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

Draft Report for Comment

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

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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 draft 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 Plant, Units 2 and 3, for an additional 20 years under 10 CFR Part 54. This draft 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 preliminary recommendation regarding the proposed action.

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 process 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 offsite 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 draft 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 scoping process did not identify any new issue that has a significant environmental impact.

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

Abstract

The NRC staff's preliminary 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 received during the scoping process.

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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) states that the EIS prepared at the OL renewal stage will be a supplement to the *Generic Environmental Impact Statement for License Renewal of Nuclear Plants* (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 the preparation of this draft 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 received during the scoping process. The comments and responses that were considered to be within the scope of the environmental review are provided in Appendix A, Part 1, of this SEIS.

The staff will hold two public meetings in Morris, Illinois, in January 2004, to describe the preliminary results of the NRC environmental review, answer questions, and provide members of the public with information to assist them in formulating comments on the draft SEIS. When

(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.

the comment period ends, the staff will consider and disposition all of the comments received. These comments will be addressed in Appendix A, Part 2, of the final SEIS. This draft SEIS includes the NRC staff's preliminary 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 preliminary 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 goal of 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 offsite 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 draft 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 that are applicable to Dresden Units 2 and 3.

Exelon's license renewal application presents an analysis of the Category 2 issues 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 draft 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 its review of the SAMAs for Dresden Units 2 and 3 and the plant improvements already made, the staff concludes that none of the candidate SAMAs is cost-beneficial.

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 associated with continued operation of Dresden Units 2 and 3. The impacts may, in fact, be greater in some areas.

The preliminary 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 public comments received during the scoping process and on the draft SEIS.

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 micrometers 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 that are 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 to renew the Dresden 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 action, and evaluated mitigation measures for reducing adverse environmental effects (Exelon 2003b).

This report is the draft plant-specific supplement to the GEIS (the supplemental EIS [SEIS]) for the Exelon license renewal application. This draft 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.

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[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 preliminary recommendation with respect to the proposed license renewal action.

Additional information is included in appendices. Appendix A contains public comments received at the scoping meeting on the environmental review for license renewal and staff responses. Appendices B through G, respectively, list the following:

- The preparers of the supplement

- The chronology of 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

- SAMAs

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 that was 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 characteristic.

(2) A single significance level (i.e., SMALL, MODERATE, or LARGE) has been assigned to the impacts (except for collective offsite 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 two 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 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* (68 FR 10273 [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.

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 preliminary 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.

A 75-day comment period will begin on the date of publication of the U.S. Environmental Protection Agency Notice of Filing of this SEIS to allow members of the public to comment on the preliminary results of the NRC staff's review. During this comment period, two public meetings will be held in Morris, Illinois, in January 2004. During these meetings, the staff will describe the preliminary results of the NRC environmental review and answer questions related to it to provide members of the public with information to assist them in formulating their comments.

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 with 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. 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 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 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.

National Environmental Policy Act (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.

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.

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.

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

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

(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.

outages, site employment increases by as many as 760 workers for temporary duty (typically, about 20 days).

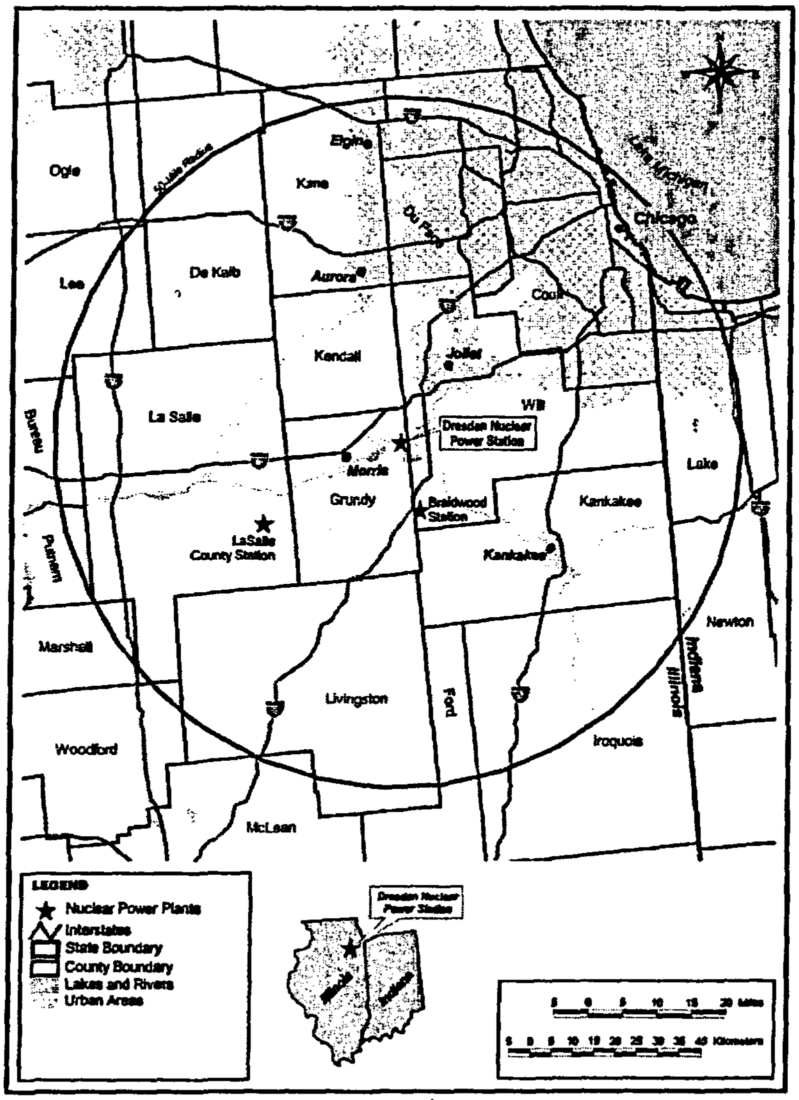


Figure 2-1. Location of Dresden Site, 80-km (50-mi) Region

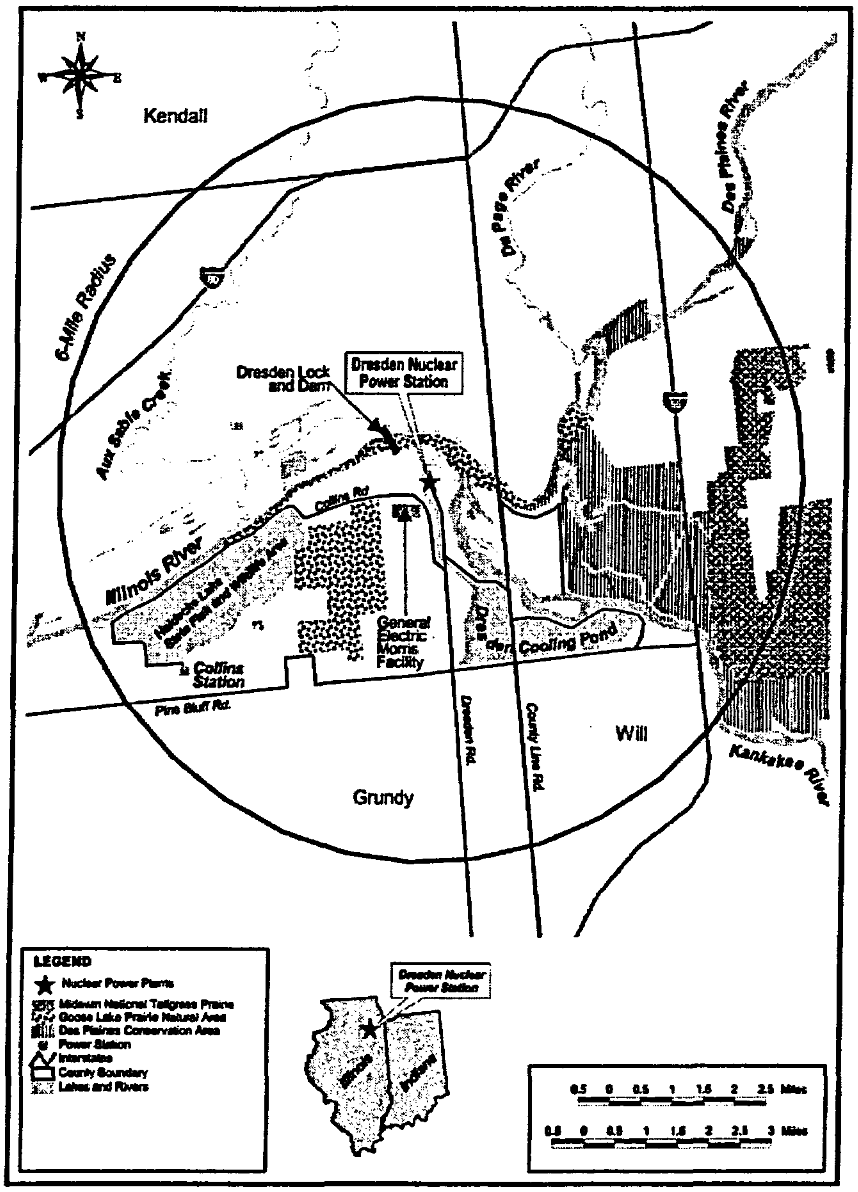


Figure 2-2. Location of Dresden Site, 10-km (6-mi) Region

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.

