Secondary containment is needed to provide a controlled, filtered, elevated release of the building atmosphere under accident conditions. The reactor building also provides primary containment protection when the drywell is opened for maintenance during outages. The reactor building is maintained under a slight negative pressure, with the building exhaust monitored prior to release to the atmosphere through the reactor building ventilation exhaust stack. Radiation monitors on the exhaust stream can trigger the isolation of the ventilation system in the event of a process upset that could release excess radioactivity to the environment. A standby gas treatment system is provided to filter and hold up the exhaust before discharging it to the 95-m (310-ft) main stack (Exelon 2003b).

2.1.3 Cooling and Auxiliary Water Systems

Dresden was originally constructed with a once-through open-cycle cooling system; however, a number of configuration changes have been made in the cooling system in subsequent years. These configuration changes include the construction of a cooling pond and associated cooling canals, and permanent, mechanical draft cooling towers. Circulating water that removes heat rejected from the main condensers is drawn from the Kankakee River and discharged to the Illinois River. A separate service water system also draws from the Kankakee River and discharges to the Illinois River. Groundwater from three wells are used for domestic water consumption and for other industrial purposes. These three water systems are described in this section.

The circulating water system can be operated in two general heat dissipation modes. Flow-regulating gates are used to direct effluent to the river (indirect open-cycle mode) or to the intake structure (closed-cycle mode). In the indirect open-cycle mode, cooling water is withdrawn from the Kankakee River and pumped through the condensers. Heated effluent is circulated through a cooling pond before being discharged to the Illinois River (see Figure 2-4). While operating in the closed-cycle mode, heated effluent is recirculated through the condensers, and withdrawal from the Kankakee River is limited to makeup water needed to compensate for evaporative, seepage, and blowdown losses.

Condenser cooling water is withdrawn from the Kankakee River through a canal that is approximately 610 m (2000 ft) long and 15 m (50 ft) wide. A log boom separates the Kankakee River and the intake canal. This log boom prevents logs and other large debris from entering the intake canal. During periods of low flow on the Kankakee River, water from the Des Plaines River may also enter the canal. At the end of the canal are bar racks, consisting of 1.3-cm by 5-cm (½-in. by 2-in.) bars spaced vertically on 6-cm (2-1/2-in.) centers, to prevent large objects from entering the cooling system. The circulating water pumps are further protected by sets of traveling screens with 1-cm (3/8-in.) mesh that prevent debris and organisms from entering the cooling system. The maximum design water intake velocity at the bar racks is 0.2 m/s (0.6 ft/s), and the velocity at the traveling screens is 0.56 m/s (1.85 ft/s).

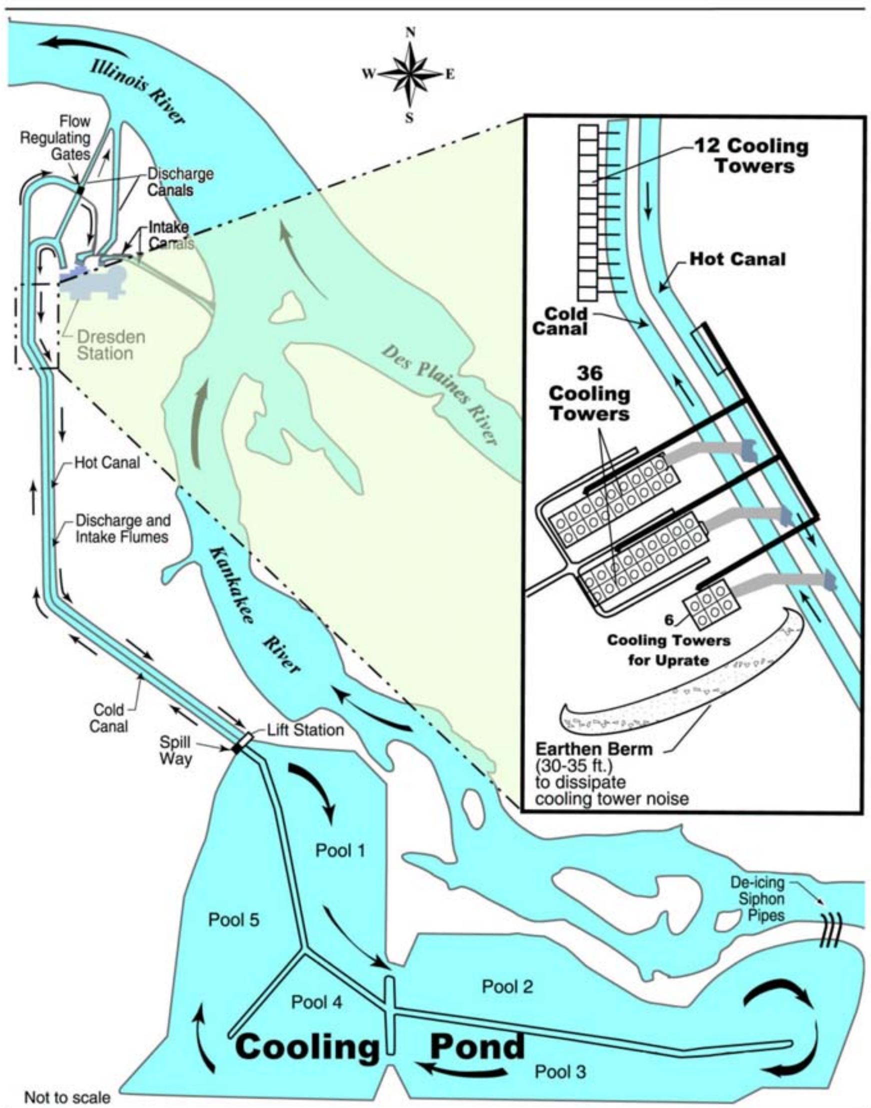


Figure 2-4. Dresden Cooling Water System Schematic

Heated water is discharged to the Dresden cooling pond system that is operated under a permit (No. DS2000233) from the Illinois Department of Natural Resources (IDNR) for Class 1 dam operation and maintenance. The cooling pond is defined by a dike system and associated structures. The cooling pond dike is characterized as an intermediate-size Class 1 (high-hazard) structure. The permit requires that the dike and associated structures be inspected annually by a Certified Civil Engineer. In addition to this, Exelon performs an independent inspection every two months. This inspection consists of visual inspections of the dike and monitoring the 18 piezometers installed around the cooling pond on the dikes. Exelon submits an annual report, signed by the Dresden Station Manager, to the IDNR.

Dresden Units 2 and 3 are operated in the indirect open-cycle mode from June 15 through September 30. In this mode of operation, a maximum of 59 m^3/s (940,000 gpm) is withdrawn from the Kankakee River by six pumps (each rated at 9.9 m^3/s [157,000 gpm]) for condenser cooling water use. After circulating through the condensers, water is discharged into a cooling canal (i.e., the hot canal) that is approximately 3 km long (2 mi long).

Dresden Units 2 and 3 may be operated in closed-cycle mode at any time, but normally this mode is used from October 1 through June 14. The mechanical draft cooling towers are typically not utilized in the closed-cycle mode. In this mode, water is circulated through the condensers for Units 2 and 3; passed through the hot canal, the cooling pond, and the cold canal; and then routed back to the intake structure via the flow-regulating station gates (i.e., recirculated). In order to prevent an increase in the dissolved solids concentrations in the cooling pond (which would impact condenser efficiency), approximately 3.2 m^3/s (50,000 gpm) of the cooling water is discharged (i.e., blown down) to the Illinois River. A small portion of condenser cooling water (4.4 m^3/s [70,000 gpm]) is withdrawn from the Kankakee River to compensate for evaporative, seepage, and blowdown losses in the cooling pond.

As water travels through the hot canal, it may be withdrawn and circulated through a series of 36 mechanical draft cooling tower cells for supplemental cooling. These cooling towers have a maximum water withdrawal capacity of 40 m^3/s (630,000 gpm) and, on average, total evaporative losses of 0.9 m^3/s (14,400 gpm) when both units are operating. The "cold tower," consisting of 12 cells in a row, was constructed first. Towers 1 and 2, constructed later, consist of 18 cooling tower cells each, arranged in two rows of nine cells. An additional six cooling tower cells have been constructed and are available for operation. Average evaporative losses through the towers are on the order of 0.033 m^3/s (400 gpm) per cell. The water is discharged to the Illinois River. During the summer, the cooling towers operate as necessary to maintain water temperatures within the limits of Dresden's National Pollutant Discharge Elimination System (NPDES) permit (IL0002224). The NPDES permit, which expires October 31, 2005, includes a condition that provides for a maximum of 68 m^3/s (1,075,000 gpm) of cooling water blowdown flow during indirect open-cycle operation, or 3.2 m^3/s (50,000 gpm) during closed-cycle operation.

From the hot canal, a lift station pumps cooling water into a 516-ha (1275-ac) cooling pond. The cooling pond consists of five pools through which the cooling water is circulated for a mean retention time of approximately 2-1/2 days at full pumping capacity. After circulation through the cooling pond, the water is discharged via a spillway into another 3-km-long (2-mi-long) canal (i.e., the cold canal) that runs parallel to the hot canal. Water may be pumped from the cold canal at a maximum rate of approximately 13 m^3/s (210,000 gpm).

Dresden has approval to allow the local Emergency Management Agency to operate a de-icing project on the Kankakee River, using heated water from the Dresden cooling pond (Illinois Environmental Protection Agency [IEPA] 2000a). The ice control project was initiated to help alleviate possible ice jams, boat dock damage, and flooding along the Kankakee River in Wilmington Township. Heated water from the cooling pond is transported through a permanent pipe by siphon to the Kankakee River. The siphon consists of three pipes that go over the retention dike near the east end of the pond, under Cottage Road, between two private residences, and out to three points in the Kankakee River (Commonwealth Edison [ComEd] 1999a). Special Condition 10 of the permit allows the system to operate for only two runs during the winter with each run to last no more than 14 days (never past March 15) and with a limit on the maximum amount of heat; a fish barrier net must be in place around the siphon inlet at all times of operation. A report is submitted to the IEPA each spring at the conclusion of siphon de-icing operations. During January 2001, Exelon discharged just over 250 m^3/s (67,000 gpm) during de-icing operations.

Dresden has a separate service water system. This system provides strained water from the Kankakee River for cooling several closed-cycle cooling water systems, the recirculation motor generator set oil coolers, the generator stator coolers, the turbine oil coolers, the generator hydrogen coolers, and other systems. It also is used to wash the circulating water traveling screens and to pressurize the fire header. The service water pumps draw from the same intake system as the circulating water system. The five pumps withdraw a maximum of 4.4 m^3/s (75,000 gpm). One additional pump is available as a backup. The pumps discharge through strainers with automatic self-cleaning capability. Biocide and silt dispersant can be injected into the pump discharge, if needed. Biocides used do not contain toxic heavy metals but do contain chlorine and/or detergents. The system discharges to the Dresden discharge flume, which leads to the Illinois River. Residual chlorine is monitored in the effluent water and is not detected by the time it reaches the Illinois River.

Dresden is not connected to a municipal water system and pumps groundwater for use as potable water and for process water. Two wells are at a depth of approximately 1500 ft and a third well is installed to a depth of approximately 160 ft in the shallow aquifer. The two deeper wells are in the Cambrian-Ordovician aquifer (AEC 1973). The shallow well is in the dolomite aquifer. The total flow from all three wells is about 72 gpm.

2.1.4 Radioactive Waste Management Systems and Effluent Control Systems

Radioactive wastes resulting from plant operations are classified as liquid, gaseous, and solid waste. Dresden Units 2 and 3 use liquid, gaseous, and solid radioactive waste management systems to collect and process these wastes before they are released to the environment. The waste disposal system meets the design objectives and release limits as set forth in 10 CFR Part 20 and 10 CFR Part 50, Appendix I, “Numerical Guide for Design Objectives and Limiting Conditions for Operation to Meet the Criterion ‘As Low As is Reasonably Achievable’ for Radiological Material in Light-Water-Cooled Nuclear Power Reactor Effluents,” and controls the processing, disposal, and release of radioactive liquid, gaseous, and solid wastes.

Liquid and solid waste from Dresden Units 2 and 3 are routed to a common on-site radioactive waste facility for further treatment, temporary storage, sampling, and discharge. The radioactive waste facility handles liquid waste on a batch basis. The batches are either solidified and stored until they can be disposed of; or, if they meet the release limits, they are released to the Illinois River after dilution in the discharge canal. Packaged solid waste and reusable radioactive material may be temporarily stored in the on-site radioactive waste storage facility or in approved outside storage locations. A gaseous waste system monitors the radiation levels, recombines the radiolytically produced hydrogen and oxygen, removes moisture, provides a holdup time, and filters the noncondensible gases. The gaseous waste (off-gas) is then diluted by a large volume of ventilation air before release through the 95-m (310-ft) stack to the atmosphere. The liquid and the gaseous radioactive waste systems are designed to reduce the activity in the liquid and the gaseous waste so that the concentrations in routine discharges are less than the applicable regulatory limits. Liquid and gaseous effluents are continuously monitored, and the discharge is stopped if the effluent concentrations exceed predetermined limits.

Radioactive fission products build up within the fuel as a consequence of the fission process. These fission products are contained in the sealed fuel rods, but small quantities escape from the fuel rods and contaminate the reactor coolant. Neutron activation of the primary coolant system is also responsible for coolant contamination. Nonfuel solid waste results from treating and separating radionuclides from gases and liquids, and removing contaminated material from various reactor areas. Solid waste also consists of reactor components, equipment, and tools removed from service as well as contaminated protective clothing, paper, rags, and other trash generated from plant operations, during design modification, and during routine maintenance activities. Solid waste may be shipped to a waste processor for volume reduction before disposal, or it may be sent directly to the licensed burial site. Spent resins and filters are stored or packaged for shipment to an off-site processing or disposal facility. An on-site interim radioactive waste storage facility (IRSF) was constructed to store solid waste should existing off-site burial facilities not be available.

Fuel rods that have exhausted a certain percentage of their fuel and that are removed from the reactor core for disposal are called spent fuel. Dresden Units 2 and 3 currently operate on a 24-month refueling cycle per unit, with one refueling at the site every year. Spent fuel is stored on-site either in the spent fuel pool or at the independent spent fuel storage installation (ISFSI).