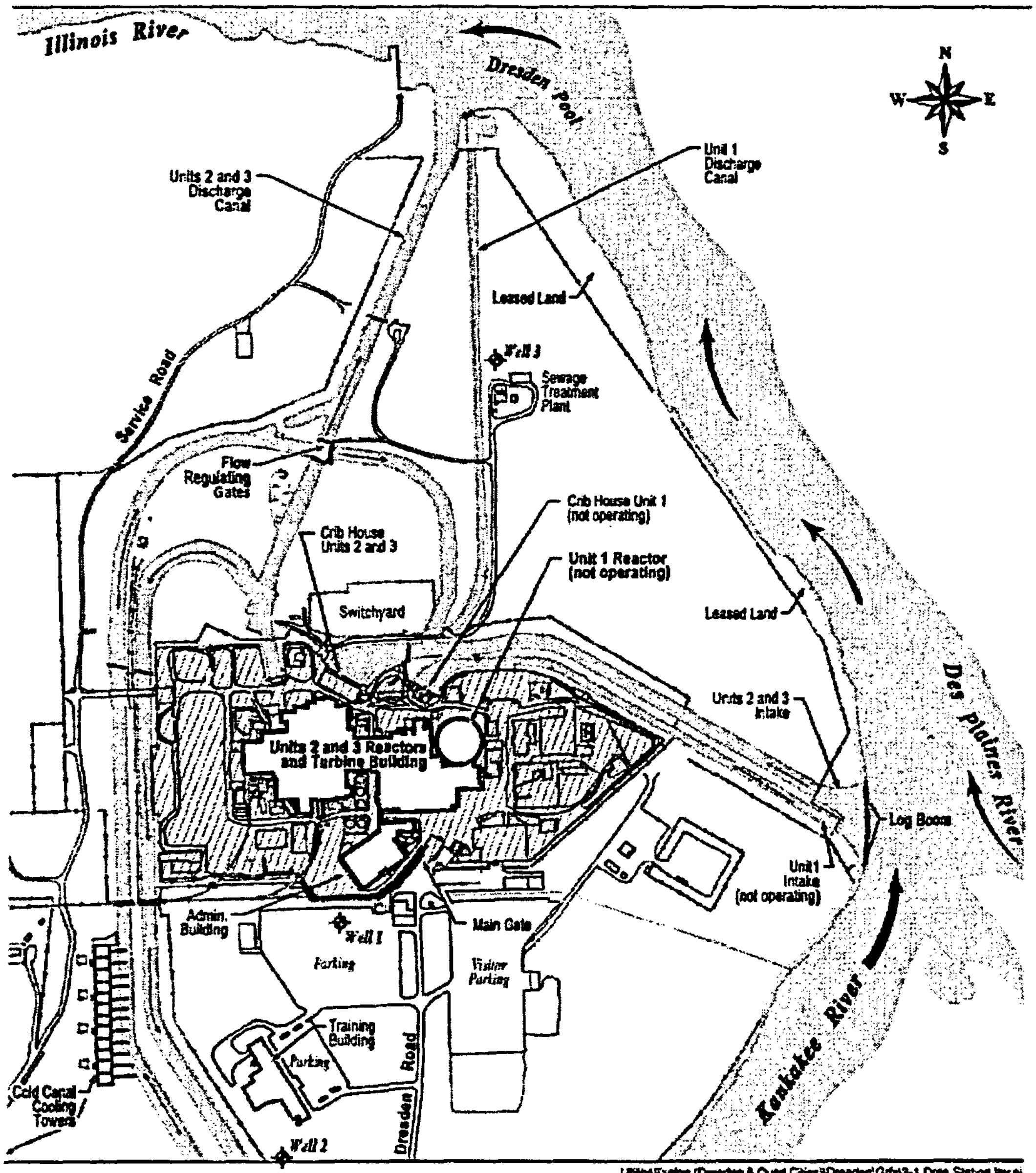
The upper layer of the bedrock varies across the region, being primarily of Silurian or Ordovician Period. The upper layer of the smaller portion, which includes the site, is of Pennsylvania Period. The rocks of the Pennsylvania system belong to the "Coal Measures" or strata associated with beds of coal. 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)Ca 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 increasing from 4 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).

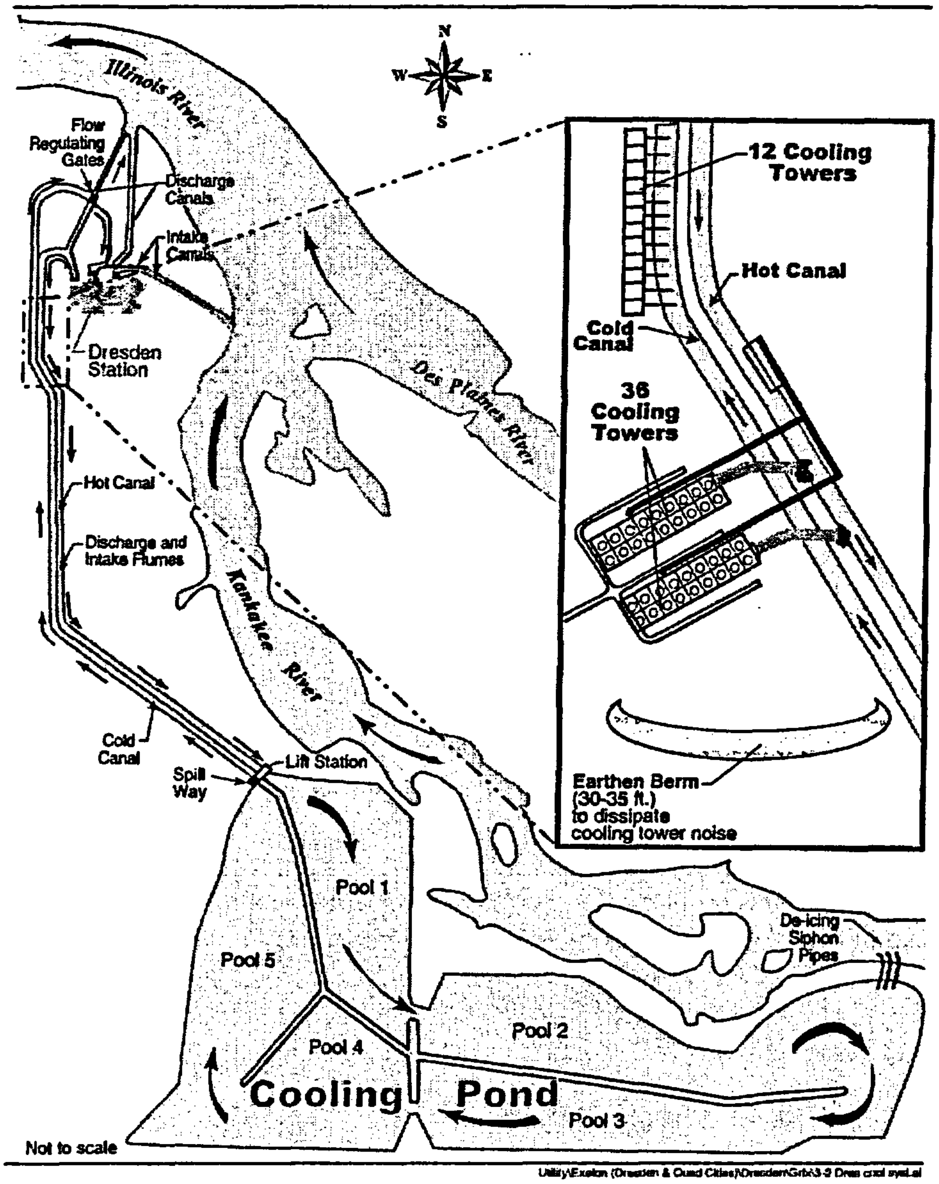


Figure 2-4. Dresden Cooling Water System Schematic

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 are currently under construction. 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 wastes. 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 wastes from Dresden Units 2 and 3 are routed to a common onsite radioactive waste facility for further treatment, temporary storage, sampling, and discharge. The radioactive waste facility handles liquid wastes 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 wastes and reusable radioactive material may be temporarily stored in the onsite 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 wastes so that the concentrations in routine discharges are less than the applicable regulatory limits. The liquid and the 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 wastes result from treating and separating radionuclides from gases and liquids, and removing contaminated material from various reactor areas. Solid wastes also consist 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 wastes may be shipped to a waste processor for volume reduction before disposal, or they may be sent directly to the licensed burial site. Spent resins and filters are stored or packaged for shipment to an offsite processing or disposal facility. An onsite interim radioactive waste storage facility (IRSF) was constructed to store solid wastes should existing offsite 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 offsite 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. The reports from Exelon documenting the impact of this 17 percent power uprate on the amount of radioactive material released in effluents from Dresden during the first year of full implementation will be submitted to the NRC in May 2004. Also 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 18 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 wastes are 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 wastes are 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 wastes are 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 wastes handled by this system typically have a low conductivity and low solids content, but they may have a low or high activity. Where appropriate, sources of wastewater are provided with heat exchangers and/or multiple sumps and sump pumps. 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 the processed liquid radioactive waste in the waste sample tank meets certain specifications, 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 wastes are 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, it is then 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 5.4×10^{12} Bq (146.1 Ci). These volumes and activities are typical of past years. The liquid wastes generated are reported in annual Radioactive Effluent Release Report (Exelon 2002c). Exelon anticipates that liquid effluents could increase by 18 percent, proportionate to the power uprate (NRC 2001a). Exelon does not anticipate any further significant yearly increases in liquid 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 wastes from Dresden Units 2 and 3 consist 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 wastes so that the waste is suitable for transport and disposal. The system is not used for spent fuel storage and shipment. Reactor wastes, such as spent control rod blades and fuel channels, are stored in the fuel storage pool to allow decay, then packaged, and transferred in approved shipping containers for offsite burial. Used reactor equipment is also stored in the spent fuel storage pool before shipment. Maintenance wastes, 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. The process wastes, such as filter sludges and spent resins, are 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 wastes is provided by the onsite 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 wastes (DAWs), generated as a result of operation and maintenance activities, are collected throughout the radiological-controlled areas of the facility. Typical wastes of this type are air filters, cleaning rags, protective tape, paper and plastic coverings, discarded contaminated clothing, tools, equipment parts, and solid laboratory wastes. Most DAWs have 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 wastes result 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 wastes are spent demineralizer resins and filter material water slurries, which are collected in four backwash receiving tanks or in the waste sludge tank. The wet wastes are 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 wastes requiring solidification include concentrator waste, certain sludges, and ion-exchange resins. If storage is required for any of these types of wastes, the containers of waste may be temporarily stored on site at the IRSF.

Disposal and transportation of solid radioactive wastes are 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 wastes, resin regeneration wastes, Freon™ filters, and sanitary wastes. 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 onsite 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-long (1.1-mi-long) 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 long [31.1 mi long]) from Dresden to the Electric Junction substation; and a pair of new lines (48 km long [29.8 mi long]) 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

			Approximate Corridor Length		Corridor (Right-of-way) Width		Estimated Corridor Area	
Substation	Number of Lines	kV	km	(mi)	m	(ft)	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 (20 to Elwood)	29.8 (12.4 to Elwood)	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	64 to 76 (mostly 76)	210 to 250 (mostly 250)	~1250	~3100
Collins Station (Line 2311)	1	345	19	11.8	46	150	90	220
Totals	7		355	220.5			~2440	~6030

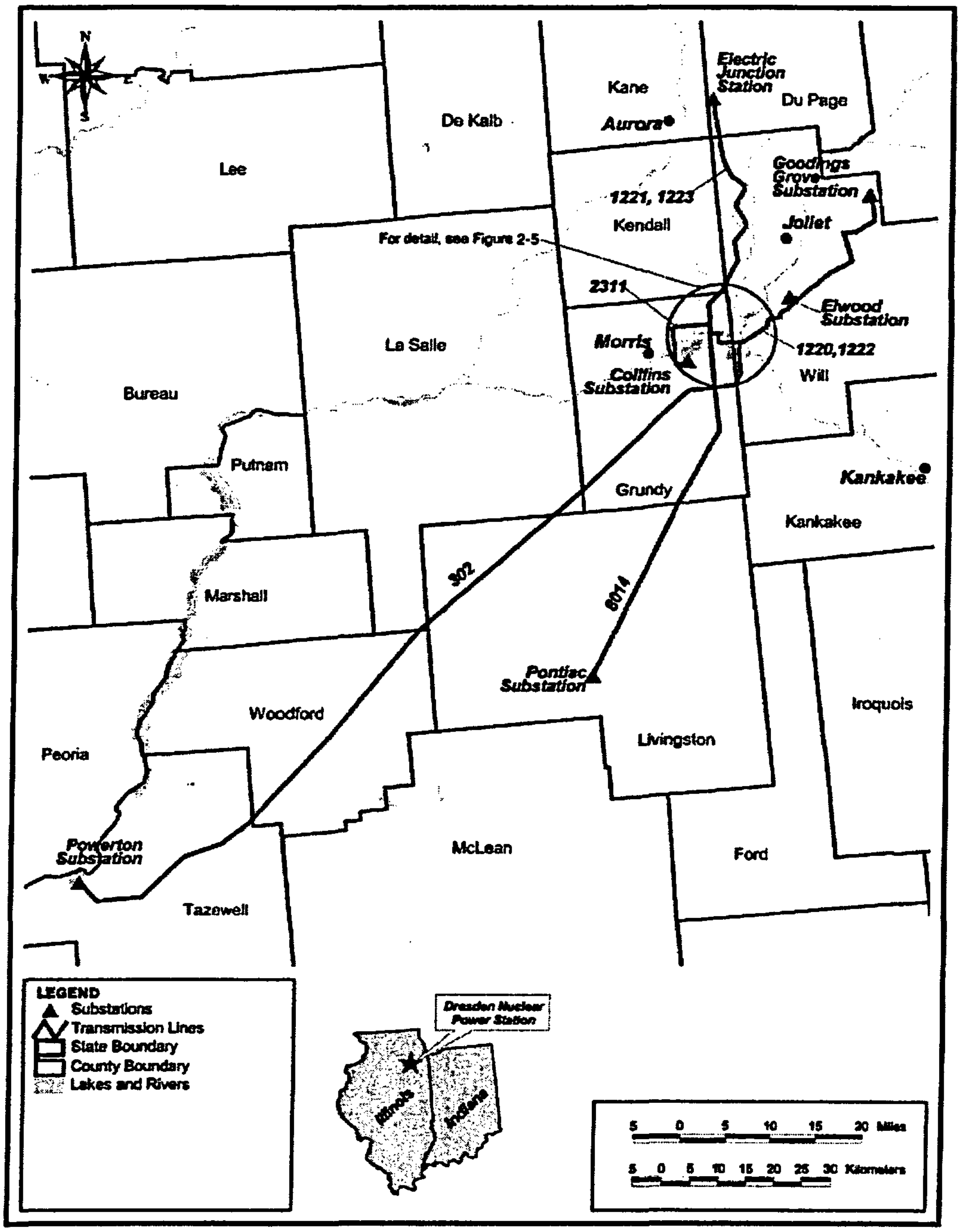


Figure 2-5. Dresden Transmission Line Map

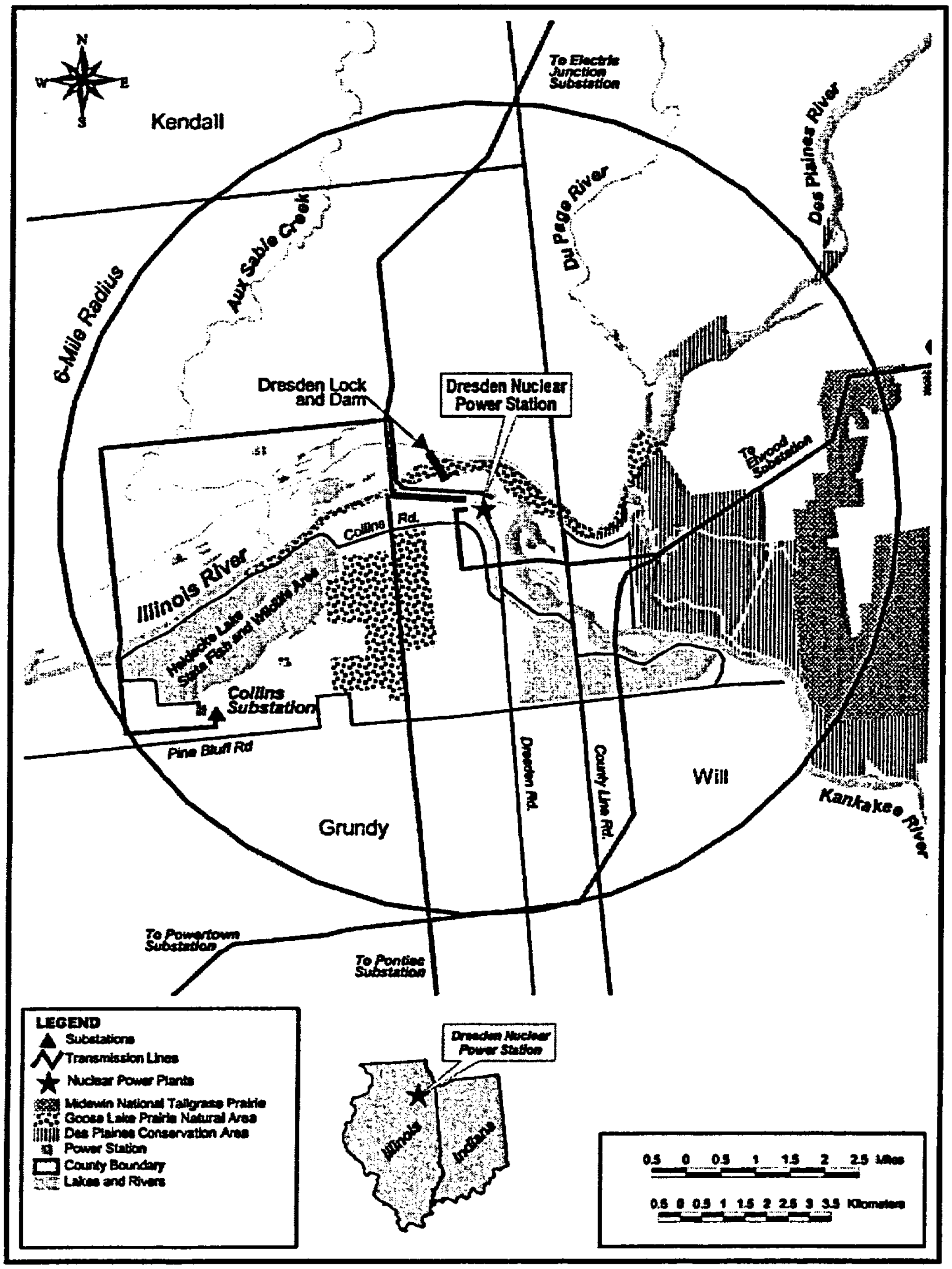


Figure 2-6. Dresden Detailed Transmission Line Map

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 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 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 B11°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 x 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 severe-17 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 (PM_{10}). After several years of litigation, new $PM_{2.5}$ and 8-hr ozone standards 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 (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 (*Notropis spilopterus*), bluntnose minnow (*Pimephales notatus*), and bullhead minnow (*Pimephales vigilax)* (Exelon 2002c). Other species present in significant numbers (greater than 1 percent of sample) included green sunfish (*Lepomis cyanellus*), spottail shiner (*Notropis hudsonius)*, largemouth bass (*Micropterus salmoides*), smallmouth bass (*Micropterus dolomieui*), sand shiner (*Notropis stramineus*), threadfin shad (*Dorosoma 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 lines. However, populations of this species have not been found to occur on or in the vicinity of the Dresden site (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 valencienneis* - 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. 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 listed species on or in the vicinity of the site.