The *Offsite Dose Calculation Manual* (ODCM) for Dresden Units 2 and 3 (ComEd 1999c) is subject to NRC inspection and describes the methods and parameters used for calculating off-site doses resulting from radioactive gaseous and liquid effluents. It is also used for calculating gaseous and liquid effluent monitoring alarm/trip set points for release of effluents from Dresden Units 2 and 3. Operational limits for releasing liquid and gaseous effluents are specified to ensure compliance with NRC regulations.

In December 2000, Exelon submitted a request for a license amendment for a power uprate from 2527 to 2957 MW(t) (ComEd 2000b). In December 2001, NRC granted Exelon a license amendment allowing an increase in power level to 2957 MW(t) for both units (NRC 2001b). This power uprate was implemented at both units by the end of 2002. However, because of steam dryer cracking problems, the Dresden units did not operate at the uprated power level for much of calendar year 2003. Therefore, no data are available to assess radiological effluents for full uprate operation at Dresden. In December 2001, NRC issued an environmental assessment for the power uprate (NRC 2001a). In this environmental assessment, the NRC estimated that the power uprate could potentially increase both gaseous and liquid radiological effluents by approximately 17 percent. Even if the increase in radiological effluents is as much as 17 percent because of the power uprate, Dresden will still meet all NRC limits for the amounts of radiological effluents that may be released. Therefore, the staff finds that the power uprate does not represent new or significant information which would cause it to revisit the GEIS' Category 1 determinations applicable to Dresden.

2.1.4.1 Liquid Waste Processing Systems and Effluent Controls

Potentially radioactive liquid waste is generated from equipment drains, floor drains, containment sumps, chemistry laboratory, laundry drain, and miscellaneous sources. The liquid radioactive waste system collects, processes, stores, monitors, and disposes of all normal and potentially radioactive aqueous liquid wastes from Units 2 and 3. Radioactive materials are removed from the liquid waste streams by various mechanisms before the waste streams are discharged to condensate storage tanks for plant re-use or are released to the discharge canal after analysis and dilution with condenser circulating water. Liquid waste is processed on a batch basis, and each batch is sampled to determine that all discharge requirements are met prior to release from the waste system (Exelon 2003b). In addition, releases to the discharge canal must meet the State of Illinois requirement for liquid discharges to the Illinois River.

Liquid radioactive waste is processed through the equipment drain system, floor drain system or maximum recycle system (part of the floor drain system), and portable waste treatment system. The equipment drain system collects liquid effluents from seal leakage from pumps and valve glands, which are collected in equipment drain sumps in the drywells, reactor building, and turbine building. The waste handled by this system typically has a low conductivity and low solids content, but it may have a low or high activity. Where appropriate, sources of wastewater are provided with heat exchangers and/or multiple sumps and sump pumps. Waste from the drywell floor drain sump is normally pumped to a waste collector tank. During a refueling outage, it may be aligned to the floor drain collection tank. From the waste collector tank, the liquid waste is pumped through a filter and then to the demineralizer unit. The normal process flow is to the waste sample tanks where the processed water is sampled. If processed liquid radioactive waste in the waste sample tank meets certain specifications, then the processed water is pumped to the condensate storage tanks for plant re-use. Otherwise, the wastewater from the waste sample tanks or floor drain sample tanks can be either transferred to the waste surge tank for discharge to the Illinois River or discharged directly to the Illinois River from the floor drain sample tanks, if required (Exelon 2003b).

All potentially radioactive liquid waste discharges to the environment are routed through a single line to the discharge canal. This line has flowmeters, an offline radiation monitor, and double valves that are locked closed except when in use. The normal flow of liquid waste to the Illinois River is from the waste surge tank. The floor drain sample tanks or portable waste treatment system tanks could also be discharged, if necessary. The waste surge tank is sampled and analyzed, and a discharge rate is determined prior to allowing discharges to the canal. The discharge procedure also requires the independent verification of the valve lineup for discharge as well as the discharge rate calculations. Once a transfer is initiated, the operator checks the flowmeter, the effluent radiation monitor, and the level recorder for the waste surge tank. Thus, the operator has a number of means of confirming the correct routing.

Wastewater containing oils, cleaning agents, or chemicals may also be collected in designated drums located in areas around the plant where such liquid waste is generated. These drums of liquid are transported to the Radioactive Waste Building for processing as required. Processed liquids or wastewater that are acceptable for release without processing are transferred to drain tanks and isolated. Each isolated batch for discharge is sampled during recirculation. If acceptable for release, then it is discharged to the environment through a drain filter.

During 2001, the total volume of liquid effluents from Dresden Units 2 and 3 was 12,920 m^3 (3,413,000 gal), including 43 batch releases. In this liquid waste, there was a total fission and activation product activity of 2.95×10^8 Bq (7.97×10^{-3} Ci) and a total tritium activity of

5.4 x 10^{12} Bq (146.1 Ci). These volumes and activities are typical of past years. The liquid waste generated is reported in annual Radioactive Effluent Release Report (Exelon 2002c). Exelon anticipates that liquid effluents could increase by 17 percent, proportionate to the power uprate (NRC 2001a). Exelon does not anticipate any further significant yearly increases in liquid waste released during the renewal period. See Section 2.2.7 for a discussion of the theoretical doses to the maximally exposed individual as a result of these releases.

2.1.4.2 Gaseous Waste Processing Systems and Effluent Controls

Radioactive gaseous effluents include low concentrations of fission product noble gases (such as krypton and xenon), halogens (mostly iodines), tritium contained in water vapor, and particulate material, including both fission products and activated corrosion products. Each reactor unit is provided with a gaseous radioactive waste/off-gas system, which includes condenser air removal subsystems, and gland seal steam exhauster subsystems that discharge to the common main stack. The condenser air removal subsystem is utilized to establish a vacuum in the three main condenser sections and to maintain this vacuum during normal plant operation by removing noncondensible gases. The subsystem removes the condenser gases, which include radiolytic oxygen and hydrogen, air in-leakage, and radioactive fission and activation gases (Exelon 2003b).

The off-gas system collects, contains, and processes the radioactive gases extracted from the steam condenser. The gases are exhausted by the steam jet air ejectors and flow through a preheater to a catalytic recombiner, where all of the hydrogen is recombined with oxygen to form steam. All steam from the off-gas stream is condensed for return as condensate, and the noncondensible gases flow to a holdup pipe. The holdup allows the shorter lived xenons and kryptons to decay to particulate daughter products. The gas flow continues through a cooler condenser, a moisture separator, electric reheaters, a prefilter, activated charcoal adsorber vessels, and high-efficiency particulate air (HEPA) filters; and then, along with dilution make-up air, it continues to the 95-m (310-ft) stack for discharge to the environment. An alternate off-gas system flow path allows flow to bypass the catalytic recombiners and the activated charcoal adsorber vessels. The gland seal exhaust system removes steam, air, and radioactive gases from the turbine gland sealing system exhaust header. The steam is condensed, and the condensate returned to the main condenser. The gases are discharged to the stack via a holdup volume in the base of the stack shared by Units 2 and 3. The mechanical vacuum pump system rapidly establishes main condenser vacuum during startup. The vacuum pump effluent is discharged to the gland seal exhaust system line to the holdup volume in the stack base (Exelon 2003b).

Continuous main stack radiation monitoring at sample points in the stack base provides an indication of radioactive releases from the off-gas system. The off-gas effluent radiation monitor and control system is used to monitor the condition of reactor fuel and alert operators if off-gas activity levels are increasing.

The ODCM prescribes alarm/trip set points for the monitor and control instrumentation to ensure that the alarm/trip will occur prior to exceeding the limits of 10 CFR Part 20 for gaseous effluents (ComEd 1999c). The actual gaseous effluents for the year 2001 were reported in the *Dresden Nuclear Power Station, Units 1, 2 and 3, Radioactive Effluent Release Report* (Exelon 2002c). A total of 9.84×10^{12} Bq (266 Ci) of noble gases, 1.88×10^{8} Bq (5.09×10^{-3} Ci) of iodine-131, 4.2×10^{9} Bq (0.114 Ci) of beta-gamma emitters as airborne particulate matter, and 4.26×10^{12} Bq (115 Ci) of tritium were released to the environment. These activities are typical of past years.

Exelon anticipates radioactive gaseous releases could increase by 17 percent, proportionate to the power uprate (NRC 2001a). No further increases in gaseous releases are expected during the renewal period. See Section 2.2.7 for a discussion of the theoretical doses to the maximally exposed individual as a result of these releases.

2.1.4.3 Solid Waste Processing

Solid waste from Dresden Units 2 and 3 consists of spent (dewatered) resin, solidified resin, filters, filter sludge, evaporator bottoms, concentrated wastes, dry compressible waste, air filters from off-gas and radioactive ventilation systems, irradiated components (control rods, etc.), contaminated clothing and tools, paper and rags from contaminated areas, and used reactor equipment (Exelon 2003b).

The solid radioactive waste system consists of those systems and components that are used to condition and package wet and dry solid waste so that the waste is suitable for transport and disposal. The system is not used for spent fuel storage and shipment. Reactor waste, such as spent control rod blades and fuel channels, is stored in the fuel storage pool to allow decay, then packaged, and transferred in approved shipping containers for off-site burial. Used reactor equipment is also stored in the spent fuel storage pool before shipment. Maintenance waste, such as contaminated clothing and tools, are packed in suitable U.S. Department of Transportation- (DOT) approved containers and may be stored prior to shipment. Process waste, such as filter sludges and spent resins, is collected in tanks, processed, and stored prior to shipment. All waste loading is accomplished by using a remotely operated overhead crane. When required, shipping casks are used to shield the radioactive waste.

Temporary storage capacity for packaged solid waste is provided by the on-site storage facility or in approved outside storage locations. Different methods are used for processing and packaging solid radioactive wastes, depending primarily upon the waste characteristics. The solid radioactive waste system includes phase separators, which serve as an interface with the liquid radioactive waste processing system and the denaturing system. The denaturing system is the system used to dewater the filter and demineralizer material to meet burial site and 10 CFR 61.56 requirements. High-integrity containers (HICs) are the disposal packages used when the waste classification requires that the waste meet stability requirements. Only certified HICs acceptable for use at the disposal facility are used (Exelon 2003b).

Dry active waste (DAW), generated as a result of operation and maintenance activities, is collected throughout the radiological-controlled areas of the facility. Typical waste of this type is air filters, cleaning rags, protective tape, paper and plastic coverings, discarded contaminated clothing, tools, equipment parts, and solid laboratory wastes. Most DAW has relatively low radioactive content and may be handled manually. The DAW is normally stored in a various work areas and then moved to the process area. DAW with radiation levels greater than 100 mrem/hr is normally stored in the radioactive waste building container storage areas. DAW may also be stored at an interim storage location away from the processing area while awaiting shipment to the processor or a burial site.

Wet solid radioactive waste results from the processing of spent demineralizer resins (both bead and powdered) and spent filter material from the equipment drain and floor drain subsystems, and from the water clean-up systems. The waste is spent demineralizer resins and filter material water slurries, which are collected in four backwash receiving tanks or in the waste sludge tank. The wet waste is solidified, dried, or dewatered for acceptability for the disposal site. Contractor solidification or drying services are also used at the station or performed off-site. Radioactive waste requiring solidification includes concentrator waste, certain sludges, and ion-exchange resins. If storage is required for any of these types of waste, the containers of waste may be temporarily stored on-site at the IRSF.

Disposal and transportation of solid radioactive waste is performed in accordance with the applicable requirements of 10 CFR Part 61 and Part 71, respectively. There are no releases to the environment from solid radioactive wastes created at Dresden Units 2 and 3. In 2001, Dresden Units 2 and 3 made 110 shipments of solid radioactive waste with a volume for spent resins, filter sludges, evaporator bottoms, etc., of 202 m^3 (7133 ft^3) and a total activity of 6.8×10^{13} Bq (1830 Ci) (Exelon 2002c). These volumes and activities are typical of past years. Exelon anticipates solid radioactive waste generation could increase by 17 percent, proportionate to the power uprate (NRC 2001a).

2.1.5 Nonradioactive Waste Systems

The principal nonradioactive effluents from the Dresden Units 2 and 3 consist of chemical and biocide wastes, lubrication oil waste, resin regeneration waste, Freon™ filters, and sanitary waste. The plant stopped using chlorinated solvents and oils several years ago. The chemistry laboratory may generate small quantities of expired chemicals. Other wastes could include lab packs and mercury switches. Spent batteries and discarded fluorescent lights are recycled. Sanitary waste is sent to the on-site sewage treatment plant, which can handle up to 60 m^3/d (15,000 gallons per day [gpd]). The treated sanitary wastewater is discharged to the Illinois River.

2.1.6 Plant Operation and Maintenance

Routine maintenance performed on plant systems and components is necessary for the safe and reliable operation of a nuclear power plant. Maintenance activities conducted at Dresden Units 2 and 3 include inspection, testing, and surveillance to maintain the current licensing basis of the plant and to ensure compliance with environmental and safety requirements. Certain activities can be performed while the reactor is operating. Others require that the plant be shut down. Long-term outages are scheduled for refueling and for certain types of repairs or maintenance, such as the replacement of a major component. Each of the two units is refueled on a 24-month schedule, resulting in an average of one refueling every year for the site. Exelon provided an appendix (Appendix A) in the Environmental Report (ER) submittal (Exelon 2003a), as the *Updated Final Safety Analysis Report (UFSAR) Supplement* (Exelon 2003c), regarding the aging management review to manage the effects of aging on systems, structures, and components in accordance with 10 CFR Part 54. The summary descriptions of aging management program activities presented in this Appendix A represent the commitments for managing aging of the systems, structures, and components within the scope of license renewal during the period of extended operation. This appendix also provides summary descriptions of time-limited aging analyses. These summary descriptions of aging management program activities and time-limited aging analyses will be incorporated into the *Updated Final Safety Analysis Reports for the Dresden Nuclear Power Station,* following the issuance of the renewed operating license. Exelon expects to conduct the activities related to the management of aging effects during plant operation or normal refueling and other outages but does not plan any outages specifically for the purpose of refurbishment.