Listed or candidate terrestrial species found in Grundy County, and, therefore, possibly found on or in the vicinity of the Dresden site, are the eastern prairie fringed orchid and the bald eagle. The eastern prairie fringed orchid was formerly found in mesic to wet prairies throughout Illinois but has been eliminated from all but portions of northeastern Illinois by agriculture, drainage, and urban development (Herkert 1991). The species is now known from only 22 populations located in protected areas that include nature preserves, county forest preserves, and a state park.

The bald eagle (currently Federally listed as threatened but proposed for delisting) is likely to occur at least occasionally in the vicinity of the Dresden site as a winter visitor to the Illinois River, Heideke Lake, or the Dresden cooling pond. The relatively warm water in these areas prevents a complete ice cover from forming and could attract foraging bald eagles. Exelon has not documented any bald eagle occurrences on the site or vicinity.

Other species listed in Table 2-2 occur in counties through which the transmission lines associated with the Dresden site pass. The only state or Federally listed species identified by the IDNR as known to occur in the project area are 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 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.

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	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).

Exelon participates in "Project Habitat," an industry program that emphasizes ROW management practices that are compatible with wildlife and improve habitat for native species. Exelon has converted some portions of the transmission line corridors to native prairie-grass species (Exelon 2003a). On those lines associated with Dresden re-licensing, prairie has been established on a 4-km (2.5-mi) segment on the northern portion of the Electric Junction transmission line.

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 the following:

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

Supplement the radiological effluent monitoring program by verifying 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), ingestions 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, onsite 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]

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 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 near 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. 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 Dresden staff.

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

Table 2-3 provides the number of housing units and housing unit 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.

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 onsite 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 is 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 Offsite Land Use

This section on offsite 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 towers 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. 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.

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 2-5. 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

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 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 archaeological 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 approximately 1000 years ago (A.D. 1000 -1200) 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 (i.e., within 10 km [6 mi]) of the Dresden site.

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 initiated.

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 operating license 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. Joliet Arsenal Project - Meadin 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.

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."

40 CFR Part 190. Code of Federal Regulations, Title 40, *Protection of Environment*, Part 190, "Environmental Radiation Protection Standards for Nuclear Power Operations."

Commonwealth Edison Company (ComEd). 1987. *Final Report Dresden Station Aquatic Monitoring 1986*. Prepared by Environmental Science and Engineering, Inc., St. Louis, Missouri. January.

Commonwealth Edison Company (ComEd). 1993. *Final Report Dresden Station Aquatic Monitoring 1992*. Prepared by EA Engineering, Science and Technology, Chicago, Illinois. March.

Commonwealth Edison Company (ComEd). 1995. *Updated Final Safety Analysis Report for Dresden Station*. Rev. 011. December.

Commonwealth Edison Company (ComEd). 1996a. *1995 Upper Illinois Waterway Fisheries Investigation River Mile 270.2-323.4*. Prepared by EA Engineering, Science and Technology, Chicago, Illinois. December.

Commonwealth Edison Company (ComEd). 1996b. *Dresden Nuclear Power Stations Units 2 and 3 Individual Plant Examination Submittal Report*. June.

Commonwealth Edison Company (ComEd). 1999a. *Letter Report on the Operation of the Kankakee River Ice Management Project to Illinois Environmental Protection Agency* (Thomas McSwiggin). Chicago, Illinois. March 25.

Commonwealth Edison Company (ComEd). 1999b. *NPDES Noncompliance for Dresden Nuclear Power Station*. November 8.

Commonwealth Edison Company (ComEd). 1999c. *Offsite Dose Calculation Manual*, Dresden Docket Nos. 50-101, 50-237, and 50-249. Chicago, Illinois.

Commonwealth Edison Company (ComEd). 2000a. *Final Report Dresden Station Aquatic Monitoring 1999, River Mile 266.0-274.4*. Prepared by EA Engineering, Science and Technology, Chicago, Illinois. November.

Commonwealth Edison Company (ComEd). 2000b. Letter from R. M. Krich, Director of Licensing, Commonwealth Edison Company, to U.S. Nuclear Regulatory Commission, Subject: "Request for License Amendment for Power Uprate Operation." December 27.

Cunningham, E. 2003. *ComEd Transmission Vegetation Management Program.*

Elliott, D. L., C. G. Holladay, W. R. Barchet, H. P. Foote, and W. F. Sandusky. 1986. *Wind Energy Resource Atlas of the United States.* DOE/CH 10093-4, U.S. Department of Energy, Washington, D.C.

Exelon Generation Company, LLC (Exelon), Dresden Nuclear Power Station. 2002a. *Application for a Joint Construction and Operating Permit, Supplemental Cooling Tower, Dresden Generating Station, Facility Identification Number: 063806AAC, Application 01120031.* Memo # DGBLTR 02-0025. December 2.

Exelon Generation Company, LLC (Exelon). 2002b. *Dresden Nuclear Power Station Annual Radiological Environmental Operating Report for 2001.* April.

Exelon Generation Company, LLC (Exelon). 2002c. *Radioactive Effluent Release Report,* Docket Numbers: 50-101/50-237/50-249. Warrenville, Illinois. January through December 2001.

Exelon Generation Company, LLC (Exelon). 2003a. *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.

Exelon Generation Company, LLC (Exelon). 2003b. *Dresden Station, Updated Final Safety Analysis Report.* Warrenville, Illinois. January.

Exelon Generation Company, LLC (Exelon). 2003c. *Updated Final Safety Analysis Report (UFSAR) Supplement.* Warrenville, Illinois. January.

Geolytics Software. 2000. *Census 2000 Redistricting.* Data from the U.S. Bureau of the Census 2000.

Grundy County. 1996. *Grundy County Land Use Plan - Year 2010 Update.* Adopted July 9.

Henderson, D. 2003. Information on Grundy County tax assessments. Personal communication with D. Henderson. February 24.

Herkert, J. 1991. *Endangered and Threatened Species of Illinois: Status and Distribution. Volume 1: Plants.* Illinois Endangered Species Protection Board. Springfield, Illinois.

Herkert, J. 1992. *Endangered and Threatened Species of Illinois: Status and Distribution. Volume 2: Animals.* Illinois Endangered Species Protection Board. Springfield, Illinois.

Illinois Department of Natural Resources (IDNR). 2003a. *Goose Lake Prairie State Natural Area.* <http://dnr.state.il.us/lands/landmgt/parks/i%26m/east/ goose/home.htm#Natural> Accessed on March 7, 2003.

Illinois Department of Natural Resources (IDNR). 2003b. *Illinois Endangered Species Protection Board, 1999 Endangered and Threatened Species List.* Accessed at < http://dnr.state.il.us/espb/datelist.htm> on March 10, 2003.

Illinois Environmental Protection Agency (IEPA). 2000a. *National Pollutant Discharge Elimination System (NPDES) Permit No. IL0002224.* Springfield, Illinois. October.

Illinois Environmental Protection Agency (IEPA). 2000b. *National Pollutant Discharge Elimination System (NPDES) Permit No. IL0002224, Fact Sheet and Public Notice No. DEL:99122901.* Springfield, Illinois. April 25.

Illinois Historic Preservation Agency (IHPA). 2003a. National Register of Historic Places in Illinois. Accessed at <http://www.state.il.us/hpa/ps/grundy.htm> on March 14, 2003.

Illinois Historic Preservation Agency (IHPA). 2003b. National Register of Historic Places in Illinois. Accessed at <http://www.state.il.us/hpa/ps/will.htm> on March 14, 2003.

National Center for Educational Statistics. 2001. "Common Core of Data Public School District Data for the 2000-2001 School Year." Accessed at < http:nces.ed.gov/ccd>.

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

National Park Service (NPS). no date. *Illinois & Michigan Canal.* National Park Service, Washington, D.C.

National Renewable Energy Laboratory (NREL). 2003. "Illinois Wind Resource Maps." <http://www.eere.energy.gov/windpoweringamerica/ where_is_wind_illinois.html> Accessed on March 4, 2003.

Pachol, L. 2003. Information on Grundy County growth. Personal communication with L. Pachol. February 21, 2003.

Pietruszka, R. 2002. Letter from R. Pietruszka, Illinois Department of Natural Resources, Springfield, Illinois, to K. Jury, Exelon Generation Company, LLC, Warrenville, Illinois. Subject: "Dresden Nuclear Station, Units 2 & 3 License Renewal DuPage, Will, Kendall, Grundy, Livingston, Woodford, and Tazewell Counties, Endangered Species Consultation Program, Natural Heritage Database Review #0201015." July 8.

Ramsdell, J. V., and G. L. Andrews. 1986. *Tornado Climatography of the Contiguous United States.* NUREG/CR-4461, Nuclear Regulatory Commission. Washington, D.C.

U.S. Atomic Energy Commission (AEC). 1973. *Final Environmental Statement Related to Operation of Dresden Nuclear Power Station, Units 2 and 3. Commonwealth Edison Company.* Docket Nos. 50-237 and 50-249. Directorate of Licensing. Washington, D.C.

U.S. Bureau of the Census (USBC). 2000a. "State and County QuickFacts." Accessed at <http://quickfacts.census.gov>.

U.S. Bureau of the Census (USBC). 2000b. "Quick Tables." Accessed at http://factfinder.census.gov.

U.S. Bureau of the Census (USBC). 2000c. "American Fact Finder Economic Characteristics: Employment, Income, Poverty and More." Accessed at <http://factfinder.census.gov>.