2.1.7 Power Transmission System

Five 345-kV transmission lines connecting Dresden Units 2 and 3 to the transmission system in 1973 are identified in the final environmental statement (FES) for the operation of Dresden Units 2 and 3 (AEC 1973). These lines include a pair of 1.8-km (1.1-mi) lines to existing transmission lines between the Pontiac substation to the south and the Electric Junction substation to the north; a new line (50 km [31.1 mi]) from Dresden to the Electric Junction substation; and a pair of new lines (48 km [29.8 mi]) from Dresden to the Goodings Grove substation.

Exelon describes seven lines that currently connect Dresden Units 2 and 3 to the transmission system (Exelon 2003a). The seven lines include all or portions of the original five lines and two new lines. Two transmission lines now run to the Electric Junction substation and to the Pontiac-Midpoint substation. The two Goodings Grove lines now terminate at the Elwood substation, which is about 20 km (12.4 mi) from Dresden. However, the entire lengths of the lines running to Goodings Grove are considered to be within the scope of this review. New transmission lines run 168 km (104.5 mi) to Powerton substation and 19 km (11.8 mi) to the Collins Station. The lines are listed in Table 2-1 and are shown in Figures 2-5 and 2-6.

The corridors containing the transmission lines that connect Dresden Units 2 and 3 to the transmission system have a length of about 355 km (220.5 mi) and cover about 2440 ha (6030 ac). The corridors pass through land that is primarily flat farmland with a small amount of forest. The areas are mostly rural with low population densities. The longer lines cross numerous State and U.S. highways, including Interstate-80 and Interstate-55.

Routine rights-of-way (ROWs) surveillance and transmission facility maintenance are conducted to ensure continued conformance of transmission lines to the standards to which they were constructed. Procedures include routine aerial patrols of all corridors and ground inspections at questionable locations. Problems noted during any inspection are brought to the attention of the appropriate organizations for corrective action (Exelon 2003a).

Exelon prevents encroachment by vegetation in its transmission corridors by trimming and mowing and through the use of approved herbicides. Unless otherwise needed, vegetation management follows a five-year cycle. The preferred method of vegetation management is the use of low-volume foliar herbicides to eliminate undesirable species while preserving grasses, herbs, forbs, shrubs, and other low-growing vegetation. Herbicide application is performed by certified applicators according to label specifications. Special attention is given to stream crossings, riparian and wetland areas.

Table 2-1. Dresden Transmission Line Corridors

Substation	Number of Lines	kV	Approximate Corridor Length km	(mi)	Corridor (Right-of-way) Width m	(ft)	Estimated Corridor Area ha	(ac)
Electric Junction (Lines 1221 and 1223)	2	345	50	31.1	40 to 116	130 to 380	~420	~1050
Goodings Grove (Lines 1220 and 1222)	2	345	48[a]	29.8[b]	76	250	370	900
Pontiac-Midpoint (Line 8014)	1	345	70	43.3	44	145	310	760
Powerton (Line 302)	1	345	168	104.5	76[c]	250[d]	~1250	~3100
Collins Station (Line 2311)	1	345	19	11.8	46	150	90	220
Totals	7		355	220.5			~2440	~6030

(a) 20 km to Elwood.
(b) 12.4 m to Elwood.
(c) Varies from 64 to 76 m width (mostly 76 m).
(d) Varies from 210 to 250 ft width (mostly 250 ft).

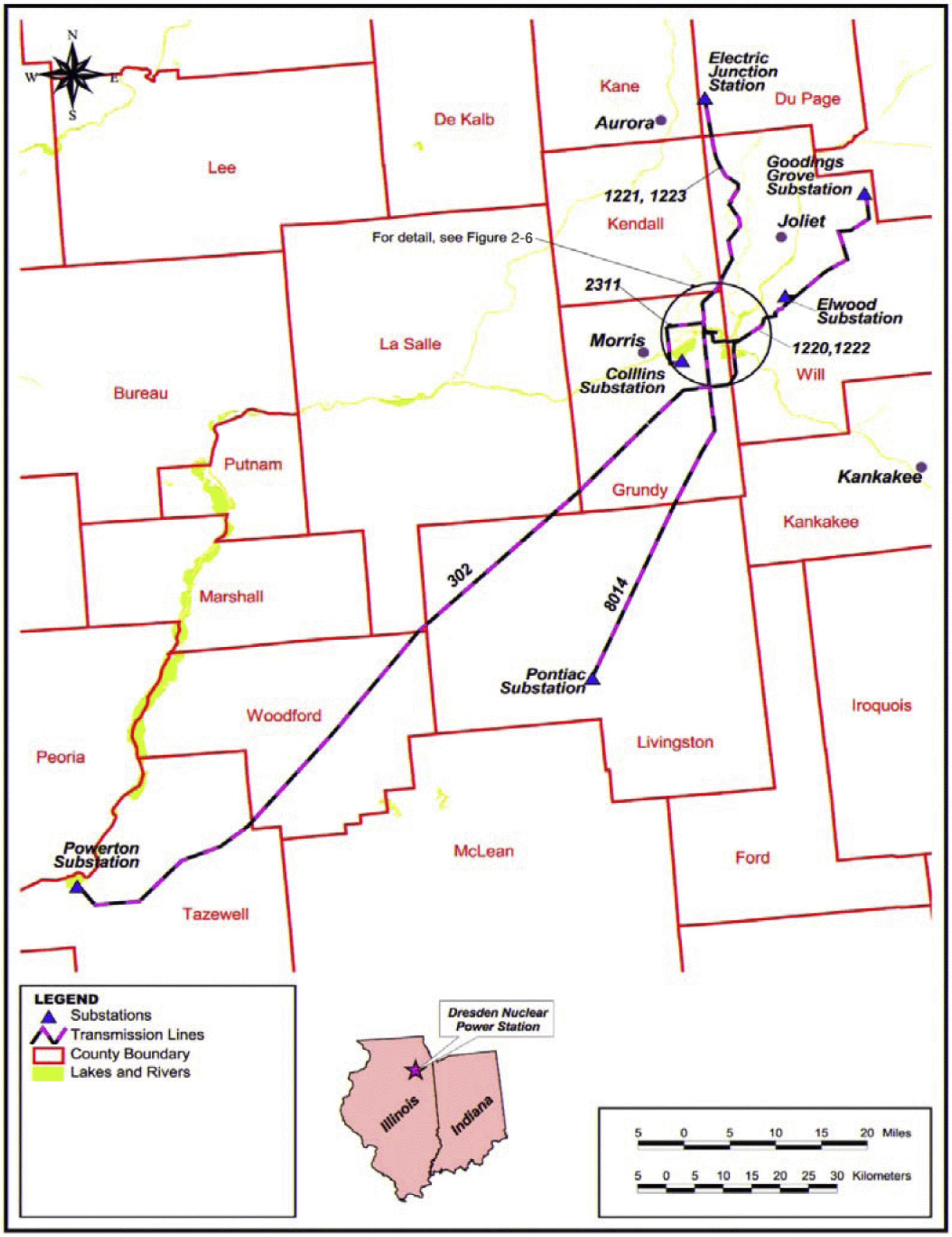


Figure 2-5. Dresden Transmission Line Map

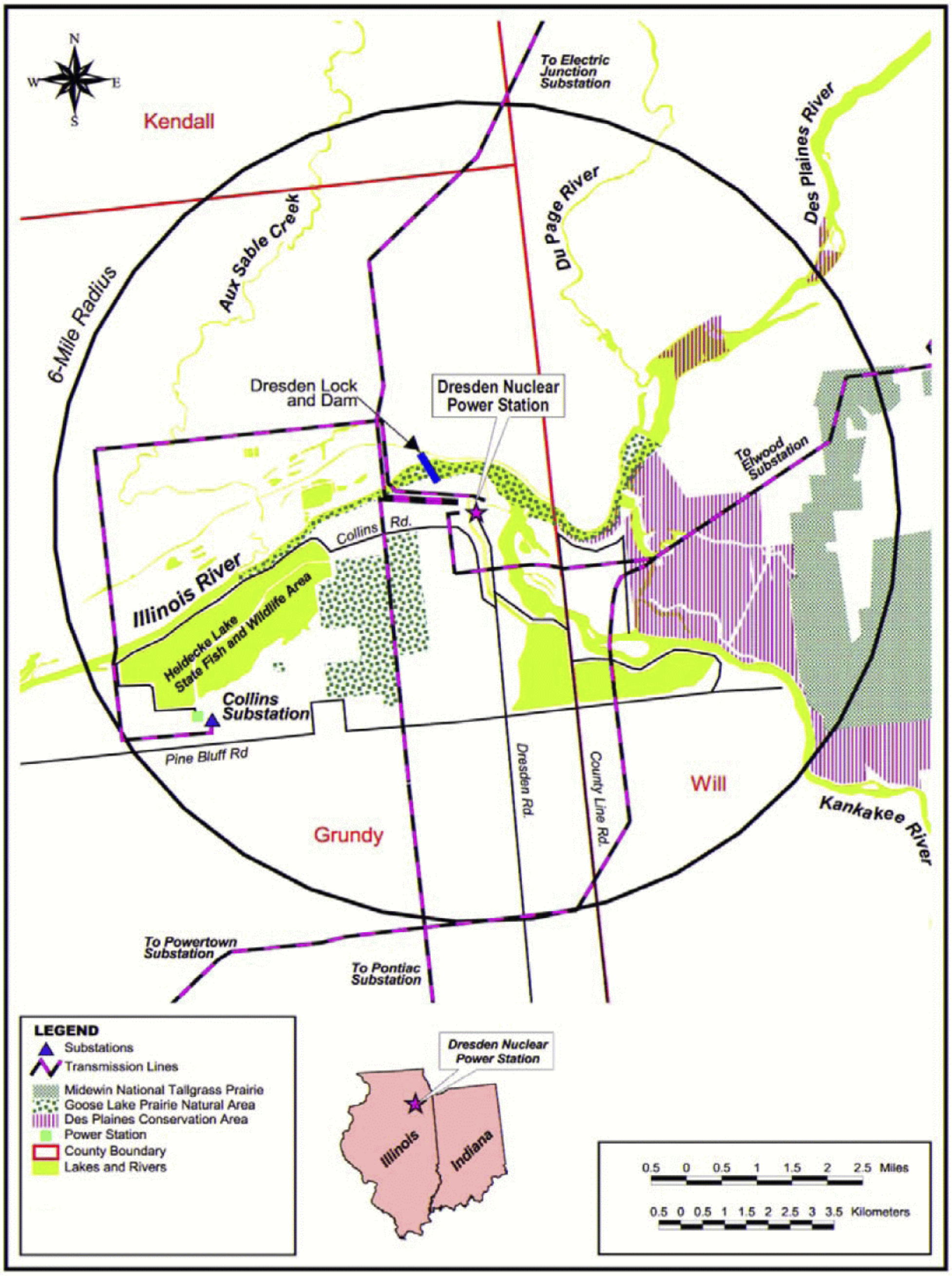


Figure 2-6. Dresden Detailed Transmission Line Map

2.2 Plant Interaction with the Environment

Sections 2.2.1 through 2.2.8 provide general descriptions of the environment near Dresden as background information. They also provide detailed descriptions where needed to support the analysis of potential environmental impacts of operations during the license renewal term, as discussed in Chapters 3 and 4. Section 2.2.9 describes the historic and archaeological resources in the area, and Section 2.2.10 describes possible impacts on other Federal project activities.

2.2.1 Land Use

Dresden Units 2 and 3 are located in Goose Lake Township, Grundy County, Illinois. The nearest town is Channahon, approximately 5 km (3 mi) northeast. The area within 9 km (6 mi) of the site includes parts of both Grundy and Will counties. The local terrain is level to gently undulating except for the Kankakee Bluffs just northeast of the Dresden site on the north bank of the Illinois River. The area around Dresden is largely rural, characterized by farmland, woodlands, and small residential communities. The lands at the Dresden site are zoned for manufacturing use in Grundy County.

The Goose Lake Prairie State Natural Area is located approximately 1.6 km (1 mi) southwest of the Dresden turbine building. This 1015-ha (2537-ac) preserve contains the largest remnant of prairie left in Illinois and includes open grasslands and prairie marshes (Exelon 2003a). Directly across the Kankakee River from the Dresden site is the 200-ha (500-ac) Des Plaines Conservation Area that offers a variety of recreational facilities, including pheasant hunting. To the east of the Des Plaines Conservation Area is the Midewin National Tallgrass Prairie, a 6400-ha (16,000-ac) site formerly used as the Joliet Army Ammunition Plant. This area was transferred to the USFS in 1997 and will be managed to restore, maintain, and enhance the prairie ecosystem (Exelon 2003a).

2.2.2 Water Use

Dresden is located at the headwaters of the Illinois River at the confluence of the Des Plaines and the Kankakee Rivers. There is a 7-m-high (22-ft-high) dam at Dresden Island, approximately 3 km (2 mi) downstream from the confluence of the Kankakee and the Des Plaines Rivers, a 10m-high (34-ft-high) dam just south of Joliet at Brandon Road, and a 12-m-high (40-ft-high) dam on the Des Plaines River just south of Lockport (ComEd 1996b). Construction of these dams has resulted in a series of reservoirs maintained principally to facilitate barge traffic. Pool elevations are controlled, eliminating natural, seasonal flushing events, and are manipulated frequently (ComEd 1996b). Mean annual flow of the Illinois River at Marseilles, Illinois, located approximately 43 km (26.5 mi) below Dresden, was 306 m^3/s (10,820 ft^3/s), ranging from 214 to 464 m^3/s (7568 to 16,380 ft^3/s) over the 1920 to 1999 time period. Flows tend to be highest in spring (March, April, and May) when the Upper Illinois River Basin receives snow melt and runoff from spring rains, and lowest during late summer and early fall (August, September, and October) when precipitation in the region is lowest (U.S. Geological Survey [USGS] 2000b).

The dam at Dresden Island creates the Dresden Pool, which has a normal pool elevation of 154 m (505 ft) mean sea level (msl) and can vary from 153.3 to 154.4 m (503 to 506.5 ft) mean sea level (msl). The pool level below the Dresden dam is 147.3 m (483.4 ft) msl (ComEd 1995). Dresden Pool has “natural” shoreline areas and a number of natural tributaries.

The Kankakee River flows from its headwaters in northeast Indiana toward Illinois in a general northeast to southwest trend and turns northwest at its confluence with the Iroquois River about 7.7 km (4.8 mi) upstream from Kankakee, Illinois (USGS 1999). The mean annual flow of the Kankakee River near Wilmington, Illinois, from 1934 to 1999 was 134 m^3/s (4739 ft^3/s), ranging from 56 to 231 m^3/s (1965 to 8153 ft^3/s) (USGS 2000b). The Kankakee River flows 92 km (57 mi) before joining the Des Plaines River to form the Illinois River near the Grundy and Will County line in Illinois. The Des Plaines River originates just south of Union Grove, Wisconsin, and enters Illinois near Russell, Illinois. The river flows 253 km (157 mi) and drains approximately 13.3 percent (377,158 ha [931,978 ac]) of the Upper Illinois River Basin. It flows north to south from Wisconsin into Lake and Cook counties, Illinois, turns southwest at Lyons, Illinois, flows alongside the Chicago Sanitary & Ship Canal, and joins the Kankakee River (USGS 1999). The mean annual flow of the Des Plaines River just above its confluence with the Kankakee River is approximately 172 m^3/s (6080 ft^3/s); seasonal flows parallel those of the Illinois River (USGS 1999, 2000b). The Des Plaines River is the primary drainage system for the greater Chicago/Cook County area (USGS 1999).

Dresden is authorized to withdraw water from the Kankakee River, and there is no explicit limit on water withdrawal amounts. Dresden operates a cooling system in two modes: closed-cycle and indirect open-cycle. The cooling system includes cooling towers, cooling canals, and a cooling pond. Make-up water system is withdrawn from the Kankakee River at its confluence with the Des Plaines River. During periods of average to high flow, water is predominantly removed from the Kankakee River. During periods of low flow, water from the Des Plaines River comprises a larger portion of the Dresden influent. Cooling water discharges to the Illinois River except during the winter months when approximately 4 m^3/s (156 ft^3/s) of water from the cooling pond may be siphoned to the Kankakee River as part of a de-icing program.

2.2.3 Water Quality

In accordance with the Federal Water Pollution Control Act (also known as the Clean Water Act [CWA]), the quality of plant effluent discharges is regulated through the NPDES. The Illinois Pollution Control Board is authorized by the U.S. Environmental Protection Agency (EPA) to issue discharge permits in Illinois. Dresden’s NPDES permit (IL0002224) regulates all of

Dresden's discharges to the Illinois River, including process and cooling water, sanitary wastewater, and storm water. A Storm Water Pollution Prevention Plan was prepared and implemented, pursuant to Special Condition No. 18 of the NPDES Permit. Dresden has maintained consistent compliance with the NPDES permit and the Storm Water Pollution Prevention Plan.

For almost 100 years, the Dresden Pool has been part of a water body that has been heavily impacted by channelization of the Des Plaines River, construction of locks and dams, periodic dredging, stormwater runoff from continued expansion of upstream urban areas, and its use as a conduit for sanitary and industrial discharges from metropolitan areas (with a 1998 population of 8.9 million) within the Upper Illinois River Basin. However, during the past 50 years, water quality has improved in the Basin because of advances in municipal and industrial waste treatment. Numerous ongoing research and management programs, such as the implementation of Total Maximum Daily Loads, Best Management Practices, Wetland Restoration, and Pesticide Management and Monitoring, have been initiated to address point and nonpoint source pollution (USGS 1998). Overall, although the water quality of the Dresden Pool is classified by the IEPA as "general use," the Dresden Pool is on the State of Illinois list of impaired waters. The pollutants identified as causing impairment are priority organics, metals, nutrients, and siltation. Flow alteration is also a contributing factor (IEPA 2000a).

During the 1999 aquatic monitoring program (May through October), water temperatures, dissolved oxygen, specific conductivity, and transparency were measured at locations in the Dresden Pool, both above and below the Dresden discharge (ComEd 2000a). During this sampling program, water temperatures ranged from 14.1° to 35.9°C (57.4°- 96.6°F) with the warmest temperatures occurring at the Dresden discharge canal, and the coolest occurring at either the upstream Des Plaines or Kankakee River stations. Warmest temperatures generally occurred during late July or August, and the coolest in late October. Mean temperatures at most locations during the 1999 monitoring period were between 24° and 29°C (75°- 84°F). Mean temperatures within the discharge canal were slightly to moderately higher (2.0°-6.3°C [36°- 43°F]) than at other locations. Compared to recent years, mean summertime (i.e., June 15 to September 30) temperatures in the Dresden Pool were similar in 1995 (28.5°C [83.3°F]); 1998 (29.3°C [84.7°F]); 1999 (29.8°C [85.6°F]); but lower in 1994 (26.4°C [79.5°F]) and 1997 (27.6°C [81.7°F]) (ComEd 2000a). During 1999, dissolved oxygen concentrations ranged from 5.8 to 16.6 parts per million (gpm). Generally, dissolved oxygen values were the highest in the Kankakee River with similar values at all other locations within the Dresden Pool (with a mean range of 7.9 to 8.2 gpm). The highest dissolved oxygen values were generally observed in July and the lowest in June. Specific conductance values ranged from 597 to 1075 μmho per centimeter (μmho/cm), with mean values highest in May and late October and lowest from July to August. Transparency values (using Secchi disk) ranged from 35 to 79 cm (14 to 31 in.), with the Kankakee River location exhibiting the lowest values and the Dresden discharge canal exhibiting the highest (ComEd 2000a).

2.2.4 Air Quality

The area in the vicinity of the Dresden site has a temperate continental climate with a wide temperature range throughout the year. Climatological records for Midway Airport, which is located in Chicago, Illinois, about 48 km (30 miles) northeast of the Dresden site, are generally representative of the Dresden site. These records indicate that the normal daily maximum temperatures range from about −2°C (29°F) in January to a high of about 29°C (84°F) in July. Normal minimum temperatures range from about -11°C (13°F) in January to about 17°C (63°F) in July.

The average precipitation is about 91 cm (36 in.) per year. Of this total, about 64 cm (25 in.) falls during the growing season (March through September). There are an average of about 41 thunderstorms per year in the area, with about 50 percent of the thunderstorms occurring in June, July, and August. Based on statistics for the 30 years from 1954 through 1983 (Ramsdell and Andrews 1986), the probability of a tornado striking the site is expected to be about 3×10^{-4} per year.

Wind energy potential is generally rated on a scale of 1 through 7. There are areas in Illinois where the annual average wind energy resource is rated 3 or higher and is generally suitable for generation of electricity (Elliott et al. 1986). A more recent evaluation estimates that the wind energy potential for Illinois is about 9000 MW(e) (National Renewable Energy Laboratory [NREL] 2003), which is higher than the 1986 estimate. Areas suitable for commercial wind turbine operation exist near the Dresden site.

The Dresden site is located within the Metropolitan Chicago Interstate Air Quality Control Region (AQCR). The air quality in the portion of the AQCR that includes the Dresden site is designated as better than national standards, in attainment, or unclassified for all criteria pollutants in 40 CFR 81.314 except ozone. The area is designated nonattainment with respect to the 1-hr ozone standard. Portions of the Metropolitan Chicago Interstate AQCR, not including the Dresden site, are designated as moderate nonattainment for particulate matter less than 10 μ (PM_{10}). After several years of litigation, a new standard for smaller particles ($PM_{2.5}$) and a new 8-hr ozone standard have been upheld. The EPA is taking steps to implement the new standards (e.g., developing its approach and collecting data necessary to designate which areas are nonattainment). Portions of the Metropolitan Chicago Interstate AQCR are expected to be designated nonattainment with respect to the 8-hr ozone standard. There is no mandatory Federal Class I area in which visibility is an important value designated in 40 CFR Part 81 within 160 km (100 mi) of the Dresden site.

Dresden Units 2 and 3 emit various pollutants. Emissions from these sources are regulated under a Federally enforceable State operating permit issued by the IEPA (IEPA 2000b). The current permit expires April 19, 2006. An open burning permit, also issued by the IEPA, covers burning for fire fighter training.

2.2.5 Aquatic Resources

The staff has reviewed the data from studies conducted between 1971 and 2001 that assessed the impact of Dresden Units 2 and 3 operations on aquatic communities in the Dresden Pool. These studies were initiated by Exelon (as Commonwealth Edison) to monitor the fish populations near the confluence of the lower Kankakee and the lower Des Plaines Rivers and in the Illinois River within the Dresden Pool and just downstream of the Dresden Lock and Dam. The Dresden Pool area included sampling stations near the intake and discharge areas of Dresden Units 2 and 3. Fish sampling methods included electrofishing, gill netting, and seining (ComEd 1993).

Data from these studies indicate that the fish community has improved since the 1970s (ComEd 1987, 1993, 1996a, 2000a; Exelon 2002c). For example, the number of species collected by various methods in the Dresden Pool increased from the 1970s through the early to mid-1980s, then leveled off in the early 1990s (ComEd 1987,1993; Exelon 2002c). Since the 1970s, water quality has also improved in the Kankakee and the lower Des Plaines Rivers, and the increases in the number of species may be attributed to that improvement (ComEd 1993). The increase in the number of species was primarily the result of having more cyprinid (i.e., minnow) and centrarchid (i.e., sunfish) species.

In addition to these studies of temporal trends in Dresden Pool area fish populations, an extensive fishery study of the upper Illinois Waterway conducted in 1995 compared fish communities in the Dresden area to fish communities upstream and downstream of the Dresden Pool. The 1995 study found that the fish community in the Dresden Pool area (i.e., that area upstream and downstream of the Dresden Lock and Dam) was characterized by higher catch rates and a higher number of species than fish communities located upstream in the Des Plaines River, above the Brandon Lock and Dam (ComEd 1996a). The fish community in the Dresden Pool area also had fewer pollution-tolerant species than the upstream fish communities (ComEd 1996a). The fish community downstream of the Dresden Pool was similar to that of the Dresden Pool (ComEd 1996a).

Fish sampling conducted during 2001 in the Dresden Pool and downstream of the Dresden Island Lock and Dam yielded 54 fish species and two hybrids. Numerically, the catch was dominated by gizzard shad (*Dorosoma cepedianum)*, emerald shiner (*Notropis atherenoides*), bluegill (*Lepomis macrochirus*), spotfin shiner (*N. spilopterus*), bluntnose minnow (*Pimephales notatus*), and bullhead minnow (*P. vigilax)* (Exelon 2002c). Other species present in significant numbers (greater than 1 percent of sample) included green sunfish (*L. cyanellus*), spottail shiner (*N. hudsonius)*, largemouth bass (*Micropterus salmoides*), smallmouth bass (*Micropterus dolomieui*), sand shiner (*N. stramineus*), threadfin shad (*D. petenense*), freshwater drum (*Aplodinotus grunniens*), common carp (*Cyprinus carpio*), and golden redhorse (*Moxostoma erythrurum*). This represents a shift in community composition since the mid-1970s, when carp and goldfish tended to be the numerically dominant species found in Dresden area samples (ComEd 1987). Community composition has remained relatively stable since the mid-1980s (ComEd 1993; Exelon 2002c).

Benthic community studies in the Dresden Pool were conducted in 1999 and 2001. Both studies found that the benthic community was poor and dominated by tolerant and facultative taxa, such as Oligochaeta (aquatic worms) and Chironomidae (fly larvae) (Exelon 2002c). Ephemeroptera (mayfly nymphs) were also common in the study area. The only significant differences between the 1999 and 2001 benthic communities were that Oligochaeta abundance upstream of the Dresden site was lower in 2001 than in 1999; and in 2001, the average density of Oligochaeta was significantly higher downstream of the Dresden site compared to upstream of the site.

No Federally listed aquatic species have been found during aquatic biological monitoring conducted for Dresden Units 2 and 3. The Hine's emerald dragonfly (*Somatochlora hineana*) is the only Federally listed aquatic species that occurs in any of the counties containing the Dresden site or associated transmission line ROWs. However, populations of this species have not been found to occur on or in the vicinity of the Dresden site (FWS 2001). This species is aquatic during its egg and nymphal stages, which comprise the majority of its life cycle (2-4 years). According to the U.S. Fish and Wildlife Service (FWS 2001), one population of Hine's emerald dragonfly (comprising nine subpopulations) has been documented in the lower Des Plaines River valley in the area of northern Will, eastern Cook, and southern DuPage Counties. All of the subpopulations are within 4 km of the Des Plaines River and are upstream of Dresden Units 2 and 3. Suitable habitats for the Hine's emerald dragonfly appear to be limited to spring-fed wetland complexes that include cattail marsh, sedge meadow, seep, pond and other habitats with slow-flowing water, and thin soils over dolomite bedrock. Habitat destruction and alteration are the main threats to the Hine's emerald dragonfly. Habitat fragmentation, loss of habitat types within wetland complexes, and changes in surface and subsurface hydrology are of particular concern (FWS 2001).

The pallid sturgeon (*Scaphirhynchus albus*) is the only Federally listed fish species found in Illinois. This species occurs in the Mississippi River downstream of the confluence with the Missouri River but does not occur in the Upper Illinois River Basin (FWS 1998).

Three Illinois-listed fish species have been collected in low numbers near the Dresden site: the river redhorse (*Moxostoma carinatum* - threatened), the greater redhorse (*Moxostoma valenciennesis* - endangered), and the pallid shiner (*Notropis amnis* - endangered).

Over the past 20 years, a large number of nonindigenous aquatic species have invaded the Upper Illinois River Basin. Recent invaders include the round goby (*Neogobious melanostromus*) and the zebra mussel (*Dreissena polymorpha*). Many of these species disrupt the balance of inland ecosystems by competing with native species for food, living space, and spawning areas. Zebra mussels began infesting the Dresden cooling pond in 1991. Buildup of zebra mussel colonies in cribhouse structures and equipment has been controlled by mechanical cleaning of the structures by divers and periodic application of biocides. Biocide levels in the effluent are monitored to ensure that NPDES permit limits are not exceeded.

2.2.6 Terrestrial Resources

The Dresden site occupies approximately 1011 ha (2500 ac) (Exelon 2003a). Undeveloped areas of the Dresden site are located mostly on the western half and support a mosaic of habitats, including old-field, wetlands, and woodland vegetation. Several small, intermittent streams drain the site. Some of this undeveloped area is leased for cattle grazing.

Seven transmission lines connect Dresden Units 2 and 3 to the electric grid (Exelon 2003a). These lines occupy about 2440 ha (6030 ac) of land along 355 km (220 mi) of ROWs that traverse farmland for the most part but also cross some natural terrestrial habitats. Exelon maintains the ROWs by trimming and mowing, and through the use of approved herbicides (Cunningham 2003).