U.S. Department of Agriculture (USDA). 1997. *1997 Census of Agriculture County Profile.* Illinois Agricultural Statistics Service.

U.S. Fish and Wildlife Service (FWS), Region 3. 1998. *Endangered Species Facts: Pallid Sturgeon.* Accessed at <http://midwest.fws.gov/endangered/ fishes/palld_fc.html> on May 11, 2003.

U.S. Fish and Wildlife Service (FWS). 2001. Hine's Emerald Dragonfly (*Somatochlora hineana*) Recovery Plan. Fort Snelling, MN.

U.S. Fish and Wildlife Service (FWS). 2003a. *Illinois List of Threatened, Endangered, Proposed, and Candidate Species.* <http://midwest.fws.gov/Endangered/lists/state-il.html> Accessed on March 10, 2003.

U.S. Fish and Wildlife Service (FWS). 2003b. *County Distribution os Federally Listed Species in Illinois.* Accessed at <http://midwest.fws.gov/RockIsland/ activity/endangrd/il_list.htm> on March 6, 2003.

U.S. Forest Service (USFS). 2002. *Final Environmental Impact Statement Midewin National Tallgrass Prairie Land and Resource Management Plan.* U.S. Forest Service.

U.S. Geological Survey (USGS). 1998. *USGS Fact Sheet FS-072-98, Upper Illinois River Basin.* National Water-Quality Assessment Program. Urbana, Illinois.

U.S. Geological Survey (USGS). 1999. *Environmental Setting of the Upper Illinois River Basin and Implications for Water Quality,* Water Resources Investigations Report 98-4268. Urbana, Illinois.

U.S. Geological Service (USGS). 2000a. *Discharge Tables 20000, 05543500 Illinois River at Marseilles, Illinois.* <http://il.water.usgs.fov/ annrep_2000/data/dis2000/ 05543500.htm> Accessed on May 11, 2003.

U.S. Geological Survey (USGS). 2000b. *Water Year 1999 Annual Report.*

U.S. Nuclear Regulatory Commission (NRC). 1973. *Final Environmental Impact Statement Related to Operation of Dresden Nuclear Power Station, Units 2 and 3.* Commonwealth Edison Company, Dockets Nos. 50-237 and 50-249. Directorate of Licensing. Washington, D.C. November.

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.

U.S. Nuclear Regulatory Commission (NRC). 1999. *Generic Environmental Impact Statement for License Renewal of Nuclear Plants, Calvert Cliffs Nuclear Power Plant, Supplement 1, NUREG-1437.* Washington, D.C. February.

U.S. Nuclear Regulatory Commission (NRC). 2001a. Letter from Lawrence W. Rossback, Project Manager, Office of Nuclear Reactor Regulation, to Oliver D. Kingsley, President, Exelon. Subject: "Dresden Nuclear Power Station, Units 2 and 3, Environmental Assessment and Finding of No Significant Impact Related to a Proposed License Amendment to Increase the Licensed Power Level." Washington, D.C. December 17.

U.S. Nuclear Regulatory Commission (NRC). 2001b. Letter from Lawrence W. Rossback, Project Manager, Office of Nuclear Reactor Regulation, to Oliver D. Kingsley, President, Exelon. Subject: "Dresden Nuclear Power Station, Units 2 and 3 - Issuance of Amendments for Extended Power Uprate." Washington, D.C. December 21.

Warner, T. 2003. Information on Will County growth. Personal communication with T. Warner. February 21.

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 offsite 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	
Onsite 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 an 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
Offsite 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."

Exelon Generation Company, LLC (Exelon). 2003. *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.

U.S. Atomic Energy Commission (AEC). 1973. *Final Environmental Statement Related to the Operation of Dresden Nuclear Station, Units 2 and 3, Commonwealth Edison.* Docket Nos. 50-237 and 50-249. Directorate of Licensing. Washington, D.C.

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.

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.

4.0 Environmental Impacts of Operation

Environmental issues associated with operation of a nuclear power plant during the renewal term are discussed in the *Generic Environmental Impact Statement for License Renewal of Nuclear Plants* (GEIS), NUREG-1437, Volumes 1 and 2 (NRC 1996, 1999b).[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 offsite 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 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.

This chapter addresses the issues related to operation during the renewal term that are listed in Table B-1 of 10 CFR Part 51, Subpart A, Appendix B, and are applicable to the Dresden plant. Section 4.1 addresses issues applicable to the Dresden cooling system. Section 4.2 addresses issues related to transmission lines and onsite land use. Section 4.3 addresses the radiological impacts of normal operation, and Section 4.4 addresses issues related to the socioeconomic impacts of normal operation during the license renewal term. Section 4.5 addresses issues related to groundwater use and quality, and Section 4.6 discusses the impacts of renewal term operations on threatened and endangered species. Section 4.7 addresses potential new and significant information that was identified during the scoping period. Section 4.8 addresses

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(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.

cumulative impacts of operations during the license renewal term. Section 4.9 summarizes enviornmental impacts of Dresden Units 2 and 3 operations. Finally, Section 4.10 lists the references for Chapter 4. Category 1 and Category 2 issues 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.

4.1 Cooling System

Category 1 issues in Table B-1 of 10 CFR Part 51, Subpart A, Appendix B, that are applicable to Dresden Units 2 and 3 cooling system operation during the renewal term are listed in Table 4-1. Exelon stated in its Environmental Report (ER) that it is not aware of any new and significant information associated with the renewal of the Dresden Units 2 and 3 (Exelon 2003a). The staff has not identified any new and significant information during its independent review of the Exelon ER, the staff's site visit, scoping process, or its evaluation of other available information. Therefore, the staff concludes that there are no impacts related to these issues beyond those discussed in the GEIS. For all of the issues, the GEIS concluded that the impacts are SMALL, and that additional plant-specific mitigation measures beyond those already in place at Dresden Units 2 and 3 are not likely to be sufficiently beneficial to be warranted.

A brief description of the staff's review and the GEIS conclusions, as codified in Table B-1, for each of these issues follows:

- <u>Altered current patterns at intake and discharge structures</u>. Based on information in the GEIS, the Commission found that

  > Altered current patterns have not been found to be a problem at operating nuclear power plants and are not expected to be a problem during the license renewal term.

  The staff has not identified any significant new information during its independent review of the Exelon ER, the staff's site visit, the scoping process, or its evaluation of other available information. Therefore, the staff concludes that there are no impacts of altered current patterns at intake and discharge structures during the renewal term beyond those discussed in the GEIS.

Table 4-1. Category 1 Issues Applicable to the Operation of the Dresden Units 2 and 3 Cooling System During the Renewal Term

ISSUE—10 CFR Part 51, Subpart A, Appendix B, Table B-1	GEIS Section
SURFACE-WATER QUALITY, HYDROLOGY, AND USE (FOR ALL PLANTS)	
Altered current patterns at intake and discharge structures	4.2.1.2.1; 4.3.2.2; 4.4.2
Temperature effects on sediment transport capacity	4.2.1.2.3; 4.4.2.2
Scouring caused by discharged cooling water	4.2.1.2.3; 4.4.2.2
Eutrophication	4.2.1.2.3; 4.4.2.2
Discharge of chlorine or other biocides	4.2.1.2.4; 4.4.2.2
Discharge of sanitary wastes and minor chemical spills	4.2.1.2.4; 4.4.2.2
Discharge of other metals in wastewater	4.2.1.2.4; 4.3.2.2; 4.4.2.2
Water-use conflicts (plants with once-through cooling systems)	4.2.1.3
AQUATIC ECOLOGY (FOR ALL PLANTS)	
Accumulation of contaminants in sediments or biota	4.2.1.2.4; 4.3.3; 4.4.3; 4.4.2.2
Entrainment of phytoplankton and zooplankton	4.2.2.1.1; 4.3.3; 4.4.3
Cold shock	4.2.2.1.5; 4.3.3; 4.4.3
Thermal plume barrier to migrating fish	4.2.2.1.6; 4.4.3
Distribution of aquatic organisms	4.2.2.1.6; 4.4.3
Premature emergence of aquatic insects	4.2.2.1.7; 4.4.3
Gas supersaturation (gas bubble disease)	4.2.2.1.8; 4.4.3
Low dissolved oxygen in the discharge	4.2.2.1.9; 4.3.3; 4.4.3
Losses from predation, parasitism, and disease among organisms exposed to sublethal stresses	4.2.2.1.10; 4.4.3
Stimulation of nuisance organisms	4.2.2.1.11; 4.4.3
AQUATIC ECOLOGY (FOR PLANTS WITH COOLING-TOWER-BASED HEAT DISSIPATION SYSTEMS)	
Entrainment of fish and shellfish in early life stages	4.3.3
Impingement of fish and shellfish	4.3.3
Heat shock	4.3.3

Table 4-1. (Contd)

ISSUE—10 CFR Part 51, Subpart A, Appendix B, Table B-1	GEIS Section
TERRESTRIAL RESOURCES	
Cooling tower impacts on crops and ornamental vegetation	4.3.4
Cooling tower impacts on native plants	4.3.5.1
Bird collisions with cooling towers	4.3.5.2
Cooling pond impacts on terrestrial resources	4.4.4
HUMAN HEALTH	
Microbiological organisms (occupational health)	4.3.6
Noise	4.3.7

- Temperature effects on sediment transport capacity. Based on information in the GEIS, the Commission found that

  > These effects have not been found to be a problem at operating nuclear power plants and are not expected to be a problem during the license renewal term.

  The staff has not identified any significant new information during its independent review of the Exelon ER, the staff's site visit, the scoping process, or its evaluation of other available information. Therefore, the staff concludes that there are no impacts of temperature effects on sediment transport capacity during the renewal term beyond those discussed in the GEIS.