The Pontiac-Midpoint transmission line (69.7 km [43.3 mi] long) crosses the Goose Lake Prairie State Natural Area, which is located approximately 1.6 km (1 mi) southwest of the Dresden site (Exelon 2003a). Terrestrial habitats within the Goose Lake Prairie State Natural Area include tall grass prairie and marshes (IDNR 2003a).

The Powerton and the Goodings Grove transmission line ROWs (168.2 km [104.5 mi] and 20.0 km [12.4 mi], respectively) cross the Des Plaines Conservation Area, which is located across the Kankakee and the Des Plaines Rivers, approximately 3.2 km (2 mi) east of the Dresden site. Natural habitats within the Des Plaines Conservation Area include river shorelines, lakes, swamps, marshes, and prairie (Exelon 2003a). The Midewin National Tallgrass Prairie is immediately east of the Des Plaines Conservation Area and is crossed by a short segment of the Goodings Grove transmission corridor. Much of this site (formerly the Joliet Army Ammunition Plant) has been disturbed; however, current and planned activities are intended to restore tallgrass prairie vegetation to much of the site (USFS 2002). All ROW maintenance activities on the Midewin National Tallgrass Prairie must be reviewed and approved by U.S. Forest Service staff before implementation.

A portion of the Collins transmission line ROW (19.0 km [11.8 mi]) is located along Heidecke Lake State Fish and Wildlife Area, approximately 8 km (5 mi) southwest of the Dresden site. Most of the area is occupied by a cooling lake which is leased to the IDNR for hunting and fishing. The Electric Junction transmission line ROW (50.1 km [31.1 mi]) does not cross any designated natural areas.

A variety of terrestrial wildlife species occurs in the project area. Terrestrial mammals of the area include white-tailed deer (*Odocoileus virginianus*), coyote (*Canis latrans*), red fox (*Vulpes fulva*), eastern cottontail (*Sylvilagus floridanus*), muskrat (*Ondatra zibethicus*), and beaver (*Castor canadensis*) (IDNR 2003a). Birds include Canada goose (*Branta canadensis*), mallard (*Anas platyrhynchos*), great blue heron (*Ardea herodias*), killdeer (*Charadrius vociferus*), red-tailed hawk (*Buteo jamaicensis*), American kestrel (*Falco sparverius*), northern harrier (*Circus cyaneus*), and red-winged blackbird (*Agelaius phoeniceus*).

Table 2-2 presents terrestrial species that are listed, proposed for listing, or candidates for listing by the Federal government or the State of Illinois that could occur in the vicinity of the Dresden site or associated transmission line ROWs.

Ten species, afforded protection under the Endangered Species Act of 1973, could potentially inhabit the Dresden site or transmission line rights-of-way (ROWs). These species include six plants, one insect, one reptile, six birds, and one mammal. All listed species are associated with prairie, wetland, and open water habitats of the area. One species (eastern massasauga) is a candidate for Federal listing. No designated critical habitat exists for any Federally listed species on or in the vicinity of the site.

The renewal of the Dresden licenses will have no effect on four of these Federally listed species, the decurrent false aster *(Boltonia decurrens)*, the leafy prairie-clover *(Dalea foliosa)*, the lakeside daisy *(Hymenoxys herbacea)*, and the Hine's emerald dragonfly *(Somatochlora hineana)*.

<u>Decurrent false aster</u>

The decurrent false aster (Federally listed as threatened; State listed as threatened) was originally widespread in alluvial prairie and marshland of the Illinois River flood plain (Keevin et al. 1990; Herkert 1991). It is most common in lowland areas where it appears to require disturbance for survival (Keevin et al. 1990), but most suitable habitats have been destroyed or affected by siltation or altered flooding regimes (Herkert 1991). Fifteen populations in eleven

Table 2-2. Terrestrial Species Listed as Endangered or Threatened by the Federal Government or State of Illinois That Could Occur in the Vicinity of the Dresden Site or Along Associated Transmission Lines[a]

Scientific Name	Common Name	Federal Status[b]	State Status[b]	County[c]	Habitat
			PLANTS		
Asclepias meadii	Mead's milkweed	T	E	Will	Mesic prairies[d]
Boltonia decurrens	decurrent false aster	T	T	La Salle, Tazewell, Woodford	Alluvial prairie and marshlands[d]
Dalea foliosa	leafy prairie-clover	E	E	Will	Prairie remnants[d]
Hymenoxys herbacea	lakeside daisy	T	E	Tazewell, Will	Dolomite prairies[d]
Lespedeza leptostachya	prairie bush clover	T	E	DuPage, Grundy, Kendall, La Salle, Livingston, Tazewell, Woodford, Will	Dry gravel and sand prairies[d]
Platanthera leucophaea	eastern prairie fringed orchid	T	E	DuPage, Grundy, Kendall, La Salle, Livingston, Tazewell, Woodford, Will	Mesic to wet prairies[d]
			INSECTS		
Somatochlora hineana	Hine's emerald dragonfly	E	E	DuPage, Will	Calcareous spring-fed marshes[e]
			REPTILES		
Sistrurus catenatus	eastern massasauga	C	E	Will	Shrubby wetlands[f]

Table 2-2. (contd)

Scientific Name	Common Name	Federal Status[(b)]	State Status[(b)]	County[(c)]	Habitat
		BIRDS			
Gallinula chloropus	common moorhen	—	T	DuPage	Freshwater marshes, lakes, and ponds with emergent vegetation[(e)]
Haliaeetus leucocephalus	bald eagle	T	T	Grundy, La Salle, Tazewell, Woodford, Will	Large rivers and lakes[(e)]
Ixobrychus exilis	least bittern	—	T	DuPage	Freshwater lakes and marshes[(e)]
Nycticorax nycticorax	black-crowned night heron	—	E	DuPage	Freshwater wetlands[(e)]
Podilymbus podiceps	pied-billed grebe	—	T	DuPage	Well vegetated lakes, ponds, streams, and marshes[(e)]
Xantho-cephalus xantho-cephalus	yellow-headed blackbird	—	E	DuPage	Freshwater marshes[(e)]
		MAMMALS			
Myotis sodalis	Indiana bat	E	E	DuPage, Grundy, Kendall, La Salle, Livingston, Tazewell, Woodford, Will	Woodland, riparian habitats[(e)]

(a) Federally listed species in project area based on FWS (2003a, b). State-listed species in project area from Pietruszka (2002).
(b) E = endangered; T = threatened; C = candidate for listing; — = not listed. Source: FWS (2003a, b); IDNR (2003b).
(c) County distributions for Federally listed species from FWS (2003b). County distributions for State-listed species from Pietruszka (2002).
(d) Herkert (1991).
(e) Herkert (1992).
(f) FWS (2003b).

counties (including LaSalle, Tazewell, and Woodford counties) remain along the Illinois River (Herkert 1991), but the species is considered to potentially occur in any county bordering the Illinois River (Nelson 2003). No populations of decurrent false aster are known to occur in the project area. Of the counties where the species is known to occur, only LaSalle, Tazewell, and Woodford Counties contain transmission line ROWs associated with Dresden; however, none of these is near the Illinois River flood plain where the species is found. The Dresden site itself (Grundy County) is located on the Illinois River flood plain, but existing levees, channelization, and dams prevent the flooding disturbance that is thought to be needed for the species. No populations of decurrent false aster are known from Grundy County (Herkert 1991).

Leafy prairie-clover

The leafy prairie-clover (Federally listed as endangered; State listed as endangered) is found in two disjunct regions: the cedar glades of central Tennessee and northern Alabama, and in Illinois where it is now restricted to dolomite prairie on river terraces in seven counties in the northeastern portion of the State (DeMauro and Bowles 1996). Leafy prairie-clover is found only in open limestone cedar glades, limestone barrens, and dolomite prairies that have shallow soils over limestone or dolomite with frequent expanses of exposed bedrock (DeMauro and Bowles 1996). Historically, the species was widespread in Illinois but found only in mesic dolomite prairie habitat (Herkert 1991). It was thought to be extinct in Illinois until rediscovered in 1974 (Herkert 1991). In the area potentially affected by the proposed action, the leafy prairie-clover is known to occur in Will County and potentially in LaSalle County (Nelson 2003). Known populations in Will County are found in dolomite prairie habitats in three county preserves along the western side of the Des Plaines River north of Joilet (DeMauro and Bowles 1996). These locations are at least 8 km (5 mi) from the nearest project-related transmission line ROW. The only project-related facility that occurs in LaSalle County is a portion of the Pontiac-Midpoint transmission line ROW that traverses the southeastern corner of the county. This portion of the transmission line ROW crosses agricultural land (row crops) exclusively.

Lakeside daisy

The lakeside daisy (Federally listed as threatened; State listed as endangered) occurred historically in dry prairies, on outcrops of dolomite or limestone bedrock, and on sand and gravel terraces of major river valleys (DeMauro 1990; Nelson 2003). Lakeside daisy was known from a few dolomite prairies in Will County (along the Des Plaines River at Rockdale, Illinois) and a gravel bluff along the Illinois River in Tazewell County (Herkert 1991). The last known extant population in Illinois was destroyed in 1981, but the species has been reintroduced into Will and Tazewell Counties. Restored populations are threatened with vegetation encroachment, off-road-vehicle disturbance, and high herbivory rates (DeMauro

1990). Only one natural population remains, and it is located in an abandoned quarry in northern Ohio (DeMauro 1990). In the area potentially affected by the proposed action, the lakeside daisy is known to occur in Will and Tazewell Counties (Herkert 1991; Nelson 2003). Populations in Will County have been restored in dolomite prairie habitats in two county preserves along the western side of the Des Plaines River north of Joilet (DeMauro 1990). The species has also been reintroduced to the Illinois River bluff site (a county nature preserve) in Tazewell County where it was found historically (DeMauro 1990). These locations are at least 5 mi (8 km) from the nearest project-related transmission line.

<u>Hine's emerald dragonfly</u>

Adults of the Hine's emerald dragonfly (Federally listed as endangered; State listed as endangered) live in the same habitats as their aquatic nymphs, previously discussed in Section 2.2.5. Suitable habitats appear to be limited to spring-fed wetland complexes that include cattail marsh, sedge meadow, seep, and pond and other habitats with slow-flowing water and thin soils over dolomite rock. All of the known populations of Hine's emerald dragonfly are within 4 km of the Des Plaines River and are upstream of Dresden Units 2 and 3; the species has not been found to occur on or in the vicinity of the Dresden site.

The staff has determined that license renewal for Dresden may affect, but is not likely to adversely affect the remaining six species, the Mead's milkweed *(Asclepias meadii)*, the prairie bush clover *(Lespedeza leptostachya)*, the eastern prairie fringed orchid *(Platanthera leucophaea)*, the eastern massasauga *(Sistrurus catenatus)*, the Indiana bat *(Myotis sodalis)*, and the bald eagle *(Haliaeetus leucocephalus*).

<u>Mead's milkweed</u>

Mead's milkweed (Federally listed as threatened) formerly occurred throughout the eastern tallgrass prairie region of the central United States including Kansas, Missouri, Illinois, Iowa, Wisconsin, and Indiana (FWS 2003c). There are four remaining populations in Illinois, and these are located in the Shawnee National Forest in Saline County in southern Illinois. Restoration projects have introduced the Mead's milkweed to a site in Will County (Nelson 2003; FWS 2003c). The primary habitat of Mead's milkweed is mesic to dry mesic, upland tallgrass prairie (Herkert 1991; FWS 2003c). Although no populations of Mead's milkweed are known from the project area, it is possible that undeveloped portions of the Dresden site and associated transmission line ROWs could support this species, especially in those segments of the line that pass through natural areas, such as the Goose Lake Prairie State Natural Area, the Des Plaines Conservation Area, and the Midewin National Tallgrass Prairie.

Prairie bush clover

The prairie bush clover (Federally listed as threatened; State listed as endangered) is known to occur in Lee County, Illinois, but could potentially occur anywhere in suitable prairie remnants within the State (Nelson 2003). The species occurs on dry gravel and sand prairies and is rare throughout its range (Herkert 1991; Nelson 2003). Although no populations of prairie bush clover are known to occur the project area, it is possible that undeveloped portions of the Dresden site and associated transmission line ROWs could support this species, especially in those segments of the line that pass through natural areas, such as the Goose Lake Prairie State Natural Area, the Des Plaines Conservation Area, and the Midewin National Tallgrass Prairie.

Eastern prairie fringed orchid

The eastern prairie fringed orchid (Federally listed as threatened; State listed as endangered) prefers mesic to wet prairie habitat and potentially occurs throughout Illinois (Nelson 2003). It occurs in tallgrass silt-loam or sand prairies, sedge meadows, fens, and occasionally sphagnum bogs (Bowles 1999). It appears to be adapted to disturbance and occasionally colonizes early succession habitats or recolonizes previously occupied areas (Bowles 1999). The eastern prairie fringed orchid formerly occurred from eastern Iowa, Missouri, and Oklahoma eastward across southern Wisconsin, northern and central Illinois, southern Michigan, northern Indiana and Ohio, and northwestern Pennsylvania to western New York and adjacent southern Ontario. Disjunct populations also occurred in New Jersey, Virginia, and Maine (Bowles 1999). In Illinois, the species has been eliminated from all but portions of the northeast by agriculture, drainage, and urban development (Herkert 1991; Bowles 1999). The eastern prairie fringed orchid is now known from only 22 populations in Illinois located in protected areas that include nature preserves, county forest preserves, and a State park (Herkert 1991). Although no populations of eastern prairie fringed orchid are known from the project area, it is possible that undeveloped portions of the Dresden site and associated transmission line ROWs could support this species.