- Scouring caused by discharged cooling water. Based on information in the GEIS, the Commission found that

  > Scouring has not been found to be a problem at most operating nuclear power plants and has caused only localized effects at a few plants. It is not expected to be a problem during the license renewal term.

  The staff has not identified any significant new information during its independent review of the Exelon ER, the staff's site visit, the scoping process, or its evaluation of other available information. Therefore, the staff concludes that there are no impacts of scouring caused by discharged cooling water during the renewal term beyond those discussed in the GEIS.

- Eutrophication. Based on information in the GEIS, the Commission found that

  > Eutrophication has not been found to be a problem at operating nuclear power plants and is not expected to be a problem during the license renewal term.

  The staff has not identified any significant new information during its independent review of the Exelon ER, the staff's site visit, the scoping process, or its evaluation of other available information, including plant monitoring data and technical reports. Therefore, the staff concludes that there are no impacts of eutrophication during the renewal term beyond those discussed in the GEIS.

- Discharge of chlorine or other biocides. Based on information in the GEIS, the Commission found that

  > Effects are not a concern among regulatory and resource agencies, and are not expected to be a problem during the license renewal term.

  The staff has not identified any significant new information during its independent review of the Exelon ER, the staff's site visit, the scoping process, or its evaluation of other available information, including the National Pollutant Discharge Elimination System (NPDES) permit (IL0002224) for the Dresden site (Illinois Environmental Protection Agency [IEPA] 2000), plant monitoring data, and technical reports. Therefore, the staff concludes that there are no impacts of discharge of chlorine or other biocides during the renewal term beyond those discussed in the GEIS.

- Discharge of sanitary wastes and minor chemical spills. Based on information in the GEIS, the Commission found that

  > Effects are readily controlled through NPDES permit (IEPA 2000) and periodic modifications, if needed, and are not expected to be a problem during the license renewal term.

  The staff has not identified any significant new information during its independent review of the Exelon ER, the staff's site visit, the scoping process, or its evaluation of other available information, including the NPDES permit for the Dresden site (IEPA 2000), plant monitoring data, and technical reports. Therefore, the staff concludes that there are no impacts of discharges of sanitary wastes and minor chemical spills during the renewal term beyond those discussed in the GEIS.

- Discharge of other metals in wastewater. Based on information in the GEIS, the Commission found that

  > These discharges have not been found to be a problem at operating nuclear power plants with cooling-tower-based heat dissipation systems and have been satisfactorily mitigated at other plants. They are not expected to be a problem during the license renewal term.

  The staff has not identified any significant new information during its independent review of the Exelon ER, the staff's site visit, the scoping process, or its evaluation of other available information, including the NPDES permit for the Dresden site (IEPA 2000), which expires October 31, 2005; plant monitoring data; and technical reports. Therefore, the staff concludes that there are no impacts of discharges of other metals in wastewater during the renewal term beyond those discussed in the GEIS.

- Water-use conflicts (plants with once-through cooling systems). Based on information in the GEIS, the Commission found that

  > These conflicts have not been found to be a problem at operating nuclear power plants with once-through heat dissipation systems.

  The staff has not identified any significant new information during its independent review of the Exelon ER, the staff's site visit, the scoping process, or its evaluation of other available information. Therefore, the staff concludes that there are no impacts of water-use conflicts associated with the once-through cooling system during the renewal term beyond those discussed in the GEIS.

- Accumulation of contaminants in sediments or biota. Based on information in the GEIS, the Commission found that

  > Accumulation of contaminants has been a concern at a few nuclear power plants but has been satisfactorily mitigated by replacing copper alloy condenser tubes with those of another metal. It is not expected to be a problem during the license renewal term.

  The staff has not identified any significant new information during its independent review of the Exelon ER, the staff's site visit, the scoping process, or its evaluation of available information. Therefore, the staff concludes that there are no impacts of accumulation of contaminants in sediments or biota during the renewal term beyond those discussed in the GEIS.

- Entrainment of phytoplankton and zooplankton. Based on information in the GEIS, the Commission found that

  > Entrainment of phytoplankton and zooplankton has not been found to be a problem at operating nuclear power plants and is not expected to be a problem during the license renewal term.

  The staff has not identified any significant new information during its independent review of the Exelon ER, the staff's site visit, the scoping process, or its evaluation of other available information. Therefore, the staff concludes that there are no impacts of entrainment of phytoplankton and zooplankton during the renewal term beyond those discussed in the GEIS.

- Cold shock. Based on information in the GEIS, the Commission found that

  > Cold shock has been satisfactorily mitigated at operating nuclear plants with once-through cooling systems, has not endangered fish populations or been found to be a problem at operating nuclear power plants with cooling towers or cooling ponds, and is not expected to be a problem during the license renewal term.

  The staff has not identified any significant new information during its independent review of the Exelon ER, the staff's site visit, the scoping process, or its evaluation of other available information. Therefore, the staff concludes that there are no impacts of cold shock during the renewal term beyond those discussed in the GEIS.

- Thermal plume barrier to migrating fish. Based on information in the GEIS, the Commission found that

  > Thermal plumes have not been found to be a problem at operating nuclear power plants and are not expected to be a problem during the license renewal term.

  The staff has not identified any significant new information during its independent review of the Exelon ER, the staff's site visit, the scoping process, or its evaluation of other available information. Therefore, the staff concludes that there are no impacts of thermal plume barriers to migrating fish during the renewal term beyond those discussed in the GEIS.

- Distribution of aquatic organisms. Based on information in the GEIS, the Commission found that

  Thermal discharge may have localized effects but is not expected to effect the larger geographical distribution of aquatic organisms.

  The staff has not identified any significant new information during its independent review of the Exelon ER, the staff's site visit, the scoping process, or its evaluation of other available information. Therefore, the staff concludes that there are no impacts on the distribution of aquatic organisms during the renewal term beyond those discussed in the GEIS.

- Premature emergence of aquatic insects. Based on information in the GEIS, the Commission found that

  Premature emergence has been found to be a localized effect at some operating nuclear power plants but has not been a problem and is not expected to be a problem during the license renewal term.

  The staff has not identified any significant new information during its independent review of the Exelon ER, the staff's site visit, the scoping process, or its evaluation of other available information. Therefore, the staff concludes that there are no impacts of premature emergence of aquatic insects during the renewal term beyond those discussed in the GEIS.

- Gas supersaturation (gas-bubble disease). Based on information in the GEIS, the Commission found that

  Gas supersaturation was a concern at a small number of operating nuclear power plants with once-through cooling systems but has been satisfactorily mitigated. It has not been found to be a problem at operating nuclear power plants with cooling towers or cooling ponds and is not expected to be a problem during the license renewal term.

  The staff has not identified any significant new information during its independent review of the Exelon ER, the staff's site visit, the scoping process, or its evaluation of other available information. Therefore, the staff concludes that there are no impacts of gas supersaturation during the renewal term beyond those discussed in the GEIS.

- Low dissolved oxygen in the discharge. Based on information in the GEIS, the Commission found that

  > Low dissolved oxygen has been a concern at one nuclear power plant with a once-through cooling system but has been effectively mitigated. It has not been found to be a problem at operating nuclear power plants with cooling towers or cooling ponds and is not expected to be a problem during the license renewal term.

  The staff has not identified any significant new information during its independent review of the Exelon ER, the staff's site visit, the scoping process, or its evaluation of other available information. Therefore, the staff concludes that there are no impacts of low dissolved oxygen during the renewal term beyond those discussed in the GEIS.

- Losses from predation, parasitism, and disease among organisms exposed to sublethal stresses. Based on information in the GEIS, the Commission found that

  > These types of losses have not been found to be a problem at operating nuclear power plants and are not expected to be a problem during the license renewal term.

  The staff has not identified any significant new information during its independent review of the Exelon ER, the staff's site visit, the scoping process, or its evaluation of other available information. Therefore, the staff concludes that there are no impacts of losses from predation, parasitism, and disease among organisms exposed to sublethal stresses during the renewal term beyond those discussed in the GEIS.

- Stimulation of nuisance organisms. Based on information in the GEIS, the Commission found that

  > Stimulation of nuisance organisms has been satisfactorily mitigated at the single nuclear power plant with a once-through cooling system where previously it was a problem. It has not been found to be a problem at operating nuclear power plants with cooling towers or cooling ponds and is not expected to be a problem during the license renewal term.

  The staff has not identified any significant new information during its independent review of the Exelon ER, the staff's site visit, the scoping process, or its evaluation of other available information. Therefore, the staff concludes that there are no impacts of stimulation of nuisance organisms during the renewal term beyond those discussed in the GEIS.

- Entrainment of fish and shellfish in early life stages. Based on information in the GEIS, the Commission found that

  > Entrainment of fish has not been found to be a problem at operating nuclear power plants with this type of cooling system and is not expected to be a problem during the license renewal term.

  The staff has not identified any significant new information during its independent review of the Exelon ER, the staff's site visit, the scoping process, or its evaluation of other available information. Therefore, the staff concludes that there are no impacts of entrainment of fish and shellfish in early life stages during the renewal term beyond those discussed in the GEIS.

- Impingement of fish and shellfish. Based on information in the GEIS, the Commission found that

  > The impingement has not been found to be a problem at operating nuclear plants with this type of cooling system and is not expected to be a problem during the license renewal term.

  The staff has not identified any significant new information during its independent review of the Exelon ER, the staff's site visit, the scoping process, or its evaluation of other available information. Therefore, the staff concludes that there are no impacts of impingement of fish and shellfish during the renewal term beyond those discussed in the GEIS.

- Heat shock. Based on information in the GEIS, the Commission found that

  > Heat shock has not been found to be a problem at operating nuclear power plants with this type of cooling system and is not expected to be a problem during the license renewal term.

  The staff has not identified any significant new information during its independent review of the Exelon ER, the staff's site visit, the scoping process, or its evaluation of other available information. Therefore, the staff concludes that there are no impacts of heat shock during the renewal term beyond those discussed in the GEIS.

- Cooling tower impacts on crops and ornamental vegetation. Based on information in the GEIS, the Commission found that

  > Impacts from salt drift, icing, fogging, or increased humidity associated with cooling tower operation have not been found to be a problem at operating nuclear power plants and are not expected to be a problem during the renewal term.

  The staff has not identified any significant new information during its independent review of the Exelon ER, the staff's site visit, the scoping process, or its evaluation of other available information. Therefore, the staff concludes that there are no cooling tower impacts on crops and ornamental vegetation during the renewal term beyond those discussed in the GEIS.

- Cooling tower impacts on native plants. Based on information in the GEIS, the Commission found that

  > Impacts from salt drift, icing, fogging, or increased humidity associated with cooling tower operation have not been found to be a problem at operating nuclear power plants and are not expected to be a problem during the license renewal term.

  The staff has not identified any significant new information during its independent review of the Exelon ER, the staff's site visit, the scoping process, or its evaluation of other available information. Therefore, the staff concludes that there are no cooling tower impacts on native plants during the renewal term beyond those discussed in the GEIS.

- Bird collisions with cooling towers. Based on information in the GEIS, the Commission found that

  > These collisions have not been found to be a problem at operating nuclear power plants and are not expected to be a problem during the license renewal term.

  The staff has not identified any significant new information during its independent review of the Exelon ER, the staff's site visit, the scoping process, or its evaluation of other available information. Therefore, the staff concludes that there are no impacts of bird collisions with cooling towers during the renewal term beyond those discussed in the GEIS.

- Cooling pond impacts on terrestrial resources. Based on information in the GEIS, the Commission found that

  > Impacts of cooling ponds on terrestrial ecological resources are considered to be of small significance at all sites.

  The staff has not identified any significant new information during its independent review of the Exelon ER, the staff's site visit, the scoping process, or its evaluation of other available information. Therefore, the staff concludes that there are no impacts of cooling pond operations on terrestrial resources during the renewal term beyond those discussed in the GEIS.

- Microbiological organisms (occupational health). Based on information in the GEIS, the Commission found that

  > Occupational health impacts are expected to be controlled by continued application of accepted industrial hygiene practices to minimize worker exposures.

  The staff has not identified any significant new information during its independent review of the Exelon ER, the staff's site visit, the scoping process, or its evaluation of other available information. Therefore, the staff concludes that there are no impacts of microbiological organisms on occupational health during the renewal term beyond those discussed in the GEIS.

- Noise. Based on information in the GEIS, the Commission found that

  > Noise has not been found to be a problem at operating plants and is not expected to be a problem at any plant during the license renewal term.

  The staff has not identified any significant new information during its independent review of the Exelon ER, the staff's site visit, the scoping process, or its evaluation of other available information. Therefore, the staff concludes that there are no impacts of noise during the renewal term beyond those discussed in the GEIS.

The Category 2 issues related to cooling system operation during the renewal term applicable to Dresden Units 2 and 3 are discussed in the section that follows and are listed in Table 4-2 and discussed in the following sections.

Table 4-2. Category 2 Issues Applicable to the Operation of the Dresden Units 2 and 3 Cooling System During the Renewal Term

ISSUE—10 CFR Part 51, Subpart A, Appendix B, Table B-1	GEIS Section	10 CFR 51.53(c)(3)(ii) Subparagraph	SEIS Section
SURFACE-WATER QUALITY, HYDROLOGY, AND USE (FOR ALL PLANTS)			
Water use conflicts (plants with cooling ponds or cooling towers using makeup water from a small river with low flow)	4.3.2.1; 4.4.2.1	A	4.1.1
AQUATIC ECOLOGY (FOR PLANTS WITH ONCE-THROUGH AND COOLING POND HEAT-DISSIPATION SYSTEMS)			
Entrainment of fish and shellfish in early life stages	4.2.2.1.2; 4.4.3	B	4.1.2
Impingement of fish and shellfish	4.2.2.1.3; 4.4.3	B	4.1.3
Heat shock	4.2.2.1.4; 4.4.3	B	4.1.4
HUMAN HEALTH			
Microbiological organisms (public health)(plants using lakes or canals, or cooling towers or cooling ponds that discharge into a small river)	4.3.6	G	4.1.5

4.1.1 Water-Use Conflicts (Plants with Cooling Ponds or Cooling Towers Using Makeup Water from a Small River with Low Flow)

The NRC specifies in 10 CFR 51.53(3)(ii)(A) that "if the applicant's plant utilizes cooling towers or cooling ponds and withdraws makeup water from a river whose annual flow rate is less than 3.15×10^{12} ft^3/yr (9×10^{10} m^3/yr), an assessment of the impact of the proposed action on the flow of the river and related impacts on instream and riparian ecological communities must be provided." For water use conflicts, the NRC further states in 10 CFR Part 51, Subpart A, Appendix B, Table B-1, "The issue has been a concern at nuclear power plants with cooling ponds and at plants with cooling towers. Impacts on instream and riparian communities near these plants could be of moderate significance in some situations."

This issue is applicable to Dresden because the plant uses cooling canals, a cooling pond, and cooling towers; and it ultimately discharges to the Illinois River, which has a mean annual flow of 9.6×10^9 m^3/yr (3.4×10^{11} ft^3/yr) (U.S. Geological Survey [USGS] 2000) at the confluence of the two rivers and is categorized as a small river. The annual mean flow of the Illinois River at the USGS gaging station at Marseilles, Illinois, was used to represent flow at the Des Plaines River and the Kankakee River confluence. This gaging station is the closest USGS station to

Dresden on the Illinois River, located approximately 42.7 km (26.5 river mi) downstream of Dresden. The flow data used extend over the period from water years (October through September) 1920 to 1999. The flow data also indicate a historical lowest recorded daily mean flow of 41 m^3/s (1460 ft^3/s) occurred on October 16, 1943, and November 10, 1999 (USGS 2000).

During its indirect open-cycle operation, Dresden withdraws up to 3566 m^3/min (2099 ft^3/s) of water from the Kankakee River side of the Dresden Pool for condenser cooling. During the closed-cycle operation, Dresden withdraws approximately 265 m^3/min (156 ft^3/s) from the Kankakee River side of the Dresden Pool to compensate for evaporative, seepage, and blowdown losses in the cooling pond. Approximately 76 m^3/min (45 ft^3/s) of the river water withdrawn is makeup water for that lost to evaporation and seepage from the cooling pond. This represents 3 percent of the historical lowest recorded daily mean flow. During the indirect open-cycle operation, Dresden withdraws approximately 148 m^3/min (87 ft^3/s) of water as makeup water for that lost to evaporation and seepage from the cooling pond (85 m^3/min) [50 ft^3/s]) and cooling towers (63 m^3/min [37 ft^3/s]). Therefore, approximately 4.2 percent of the water withdrawn is lost to evaporation and seepage. Makeup water represents approximately 6 percent of the historical, lowest recorded daily mean flow for the Illinois River near Marseilles, Illinois. Changes in the Dresden Pool level at the confluence of the Kankakee and the Illinois Rivers caused by Dresden operations (i.e., evaporative losses and seepage) are SMALL. In conclusion, any impacts from Dresden on instream and riparian communities in the area of the Dresden intakes over the license renewal term would be SMALL and would not warrant mitigation.

The staff reviewed the *Clean Water Act (CWA) Section 316(a) Demonstration for Dresden* Units 2 and 3 and the ER relative to potential groundwater-use conflicts due to consumptive loss of aquifer recharge. Based on this review, the staff has concluded that the potential impacts are SMALL, and that additional mitigation is not warranted.

4.1.2 Entrainment of Fish and Shellfish in Early Life Stages

For power plants with cooling pond heat-dissipation systems, the entrainment of fish and shellfish in early life stages into cooling water systems associated with nuclear power plants is considered a Category 2 issue, requiring a site-specific assessment before license renewal.

The staff independently reviewed the Dresden Units 2 and 3 ER, visited the site, and reviewed the applicant's NPDES permit (IEPA 2000).

Section 316(b) of the CWA requires that the location, design, construction, and capacity of cooling water intake structures reflect the best technology available for minimizing adverse environmental impacts (33 USC 1326). Entrainment through the condenser cooling system of fish and shellfish in the early life stages is a potential adverse environmental impact that can be minimized by the best available technology. Exelon (as Commonwealth Edison [ComEd]) conducted a comprehensive CWA Section 316(b) Demonstration for the U.S. Environmental Protection Agency (EPA) for Dresden Units 2 and 3.

The 1976 entrainment study used for the 316(b) Demonstration was conducted during the period of reproductive activity (April through August), and included weekly quantitative sampling for fish eggs and larvae in the Des Plaines and Kankakee Rivers and at the station intake (ComED 1977). Fish eggs were not identified to taxonomic level. An estimated 1.1×10^8 fish eggs were entrained during the sampling period, representing 47 percent of the eggs estimated to be in the Kankakee River drift and 38 percent of the eggs estimated to be in the combined drift of the Kankakee and the Des Plaines Rivers. Over 91 percent of the egg entrainment occurred during June 1976. The impacts of high egg entrainment levels on the fish population were not considered to be significant because fish egg mortality rates are normally high, the eggs of most fish in the study area are nonbuoyant or adhesive and do not normally occur in the drift, and fecundity is generally high for species that produce buoyant or semi-buoyant eggs and occur in the study area.