Eastern massasauga

The eastern massasauga (Federally candidate for listing as threatened or endangered; State listed as endangered) is a small rattlesnake that is declining throughout its range (Nelson 2003). The massasauga is usually found in or near wet areas including wetlands, wet prairie, and nearby woodland or shrub habitat (Nelson 2003). The species also uses dry old fields with goldenrod (*Solidago* spp.) and woody species, such as dogwood (*Cornus* spp.) or multiflora rose (*Rosa mulitflora*). Dry upland areas up to 2.4 km (1.5 mi) away from wet habitat are utilized during the summer (Nelson 2003). The massasauga once occurred in the northern four-fifths of Illinois, but intensive farming and destruction of wetlands has decreased its habitat. In recent years, it has been found in Washington County in southern Illinois, Piatt County in east central Illinois, Knox County in western Illinois, and DuPage, Cook, and Will counties in northeast Illinois (Illinois State Museum 2003). In the area potentially affected by the project, the massasauga is known to occur only in Will County. Although the eastern massasauga is not known to occur in the project area, it is possible that undeveloped portions of the Dresden site and associated transmission line ROWs could support this species, especially in those segments of the line that pass through natural areas, such as the Goose Lake Prairie State Natural Area, the Des Plaines Conservation Area, and the Midewin National Tallgrass Prairie.

Indiana bat

The Indiana bat (Federally listed as endangered; State listed as endangered) is known to occur in LaSalle County, Illinois, and could potentially occur statewide (Nelson 2003). The Blackball Mine, located in LaSalle County about 64 km (40 mi) west of the Dresden site and associated transmission line ROWs, is listed as critical habitat for the Indiana bat (FWS 1999; Nelson 2003). Indiana bats congregate for hibernation in only a few caves or mines within their range, and impacts at these hibernacula have been a major cause of this species' decline (FWS 1999). During the summer, Indiana bats use a variety of habitats for roosting and foraging but frequent the corridors of small streams with well developed riparian woods (FWS 1999; Nelson 2003). The species forages for insects in the stream corridor; within the canopy of flood plain and upland forests; over old-fields, ponds, and pastures; and along the borders of agricultural fields and wooded fence rows (Nelson 2003). Indiana bats roost and rear young in trees. Preferred roost trees have exfoliating bark with space for bats to roost between the bark and the bole of the tree; to a limited extent, tree cavities and crevices also are used for roosting (FWS 1999). Maternity colonies use multiple roosts. Each colony has at least one (but there may be more than one) "primary" roost that is used by a majority of the bats most of the summer. Indiana bats tend to return to the same roosting area year after year (Nelson 2003). Although the Indiana bat is not known to occur in the project area, it is possible that undeveloped portions of the Dresden site and associated transmission line ROWs could support the habitat of this species. It is unlikely that ROWs contain Indiana bat roost trees because these ROWs have been maintained for several decades and large trees suitable as roosts are not allowed to become established within the ROWs. The ROWs could be used by Indiana bats for foraging and bats could potentially use undeveloped portions of the Dresden site for foraging and roosting.

Bald eagle

The bald eagle (Federally listed as threatened, but proposed for delisting; State listed as threatened) is listed as wintering and possibly breeding in Tazewell, Woodford, LaSalle, Grundy, and Will Counties, Illinois (Nelson 2003). Bald eagles nest in large trees near rivers and lakes. During the winter, eagles congregate near open water created by dam tailwaters, power plant effluent, and municipal and industrial discharge, or in power plant cooling ponds (Nelson 2003). The importance of these areas increases in colder winters when open water is not available elsewhere. Large trees near open water are favored for perching and night roosting. Exelon has not reported bald eagles on the Dresden site, but it is reasonable to assume that the species is an occasional winter visitor to open water bodies on and adjacent to the site. Bald eagles are not known to nest in the project area, and there are no known roosting concentrations in the area. In the winter, eagles may be attracted to open water areas in the vicinity of the Dresden site when other large water bodies are frozen. Water without ice cover provides foraging areas for the bald eagle and normal plant operations maintain these open areas.

Five additional State listed bird species have been identified by the IDNR as known to occur in the project area. These include the pied-billed grebe, least bittern, black-crowned night heron, common moorhen, and yellow-headed blackbird; all are birds of wetlands or open water and have been documented at a site about 0.4 km (0.25 mi) from the Electric Junction transmission line. None of these State listed bird species has been documented by the IDNR to occur within the transmission line ROWs, but it is possible that undisturbed portions of the lines support these species, especially in those segments that pass through natural areas, such the Goose Lake Prairie State Natural Area, the Des Plaines Conservation Area, and the Midewin National Tallgrass Prairie.

Current Exelon ROW-management practices (Cunningham 2003) reduce the probability of impacts to these habitats and the species that are dependent on them. All activities in Goose Lake Prairie State Natural Area, Des Plaines Conservation Area, and Midewin National Tallgrass Prairie are planned in consultation with staff at these sites and must be approved prior to implementation. In general, ROWs through prairie habitat require little, if any, maintenance because of the absence of trees.

2.2.7 Radiological Impacts

Exelon has conducted a radiological environmental monitoring program (REMP) around the Dresden site since 1974. Through this program, radiological impacts to workers, the public, and the environment are monitored, documented, and compared to the appropriate standards. The objectives of the REMP are to:

- Provide representative measurements of radiation and of radioactive materials in those exposure pathways and for those radionuclides that lead to the highest potential radiation exposures to the public

- Verify that the measurable concentrations of radioactive materials and levels of radiation are not higher than expected on the basis of the effluent measurements and the modeling of the environmental exposure pathways.

Radiological releases have been summarized in two annual reports: the Dresden Nuclear Power Station *Annual Radiological Environmental Operating Report* (Exelon 2002b) and the *Dresden Nuclear Power Station Radioactive Effluent Release Report* (Exelon 2002c). The limits for all radiological releases are specified in the ODCM, and these limits are designed to meet Federal standards and requirements (ComEd 1999c). The REMP includes monitoring of the waterborne environment (ground/well, drinking water, surface water, sediments, and dredging spoils), ingestion pathways (milk, fish, and vegetation), direct radiation (gamma dose at thermoluminescent dosimeter [TLD] locations), and atmospheric environment (airborne radioiodine, particulates, gross beta, and gamma) (ComEd 1999c).

As required by 10 CFR 20.1301(d), historical data on releases and the resultant dose calculations were compared to limits that are specified in the EPA's environmental radiation standards (40 CFR Part 190). The review revealed that the doses to maximally exposed individuals in the vicinity of Dresden site were a small fraction of the EPA limits. For 2001, dose estimates were calculated based on actual liquid and gaseous effluent release data (Exelon 2002c). The calculations were performed using the plant effluent release data, on-site meteorological data, and appropriate pathways identified in the ODCM.

The total effective dose equivalent (TEDE)[a] calculated for the maximally exposed individual was 0.0751 m/Sv (7.51 mrem), which is well within the annual limit for a member of the public as specified in the ODCM. This value is largely dominated by the direct radiation from the Dresden Units 2 and 3 turbines 0.0743 m/Sv (7.43 mrem), and the balance of 8×10^{-4} m/Sv (0.08 mrem) is due to exposure from liquid and gaseous effluents. These results confirm that the Dresden Units 2 and 3 are operating in compliance with 10 CFR Part 50, Appendix I; 10 CFR Part 20; and 40 CFR Part 190. These doses, which are representative of the doses from the past five years, demonstrate that the impact to the environment from radioactive releases from Dresden Units 2 and 3 is SMALL.[b]

(a) TEDE is the sum total of the external dose and the sum of the weighted internal dose.
(b) The doses are very small fractions of the limits given in 40 CFR Part 190, i.e., annual dose equivalent not to exceed 0.25 mSv (25 mrem) to the whole body, 0.75 mSv (75 mrem) to the thyroid,

The applicant anticipates that the doses may increase by as much as 17 percent due to the power uprate; however, they do not represent significant changes to exposures to the public from Dresden Units 2 and 3 operations during the renewal period. The impacts to the environment are not expected to change.

2.2.8 Socioeconomic Factors

The staff reviewed the applicant's ER (Exelon 2003a), information from the U.S. Bureau of the Census, and information obtained from county, city, and economic development staff during a site visit to Grundy and Will counties from March 24 to March 28, 2003. The following information describes the economy, population, and communities in the region of Dresden.

2.2.8.1 Housing

Approximately 990 employees work at Dresden Units 2 and 3 (about 120 contract employees and approximately 870 permanent employees). Approximately 72 percent of these employees live in Grundy and Will counties, and the remaining 28 percent are distributed across 18 other counties (Exelon 2003a).

Given the preponderance of Dresden employees living in Grundy and Will counties and the absence of the likelihood of significant socioeconomic effects in other locations, the focus of the analyses undertaken in this supplemental environmental impact statement (SEIS) is on these two counties.

Exelon refuels Dresden Units 2 and 3 on an 24-month cycle. During refueling outages, site employment increases by as many as 760 temporary workers for 20 to 40 days. Most of these workers are assumed to be temporarily located in the same geographic areas as the permanent Exelon staff.

Table 2-3 provides the number of housing units and vacancies for Grundy and Will counties for 1990 and 2000 - the latest years for which information is available. Grundy County has developed a comprehensive land-use plan that is based on the premise that growth is encouraged and that residential development will occur within the existing municipalities as they expand toward their established growth boundaries. Will County's land-use plan encourages a compact development pattern rather than enabling a pattern of sprawl.

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and 0.25 mSv (25 mrem) to any other organ of any member of the public.

Table 2-3. Housing Units and Housing Units Vacant (Available) by County During 1990 and 2000

Housing Unit Description	1990	2000	Approximate Percentage Change 1990 to 2000
GRUNDY COUNTY			
Housing Units	12,652	15,040	18
Occupied Units	11,979	14,293	19
Vacant Units	673	747	11
WILL COUNTY			
Housing Units	122,870	175,524	43
Occupied Units	116,933	167,542	43
Vacant Units	5,937	7,982	34

Source: U.S. Bureau of the Census (USBC) 2000a.

2.2.8.2 Public Services

- **Water Supply**

This discussion of public water systems focuses on Grundy and Will counties because approximately 72 percent of Dresden employees reside in these two counties. Local municipalities and private water companies provide public potable water service to residents who do not have individual on-site wells. These providers are subject to regulation under the Federal Safe Drinking Water Act, as implemented by the Illinois Department of Health.

At the present time, the water supply systems in Grundy and Will counties are operating substantially below their maximum capacities. The Dresden site pumps groundwater for use as potable water and is not connected to a municipal system.

Will County has 33 public water suppliers with an average daily use of 173,000 m^3/d (38 million gpd) and a maximum daily capacity of 479,000 m^3/d (105 million gpd).

Grundy County has five public water suppliers with an average daily use 13,000 m^3/d (3 million gpd) and a maximum daily capacity of 50,000 m^3/d (11 million gpd).

- **Education**

In 2000 - 2001, there was a total enrollment of 90,292 students attending mainstream public schools in Grundy and Will counties. Although the region's 49 school districts do not keep track of the number of Dresden employees' children attending district schools, Table 2-4 shows the total enrollment for those school districts that likely serve most of these children.

Table 2-4. School District Enrollment in Counties with Significant Numbers of Dresden Employees

County	Enrollment
Grundy	8,516
Will	81,776
Total	90,292

Source: National Center for Educational Statistics 2001

- **Transportation**

Both Grundy and Will counties are served by U.S. Highway 55, which runs north-south, and U.S. Highway 80, which runs east-west. Highway 80 connects to the city of Chicago about 80 km (50 mi) east of the Dresden site.

Road access to the Dresden site is via Dresden Road, a two-lane, paved road. Dresden Road intersects with Pine Bluff Road approximately 3 km (2 mi) south of the station. Dresden Road ends at the city limits of Coal City. Most employees from the Grundy and Will counties area travel these roads to reach the site. Traffic count data for each of these roads are not available because the State of Illinois does not make level-of-service (LOS) determinations in rural, nonmetropolitan areas unless it is deemed necessary. As such, neither Dresden Road nor Pine Bluff Road has had a LOS determination calculated by the Illinois Department of Transportation (Exelon 2003a). However, Dresden site employees and staff observance indicate that there are no traffic-related issues.

2.2.8.3 Off-Site Land Use

This section on off-site land use in the area surrounding the Dresden site focuses on Will and Grundy counties because the majority (approximately 72 percent) of the permanent Dresden workforce lives in these two counties and because Exelon tax payments are an important portion of Grundy County's tax base. Both counties have experienced growth over the last several decades, and their comprehensive land-use plans reflect planning efforts and public involvement. Land-use planning tools, including zoning, are used by both counties to guide growth and development. Each county's plans have goals to encourage growth and development in areas where public facilities, such as water and sewer systems, are planned and to discourage strip development that would impact roads and agricultural lands.

Industrial sites located near Dresden include the General Electric Morris (Illinois) Operation and the Midwest Generation Collins Station. The lands to the west and south of the Dresden site are zoned for manufacturing. Southeast of the Dresden entrance is a 20-ha (50-ac) recreational/residential land plot. South of this area are 11 large, 4-ha (10-ac) lots zoned agriculture/residential. Agricultural and residential zones are located across the Illinois River at the confluence of the Des Plaines and the Kankakee Rivers to the north and east of Dresden. Re-zoning from agricultural to residential is occurring south of Pine Bluff Road to accommodate housing growth.

Grundy County occupies 109,814 ha (274,534 ac) of land area. Of this total, 97 percent, or 106,324 ha (265,810 ac) of the county is unincorporated. Because the majority of the developed land in Grundy County is located within or adjacent to the incorporated communities of Morris, Coal City, Minooka, and Gardner, the remainder of the planning area has a predominantly agricultural and residential character (Exelon 2003a). In the developed portion of the planning area, land is dedicated to transportation (roads, airports, railroad rights-of-way, and other terminal facilities), public and semi-public facilities, industry, utility, residential, and business/commercial uses. Developed land accounts for 10.5 percent of the total planning area (Exelon 2002a). Eastern Grundy County is now within commuting range of the growing job markets of the western and southwestern Chicago region. The population in this area is growing faster than employment. The remainder of the area is classified as undeveloped and includes vacant land, water areas, and all farmland except farm residences. Agriculture is classified as the dominant land use in this category, accounting for 90,000 ha (225,000 ac) or 81 percent of the total planning area (Exelon 2002a).

Future land use in Grundy County is based on the premise that growth is encouraged but must occur in a controlled manner. One of the principal land-use objectives of the Grundy County comprehensive land-use plan (Grundy County 1996) is the protection of prime farmland - a resource which has the greatest pressure for and the least resistance to land-use conversion. The land-use plan also promotes the protection of farmland because conversion to other uses tends to have a greater impact on the county's rural character and the economic stability of the agricultural community (Exelon 2003a). The land-use plan establishes that new residential development will occur within the existing municipalities as they expand toward their established growth boundaries. Such development will promote the most convenient and efficient provision of services. The infilling of vacant parcels or lots in municipalities and in existing subdivisions in unincorporated areas is strongly encouraged. Development of existing parcels is preferred to changes in zoning that create new nodes of development or expand the boundaries of existing subdivided areas. Finally, the Grundy County land-use plan encourages the establishment of residential and neighborhood units that are affordable to the population and workforce of the county (Exelon 2002a). Dresden is not specifically mentioned in the *Grundy County Land Use Plan - Year 2010 Update* (Grundy County 1996).

Will County occupies 218,753 ha (546,882 ac) of land. Current land-use categories and rates are agricultural (57.8 percent), forest and grassland (7.8 percent), undeveloped (2.1 percent), urban/built-up (19.7 percent), conservation open space (5.4 percent), mineral extraction (0.4 percent), water (2.3 percent), wetlands (2.6 percent), and parks (1.9 percent). Will County's land-use goals are based on "planning/management areas," whereby land is classified as one of the following eight categories: urbanized communities, contiguous growth areas, rural communities, agriculture-preservation areas, environmental corridors, high-accessibility corridors, critical sensitive areas, and special facilities areas. The land-use plan defines goals and objectives for each category in an effort to guide countywide development using standardized criteria. Areas of special interest are the urbanized communities, contiguous growth areas, rural communities, and agriculture-preservation areas (Exelon 2002a).

The majority of new development in Will County has resulted from the growing job markets of the expanding Chicago metropolitan area. The county's land-use plan encourages a compact development pattern that clusters neighborhoods, villages, and towns rather than enabling a pattern of sprawl. As the residential population expands, planned growth is promoted through the annexation of contiguous lands guided by local municipal plans. Agricultural preservation areas are designated on the basis of potential agricultural productivity and the feasibility of being protected from intrusion by urbanization. Land that has a high natural agricultural productivity but lies within the anticipated 20-year urban growth path may not obtain the classification of agriculture-preservation area (Exelon 2002a).

2.2.8.4 Visual Aesthetics and Noise

Dresden is situated on the south bank of the Illinois River. The local terrain is level to gently undulating except for the Kankakee Bluffs just northeast of Dresden on the north bank of the Illinois River. The area around Dresden is largely rural, characterized by farmlands and small residential communities. The Dresden site is visible from the surrounding areas because of the relatively level landscape and the height of the cooling towers and containment buildings. Several transmission lines can be seen crossing roads in the area.

Exelon has installed 48-cell forced-draft cooling tower cells, comprised of two 18-cell towers and one 12-cell tower. The cooling towers have allowed increased production but have increased noise to the adjacent recreational-residential zone. The NRC reviewed the Dresden measured sound readings taken with all 48 site cooling towers in service. The readings were all less than 65 decibels, the threshold as stated in GEIS (NRC 1996, 1999). Exelon has committed to implementing measures to achieve and maintain compliance with applicable State noise regulations (Exelon 2002a). These measures include construction of an earthen berm on the south side of the cooling towers (see Figure 2-4).

2.2.8.5 Demography

Exelon used the year 2000 census data from the U.S. Bureau of the Census (USBC) to determine demographic characteristics in the Dresden area. NRC guidance calls for the use of the most recent USBC decennial census data, which, in the case of Dresden, was the 2000 Census at the time of publication of the ER (Exelon 2003a). USBC provides updated annual projections, in addition to decennial data, for selected portions of its demographic information. Section 2.11 (Low-Income Populations) of the ER used 1990 low-income population demographic information because updated projections were not available by census tract. NRC staff used 2000 census data in this section and in discussing both minority and low-income populations. Population was estimated from the Dresden site out to 80 km (50 mi).

According to USBC 2000 information, at least 338,000 people live within 32 km (20 mi) of Dresden (Exelon 2003a). Applying the GEIS sparseness measures, Dresden has a population density of 103 persons/km^2 (269 persons/mi^2) within 32 km (20 mi) and falls into the least-sparse category, Category 4 (having greater than or equal to 46 persons/km^2 [120 persons/mi^2] within 32 km [20 mi]). As estimated from USBC 2000 information, at least 7 million people live within 80 km (50 mi) of Dresden (Exelon 2003a). This equates to a population density of about 350 persons/km^2 (900 persons/mi^2) within 80 km (50 mi) and falls into the in-close-proximity category, Category 4 (having greater than or equal to 190 persons within 80 km [50 mi]).

Applying the GEIS sparseness and proximity matrix, Dresden is classified as sparseness Category 4 and proximity Category 4, resulting in the conclusion that Dresden is located in a high-population area. All or parts of 21 counties are located within 80 km (50 mi) of Dresden (see Figure 2-1). Of these 21 counties, 19 are in Illinois, and 2 are in Indiana. Approximately 72 percent of Dresden employees live in Grundy and Will counties. The remaining 28 percent are distributed across 17 other counties with numbers ranging from 1 to 47 employees per county. The Chicago Metropolitan Statistical Area (MSA) is the largest metropolitan area within 80 km (50 mi) of Dresden with a population of 8.9 million and is located in Cook County. Between 1990 and 2000, Cook County experienced a population growth from 5,105,067 (in 1990) to 5,376,741 (in 2000) - a 5.3 percent increase over the decade (USBC 2000a).

Will and Grundy counties are characterized by a varied mixture of rural and metropolitan areas; and in the year 2000, they had a combined total population of 539,801 and an average annual growth rate of 3.9 percent from 1990 to 2000. Both Will and Grundy counties are growing at faster rates than Illinois as a whole. From 1990 to 2000, when the population growth rate of Illinois was 8.6 percent, the population of Will and Grundy counties increased by 40.6 and 16.1 percent, respectively (USBC 2000a).

By the year 2030, the population of Illinois is projected to be 13.5 million people, growing at an average annual rate of 0.5 percent. By the year 2030, Will and Grundy counties are projected to have grown at average annual rates of 2.0 and 0.8 percent, respectively (Exelon 2003a).

Table 2-5 shows the estimated populations and the annual growth rates for Will and Grundy counties, the two counties with the greatest potential to be affected by license renewal.

Table 2-5. Regional Demographics

Estimated Populations and Average Annual Growth Rates in Grundy and Will Counties from 1980 to 2030				
	Grundy County		Will County	
Year	**Population**	**Percent**	**Population**	**Percent**
1980	30,582	1.5	324,460	3.0
1990	32,337	0.6	357,313	1.0
2000	37,535	1.6	502,266	4.1
2010	39,546	0.5	608,600	2.1
2020	43,584	1.0	738,185	2.1
2030	46,753	0.7	807,468	0.9

Source: Exelon 2003a

- **Resident Population within 80 km (50 mi)**

Table 2-6 presents the population distribution within 80 km (50 mi) of Dresden for the year 2000. The nearest population centers to the Dresden site are Minooka Village (with a 2000 population of 3971), located approximately 5 km (3 mi) to the north; Channahon Village (2000 population of 7344), approximately 5 km (3 mi) to the northeast; Morris (2000 population of 11,928), approximately 13 km (8 mi) to the west; and Joliet (2000 population of 106,221) 24 km (15 mi) to the northeast.

Table 2-6. Population Distribution in 2000 within 80 km (50 mi) of Dresden

	Distance in Kilometers (Miles) of Dresden					
	0 to 16 km (0 to 10 mi)	**16 to 32 km (10 to 20 mi)**	**32 to 48 km (20 to 30 mi)**	**48 to 64 km (30 to 40 mi)**	**64 to 80 km (40 to 50 mi)**	**Total Population**
Population	59,724	280,695	895,209	1,882,663	4,219,273	7,337,564

Source: Geolytics Software 2000

The Grundy County planning department projects high growth (residential and industrial developments) in the northeast area of the county within the next 10 years (Pachol 2003). Will County has been identified as the fastest growing county within Illinois (Warner 2003). The growth of both counties is attributed to their proximity to Chicago.

- **Transient Population**

The transient population in the vicinity of Dresden can be identified as daily or seasonal. Daily transients are associated with places where a large number of people gather regularly, such as local businesses, industrial facilities, and schools. The major seasonal population within 16 km (10 mi) of the Dresden site is associated with recreational areas, including the Goose Lake Prairie State Natural Area and the Des Plaines Conservation Area. Their combined average annual visitors total approximately 780,000 people per year.

- **Agricultural Labor**

There are over 81 ha (201,000 ac) of farmland in Grundy County and over 117 ha (290,000 ac) in Will County (U.S. Department of Agriculture [USDA] 1997). The main agricultural crops grown within the 80-km (50-mi) radius of Dresden are corn, wheat, and soybeans. Almost all of the laborers on farms in the area are believed to be residents in the area. Migrant labor plays little or no role.

2.2.8.6 Economy

Both Will and Grundy counties are components of the nine-county Chicago Primary Metropolitan Statistical Area (PMSA), which had a regional 1998 population estimation of 8,885,919 (based on the 1990 USCB population of 8,008,507) and includes the city of Chicago. On a broader scale, several other nearby MSAs have been consolidated with the Chicago Primary Metropolitan Statistical Area to form a Consolidated Metropolitan Statistical Area (CMSA) called the Chicago-Gary-Kenosha CMSA. This CMSA ranks third in the nation for population size (Exelon 2003a). The Chicago PMSA has a transportation network of trucking and rail terminals, interstate highway access, three international airports as well as a number of regional airports, and access to international seaports via the St. Lawrence Seaway System, giving the metropolitan area access to domestic and international markets (Exelon 2003a).

Grundy County is one of the commercial and agricultural centers of Illinois. As of 1997, Grundy County's industrial profile was led by the service (25 percent), manufacturing (21 percent), retail trade (22 percent), and utilities/transportation (16 percent) sectors. Will County's dominant industries are services (29 percent), retail trade (22 percent), manufacturing (21 percent), and construction (10 percent). One of the newer growth industries in Will County is riverboat gambling. The gaming industry has created 4000 full-time jobs with an annual payroll of $100 million for Will County alone (Exelon 2003a).

The annualized unemployment rate for the State of Illinois in 2001 was 6.4 percent. In comparison, Will and Grundy counties had 2001 unemployment rates of 5.2 and 6.5 percent, respectively (USBC 2000c). In 2000, the Chicago PMSA had an estimated labor force of 4,172,205 and an unemployment rate of 6.3 percent.

The median household in Illinois in 2000 had an estimated median household income of $45,590 with Grundy and Will Counties having estimated median household incomes of $51,719 and $62,238, respectively. In comparison, the estimated income of the median household in the nation was $41,994 (USBC 2000a).

Agriculture contributes significantly to the regional economy. Principal crops in the region include corn, soybeans, and hay (USDA 1997). According to the USDA's 1997 Census of Agriculture, receipts from all agricultural products contributed $107.1 million to the economy of Will County, and $59.2 million to the economy of Grundy County (USDA 1997). Crop sales alone accounted for 94 percent of the market value of agricultural-product sales in Grundy County and 92 percent in Will County (USDA 1997).

In the State of Illinois, each county is divided into smaller taxing districts. Property tax collections and distributions are funneled through these districts. Every year, each district examines its fiscal needs for the following year and extends a levy to the county in an amount that will cover its proposed budgets. The county then issues property tax assessments and bills based on the budget needs of the individual districts and the characteristics of the properties residing within those districts. Once the tax revenues are collected, the county redistributes the revenues to the districts, which, in turn, fulfill budget obligations for the oncoming fiscal year. (Note: The amounts of revenues distributed to the districts by the county may not be identical to the amounts collected. Items, such as court-ordered refunds or abatements, may absorb a small portion of the revenues before they are redistributed [Exelon 2003a]).

Dresden pays annual property taxes to Grundy and Will counties. Taxes fund Grundy County operations, which include the school system, fire districts, libraries, road maintenance, and sanitary districts. For the three years, 1997 to 2000, Dresden's property taxes provided between 13 and 21 percent of Grundy County's total collections available for distribution (Table 2-7). Dresden-sponsored tax collections fund Will County's school districts, fire protection districts, parks, sanitary districts, libraries, road maintenance, and forest preservation. For the years 1997 to 2000, Dresden's property taxes provided less than 1 percent of Will County's total collections available for distribution (Table 2-8). Tables 2-7 and 2-8 compare Dresden's tax payments to Grundy and Will counties levee extensions and collections for distribution.

Both Will and Grundy counties may experience lower property tax revenues than in the past due to decreased valuation. Because of the likely decline in tax revenues, Exelon and Grundy County negotiated in-lieu payments (through 2005) to prevent dislocation from decreased property tax revenues to those districts most affected (i.e., Coal City Community Unit School District No. 1, Coal City Fire Protection, and Coal City Public Library District) (Exelon 2003a; Henderson 2003). However, because Will County's total collections available for distribution from Exelon are less than 1 percent, Exelon did not negotiate with Will County.

Table 2-7. Dresden Contributions to Grundy County Operating Budgets by Category

Year	Property Tax Paid by Dresden	Percent of Collections Available for Distribution	Collections Available for Distribution to Districts
1997	$11,959,131	20.6	$58,174,086
1998	$12,231,397	20.4	$59,907,894
1999	$12,781,547	19.7	$64,618,506
2000	$9,272,017	13.3	$69,576,291

Source: Exelon 2003a

Table 2-8. Dresden Contributions to Will County Operating Budgets

Year	Property Tax Paid by Dresden	Percent of Collections Available for Distribution	Collections Available for Distribution to Districts
1997	$35,554	Less than 1%	$505,223,460
1998	$35,831	Less than 1%	$548,930,903
1999	$37,560	Less than 1%	$606,168,761
2000	$38,975	Less than 1%	$679,812,340

Source: Exelon 2003a

2.2.9 Historic and Archaeological Resources

This section discusses the cultural background and the known historic and archaeological resources at the site of Dresden Units 2 and 3 and in the surrounding area of Will and Grundy counties.

2.2.9.1 Cultural Background

The area in and around the Dresden site has tremendous potential for significant prehistoric and historic resources. The Kankakee/Des Plaines/Illinois river systems provide a rich ecosystem and transportation network that would have encouraged the use and settlement of the area. Human occupation in this northern Illinois region roughly follows a standard chronological sequence for midwestern prehistory: Paleoindian Period (10,000 B.C. - 8000 B.C.); Archaic Period (8000 B.C. - 1000 B.C.); Woodland Period (1000 B.C. - A.D. 900); and Mississippian Period (A.D. 900 - 1600).

In general, the Paleoindian Period is characterized by highly mobile bands of hunters and gatherers. A typical Paleoindian site might consist of an isolated stone point or knife (of a style characteristic of the period) in an upland area along large river valleys or ancient lake beds. Although Paleoindian sites are relatively rare, one has been recorded and tested at the Joliet Army Ammunition Plant (currently known as the Midewin National Tallgrass Prairie operated by the USFS); the western boundary of the USFS land is within 8 km (5 mi) of the Dresden site.

The Archaic Period represents a transition from a highly mobile existence to a more sedentary existence. During this period of increased local resource exploitation (e.g., predominantly deer and small mammals, fish and other aquatic resources, nuts and seeds), native people exhibited more advanced tool development and increased complexity in social organization.

The Woodland Period continued the complexities begun during the Archaic Period but is distinguished by the introduction of ceramic technology (i.e., pottery appears in the archaeological record during this time). Burials dating to the Woodland Period are characteristically mounded with earth and situated along bluffs; some mounds were even built in the shapes of animals.

During the Mississippian Period, further changes in social organization appear to occur, possibly tied to the increased reliance of native people on cultivated plants, such as maize and squash. In some areas of the Midwest, large, complex centers developed surrounded by clusters of smaller villages and farmsteads. Cahokia Mounds, located in southern Illinois on the broad, fertile flood plain of the Mississippi River, and Aztalan in southern Wisconsin are examples of these complex Mississippian Period centers in the Midwest.

The historic period in this region begins with the arrival of the first European settlers in the 1600s. The Jesuit missionary, Father Jacques Marquette, and French trader and explorer, Louis Joliet, were the first nonnative people recorded as having passed through the area in 1673. Historic Native American tribes known to have inhabited this region at that time include the Kaskaskia Illinois, the Kickapoo, the Potawatomi (with some Ottawa and Chippewa), and the Winnebago.

Many properties of historic significance in the area date to the mid-to-late 1800s and early 1900s and are associated with various transportation networks. One of the earliest of these transportation networks was the Illinois and Michigan Canal that extended from the Chicago River to the Illinois River near Peru, Illinois (National Park Service [NPS] no date). In 1816, the Potawatomi, the Ottawa, and the Chippewa signed a treaty that ceded their claim to land along the Des Plaines and the Illinois Rivers for the proposed Illinois and Michigan Canal.

In 1822, Congress authorized construction of the Illinois and Michigan Canal to connect Lake Michigan and the Mississippi River. Construction of the 156-km (97-mi) canal started in 1836 and was completed in 1848. The combination of the canal and Chicago's position as the primary railroad hub in the Midwest by the mid-to-late 1800s led to an increase in settlement and industrialization in the Joliet area (i.e., Will and Grundy Counties).

In 1984, Congress established the Illinois and Michigan Canal National Heritage Corridor to protect historical, natural, and recreational resources in the area and promote awareness of the canal's significance as a cultural landscape (NPS no date). The Dresden site is located within the national heritage corridor. The Illinois and Michigan Canal is listed on the National Register of Historic Places (NRHP) for both Grundy and Will Counties.

Also passing through the area is the historic Route 66 highway. Constructed in 1926, Route 66 was one of the first roads to cross the United States. The highway, 3860 km (2400 mi) long, crossed eight states from Chicago, Illinois, to California before terminating at the Pacific Ocean. Two segments of Route 66 come within 9.7 km (6 mi) of the Dresden site.

In addition to these historic transportation networks, Grundy County has five additional sites listed on the NRHP: Coleman Hardware Company Building (1874 -1935), Mazon Creek Fossil Beds, Morris Wide Water Canal Boat Site (1865 -1915), White and Company's Goose Lake Stoneware Manufactury (1855 -1866), and White and Company's Goose Lake Tile Works (1855-1866) (Illinois Historic Preservation Agency [IHPA] 2003a). All five properties are located in or near the town of Morris, Illinois, within approximately 13 km (8 mi) of the Dresden site to the west.

Will County has 25 additional properties listed on the NRHP (IHPA 2003b). The nearest of the 25 properties is the Briscoe Mounds and the associated habitation site in Channahon along the Des Plaines River within about 5 km (3 mi) of the Dresden site. The Briscoe Mounds are earthen burial mounds constructed during the Mississippian Period. Twelve of the 25 listed properties are located in Joliet; six others are located in the Lockport area; and six more are located in Peotone, Plainfield, Romeoville, and Wilmington. These properties are historic buildings or districts, and none of them is in close proximity to the Dresden site (i.e., within 10 km [6 mi]).

2.2.9.2 Historic and Archaeological Resources at the Dresden Site

Much of the Dresden site has been disturbed by construction of the nuclear power plant facilities and related infrastructure, including roads, parking lots, and the cooling pond. Some previous disturbance has also occurred along the transmission line corridors. However, portions of the site remain undeveloped and relatively undisturbed. Intact archaeological sites could be present within these undeveloped areas.

No archaeological surveys were completed at the Dresden site prior to station construction. However, there is at least one archaeological site that is recorded within the Dresden site boundary. This archaeological site, 11GR2, was only minimally disturbed during construction according to a professional archaeologist who examined the site in 1973 (AEC 1973).

No architectural surveys have been conducted at the Dresden site to determine whether any standing structures or buildings within the Dresden site are eligible for NRHP listing. However, Dresden Unit 1 was the first commercially successful demonstration boiling water reactor. It operated from 1959 until 1978. In 1991, it was listed as an American Nuclear Society Nuclear Historic Landmark. Dresden Unit 1 is approaching 50 years of age and is likely to be considered an historic property that meets the eligibility criteria for listing on the NRHP.

Although no known sites of significance to Native Americans have been identified at the Dresden site, government-to-government consultation with the appropriate Federally recognized Native American tribes has been completed (see Appendix E). The Tribes were chosen after a review of the location of the power plant and the history of use in that vicinity through time by Native American groups. No Tribal government or organization responded to the NRC's inquiry concerning interest in the proposed action to renew the operating licenses for Dresden Units 2 and 3.

2.2.10 Related Federal Project Activities and Consultations

The staff reviewed the possibility that activities of other Federal agencies might impact the renewal of the OLs for Dresden. Any such activities could result in cumulative environmental impacts and the possible need for the Federal agency to become a cooperating agency for preparation of this SEIS. Six activities were identified: Dresden Nuclear Power Station, Unit 1; Des Plaines River Basin Generating Stations; Braidwood Nuclear Power Station; La Salle County Station; General Electric Morris (Illinois) Nuclear Facility; and Joliet Arsenal.

Dresden Units 2 and 3 share the Dresden site with retired Unit 1, a 700-MW(t) demonstration boiling water reactor that operated from November 1959 until October 1978. Des Plaines River Basin Generating Stations consist of five electric generating stations in the Des Plaines River watershed located at approximately River Mile 284. Braidwood Nuclear Power Station is a 2376-MW(e) nuclear plant located approximately 19.6 km (14 mi) from Dresden upstream on the Kankakee River. La Salle County Station is a 2280-MW(e) nuclear plant located approximately 35.2 km (22 mi) downstream of Dresden on the Illinois River. General Electric Morris (Illinois) Nuclear Facility has a facility to store spent fuel away from reactors, using wet storage pool technology, across Collins Road from Dresden. The facility currently operates under NRC license SNM-2500. The Joliet Arsenal Project - Meadin National Tall Grass Prairie is designated as a special facilities area and has existing heavy industrial uses. It is located 5 km (3 mi) from Dresden (Exelon 2002a).

The staff determined that there were no Federal projects or activities in the vicinity of Dresden that would result in cumulative impacts or that would make it desirable for another Federal agency to become a cooperating agency for preparing this SEIS. The NRC is required under Section 102 of the National Environmental Policy Act (NEPA) to consult with and obtain the comments of any Federal agency that has jurisdiction by law or special expertise with respect to any environmental impact involved. The NRC consulted with the U.S. Department of the Interior, Fish and Wildlife Service (FWS), and the consultation correspondence is included in Appendix E.

2.3 References

10 CFR Part 20. Code of Federal Regulations, Title 10, *Energy*, Part 20, "Standards for Protection Against Radiation."

10 CFR Part 50. Code of Federal Regulations, Title 10, *Energy*, Part 50, "Domestic Licensing of Production and Utilization Facilities."

10 CFR Part 54. Code of Federal Regulations, Title 10, *Energy,* Part 54, "Requirements for Renewal of Operating Licenses for Nuclear Power Plants."

10 CFR Part 61. Code of Federal Regulations, Title 10, *Energy,* Part 61, "Licensing Requirements for Land Disposal of Radioactive Waste."

10 CFR Part 71. Code of Federal Regulations, Title 10, *Energy,* Part 71, "Packaging and Transportation of Radioactive Materials."

40 CFR Part 81. Code of Federal Regulations, Title 40, *Protection of the Environment*, Part 81, "Designation of Areas for Air Quality Planning Purposes."

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3.0 Environmental Impacts of Refurbishment

Environmental issues associated with refurbishment activities are discussed in the *Generic Environmental Impact Statement for License Renewal of Nuclear Plants* (GEIS), NUREG-1437, Volumes 1 and 2 (NRC 1996; 1999).[(a)] The GEIS includes a determination of whether the analysis of the environmental issues could be applied to all plants and whether additional mitigation measures would be warranted. Issues are then assigned a Category 1 or a Category 2 designation. As set forth in the GEIS, Category 1 issues are those that meet all of the following criteria:

(1) The environmental impacts associated with the issue have been determined to apply either to all plants or, for some issues, to plants having a specific type of cooling system or other specified plant or site characteristic.

(2) A single significance level (i.e., SMALL, MODERATE, or LARGE) has been assigned to the impacts (except for collective off-site radiological impacts from the fuel cycle and from high-level waste and spent fuel disposal).

(3) 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 issues that meet the three Category 1 criteria, no additional plant-specific analysis is required in this supplemental environmental impact statement (SEIS) unless new and significant information is identified.

Category 2 issues are those that do not meet one or more of the criteria for Category 1 and, therefore, additional plant-specific review of these issues is required.

License renewal actions may require refurbishment activities for the extended plant life. These actions may have an impact on the environment that requires evaluation, depending on the type of action and the plant-specific design. Environmental issues associated with refurbishment that were determined to be Category 1 issues are listed in Table 3-1.

(a) The GEIS was originally issued in 1996. Addendum 1 to the GEIS was issued in 1999. Hereafter, all references to the "GEIS" include the GEIS and its Addendum 1.

Table 3-1. Category 1 Issues for Refurbishment Evaluation

ISSUE—10 CFR Part 51, Subpart A, Appendix B, Table B-1	**GEIS Section**
SURFACE-WATER QUALITY, HYDROLOGY, AND USE (FOR ALL PLANTS)	
Impacts of refurbishment on surface-water quality	3.4.1
Impacts of refurbishment on surface-water use	3.4.1
AQUATIC ECOLOGY (FOR ALL PLANTS)	
Refurbishment	3.5
GROUNDWATER USE AND QUALITY	
Impacts of refurbishment on groundwater use and quality	3.4.2
LAND USE	
On-site land use	3.2
HUMAN HEALTH	
Radiation exposures to the public during refurbishment	3.8.1
Occupational radiation exposures during refurbishment	3.8.2
SOCIOECONOMICS	
Public services: public safety, social services, and tourism and recreation	3.7.4; 3.7.4.3; 3.7.4.4; 3.7.4.6
Aesthetic impacts (refurbishment)	3.7.8

Environmental issues related to refurbishment considered in the GEIS for which these conclusions could not be reached for all plants, or for specific classes of plants, are Category 2 issues. These are listed in Table 3-2.

Category 1 and Category 2 issues related to refurbishment that are not applicable to Dresden because they are related to plant design features or site characteristics not found at Dresden are listed in Appendix F.

The potential environmental effects of refurbishment actions would be identified, and the analysis would be summarized within this section, if such actions were planned. Exelon Generation Company, LLC (Exelon) indicated that it has performed its integrated plant assessment, the evaluation of systems, structures, and components pursuant to 10 CFR 54.21 to identify activities that are necessary to continue operation of Dresden Units 2 and 3 during the requested 20-year period of extended operation. These activities include replacement of certain components as well as new inspection activities and are described in the Environmental Report (Exelon 2003).

Table 3-2. Category 2 Issues for Refurbishment Evaluation

ISSUE—10 CFR Part 51, Subpart A, Appendix B, Table B-1	GEIS Section	10 CFR 51.53(c)(3)(ii) Subparagraph
TERRESTRIAL RESOURCES		
Refurbishment impacts	3.6	E
THREATENED OR ENDANGERED SPECIES (FOR ALL PLANTS)		
Threatened or endangered species	3.9	E
AIR QUALITY		
Air quality during refurbishment (nonattainment and maintenance areas)	3.3	F
SOCIOECONOMICS		
Housing impacts	3.7.2	I
Public services: public utilities	3.7.4.5	I
Public services: education (refurbishment)	3.7.4.1	I
Off-site land use (refurbishment)	3.7.5	I
Public services, transportation	3.7.4.2	J
Historic and archaeological resources	3.7.7	K
ENVIRONMENTAL JUSTICE		
Environmental justice	Not addressed[a]	Not addressed[a]

(a) Guidance related to environmental justice was not in place at the time the GEIS and the associated revision to 10 CFR Part 51 were prepared. If a licensee plans to undertake refurbishment activities for license renewal, environmental justice must be addressed in the licensee's environmental report and the staff's environmental impact statement.

However, Exelon stated that the replacement of these components and the additional inspection activities are within the bounds of normal plant component replacement and inspections; therefore, they are not expected to affect the environment outside the bounds of plant operations as evaluated in the final environmental statement (AEC 1973). In addition, Exelon's evaluation of structures and components as required by 10 CFR 54.21 did not identify any major plant refurbishment activities or modifications necessary to support the continued operation of Dresden Units 2 and 3 beyond the end of the existing operating licenses. Therefore, refurbishment is not considered in this SEIS.

3.1 References

10 CFR Part 51. Code of Federal Regulations, Title 10, *Energy,* Part 51, "Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions."

10 CFR Part 54. Code of Federal Regulations, Title 10, *Energy,* Part 54, "Requirements for Renewal of Operating Licenses for Nuclear Power Plants."

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