An estimated 7.7×10^7 larvae were entrained during the five-month study period, representing 32 percent of the total number of larvae estimated in the Kankakee River drift and 19 percent of the combined drift of the Kankakee and Des Plaines Rivers. Entrainment of fish larvae was highest in June, representing 63 percent of total estimated entrainment during the sampling period. Entrainment impact was highest among suckers, representing 74 percent of the total number of larvae estimated in the Kankakee River drift and 57 percent of the combined drift of the Kankakee and the Des Plaines Rivers; herring, 55 percent of the Kankakee population and 46 percent of the combined Kankakee/Des Plaines population); and channel catfish, 41 percent of the Kankakee population and 38 percent of the combined Kankakee/Des Plaines population. Although the impact of larval entrainment on the fish population was not quantified, it was not considered to be significant because larval mortality rates are normally high, the number of larvae in the drift represents only a small percentage of their number in the river, and some larval fish survive entrainment. The 316(b) Demonstration concluded that no significant detrimental effects had occurred in the population of organisms in the Dresden pool between the pre- and post-operational periods of study as a result of the operation of Dresden Units 2 and 3 (ComEd 1987). Subsequent NPDES permits, which are renewed every five years, have required no further entrainment studies. In compliance with the provisions of the CWA and the Illinois Environmental Protection Act, Illinois issued the current NPDES permit (IEPA 2000), which expires on October 31, 2005.

The staff has reviewed the available information. Based on the results of the entrainment studies, fisheries studies, and the operating history of the Dresden Units 2 and 3 intake structure, the staff concludes that the potential impacts of entrainment of fish and shellfish in the early life stages in the cooling water intake system are SMALL. During the course of the SEIS preparation, the staff considered mitigation measures for the continued operation of Dresden Units 2 and 3. When continued operation for an additional 20 years is considered as a whole, all of the specific effects on the environment (whether or not "significant") were considered. Because there are no demonstrated, significant effects to the Dresden Pool fish population related to entrainment, the staff concludes that the measures in place (cooling canal, cooling towers, and cooling pond) provide mitigation for all impacts related to entrainment, and no further mitigation measures are warranted.

4.1.3 Impingement of Fish and Shellfish

For power plants with cooling pond intake systems, impingement of fish and shellfish on debris screens of cooling water systems associated with nuclear power plants is considered a Category 2 issue, requiring a site-specific assessment before license renewal.

The staff independently reviewed the Dresden Units 2 and 3 ER, visited the site, and reviewed the applicant's NPDES permit (IEPA 2000).

Section 316(b) of the CWA requires that the location, design, construction, and capacity of cooling water intake structures reflect the best technology available for minimizing adverse environmental impacts (33 USC 1326). The designed operation criteria are maintained in part by the removal of sediments that are deposited in the canal. Maintenance of the designed depth for the intake canal helps ensure that approach velocities at the screens meet criteria. The impingement of fish and shellfish on debris screens of the cooling system is a potential adverse environmental impact that can be minimized by the best available technology. Exelon (as ComEd) conducted a comprehensive CWA Section 316(b) Demonstration for the EPA for Dresden Units 2 and 3.

Impingement studies were conducted for a period of a year in 1975–76 for the 316(b) Demonstration (ComEd 1977) and again from June 15 to September 30 in 1986 (ComEd 1987). Gizzard shad was the most commonly impinged species, both numerically and in terms of biomass. Other species that comprised greater than 1 percent of the samples by number or weight included freshwater drum, channel catfish, emerald shiner, common carp, trout-perch, golden redhorse, smallmouth buffalo, and bluegill. Impingement rates were highest in late summer and early winter in the 1975–76 full-year study, and in August and September in the 1986 study. Both studies showed that small, young-of-year fish were the most frequently impinged due to their small size and high abundance (ComEd 1977, 1987). Larger, reproductively mature fish constituted a small portion of impingement losses. The 316(b) Demonstration concuded that no significant detrimental effects had occurred in the population of organisms in the Dresden Pool between the pre- and post-operational periods of study as a result of the operation of Dresden Units 2 and 3 (ComEd 1977). In compliance with the provisions of the CWA and the Illinois Environmental Protection Act, Illinois issued Dresden its current NPDES permit.

The staff has reviewed the available information. Based on the results of impingement studies, fish population studies, and the operating history of the Dresden Units 2 and 3 intake structure, the staff concludes that the potential impacts of impingement of fish and shellfish on the debris screens of the cooling water intake system are SMALL. During the course of the SEIS preparation, the staff considered mitigation measures for the continued operation of Dresden Units 2 and 3. When continued operation for an additional 20 years is considered as a whole, all of the specific effects on the environment (whether or not "significant") were considered. Because there are no demonstrated, significant effects to Dresden Pool fish communities related to impingement, the staff concludes that the measures in place (intake screens, cooling canal, cooling towers, and cooling pond) provide mitigation for all impacts related to impingement, and that no further mitigation measures are warranted.

4.1.4 Heat Shock

For power plants with once-through cooling systems, the effects of heat shock are listed as a Category 2 issue and require plant-specific evaluation before license renewal. NRC made impacts on fish and shellfish resources that resulted from heat shock a Category 2 issue because of continuing concerns about thermal discharge effects and the possible need to modify thermal discharges in the future in response to changing environmental conditions (NRC 1996).

The staff independently reviewed the Dresden Units 2 and 3 ER, visited the site, and reviewed the applicant's NPDES permit (IEPA 2000).

The operation of Dresden Units 2 and 3 utilizes a cooling pond, cooling towers, and withdrawals from the Kankakee River. The plant discharges to the Illinois River. The cooling system can be operated in either an indirect open-cycle or closed-cycle mode. Cooling towers can be used for supplemental cooling in either mode. Exelon also has Section 316(a) alternative thermal effluent limits. Section 316(a) of the CWA establishes a process whereby a thermal effluent discharger can demonstrate that thermal discharge limitations are more stringent than necessary to protect a balanced indigenous population of fish and wildlife, and obtain alternative facility-specific thermal discharge limits (33 USC 1326). Exelon (as ComEd) complied with 35 Illinois Administrative Code 302.211(f) and Section 316(a) of the CWA in demonstrating that the thermal discharge from Dresden Units 2 and 3 has not caused and cannot be reasonably expected to cause significant ecological damage to receiving waters as approved by the Illinois Pollution Control Board (IPCB) in PCB Order 73-359 (January 17, 1974) and PCB Order 73-1345 (July 9, 1981). The variance approval has become part of each subsequent NPDES permit as a Special Condition. The current NPDES permit expires on October 31, 2005.

In the past, Dresden site discharges above NPDES permit thermal limits have occurred. Exelon received one provisional variance from NPDES permit thermal limits in 2001 and two provisional variances from thermal limits in 1999 from the IPCB. The 2001 provisional variance was provided to allow restoration efforts in the Dresden Units 2 and 3 cooling towers to proceed. One of the 1999 provisional variances allowed additional hours to discharge water at temperatures between 90° and 93°F. The other 1999 provisional variance allowed extension of indirect open-cycle operation for 21 days. Both provisional variances in 1999 were the result of an extended heat wave and drought. Exelon conducted biological studies to characterize the response of fish and other aquatic life to the thermal conditions resulting from the provisional variances. Results of these studies indicated that the fish community near the Dresden site was not adversely impacted by the thermal conditions that resulted from the provisional variances in 1999 (ComEd 2000) or 2001 (Exelon 2002b). No fish kills or beds of dead or dying aquatic macrophytes were observed. As expected, there was a change in fish distribution during the higher temperature periods; temperature-tolerant fish remained in the warmer areas, and less temperature-tolerant species temporarily moved to other areas. As the temperatures decreased, fish diversity and abundance returned to previous levels (ComEd 2000; Exelon 2002b).

The staff has reviewed the available information and, based on the conditions of the NPDES permit and the operating history of the Dresden Units 2 and 3 discharge, concludes that the potential impacts of discharging heated water from the cooling water intake system are so minor that they will not noticeably alter any component of the aquatic ecosystem and are, therefore, SMALL. During the course of the SEIS preparation, the staff considered mitigation measures for the continued operation of Dresden Units 2 and 3. When continued operation for an additional 20 years is considered as a whole, all of the specific effects on the environment (whether or not "significant") were considered. Because the heated water discharged into the Dresden Pool does not change the temperature enough to adversely impact a balanced, indigenous population of fish and wildlife, the staff concluded that the measures in place (e.g., cooling canals, cooling towers, and cooling pond) provide mitigation for all impacts related to heat shock, and that no further mitigation measures are warranted.

4.1.5 Microbiological Organisms (Public Health)

For power plants discharging cooling water to cooling ponds, lakes, canals, or small rivers, the effects of microbiological organisms on human health are listed as a Category 2 issue and require plant-specific evaluation before license renewal. This issue is applicable to Dresden Units 2 and 3 because the plant uses cooling canals, cooling towers, and a cooling pond, and discharges to a small river. The Illinois River is categorized as a small river (USGS 2000) and has an average annual flow of 9.6×10^9 m^3/yr (3.4×10^{11} ft^3/yr) at the gaging station at Marseilles, Illinois, about 43 km (26.5 mi) downstream of Dresden Units 2 and 3. In addition, there is public access to the Illinois River, including recreational fishing, swimming, water skiing, and boating.

The Category 2 designation is based on the potential for public health impacts associated with thermal enhancement of *Naegleria fowleri*, a pathogenic amoeba, and other enteric pathogens that could not be determined generically. NRC noted that impact of nuclear plant cooling towers and thermal discharges are considered to be of small significance if they do not enhance the presence of microorganisms that are detrimental to water quality and public health (NRC 1999a). The assessment criteria relate to thermal discharge temperature, thermal characteristics, thermal conditions for the enhancement of *N. fowleri* and other pathogens, and impact to public health.

The mean maximum monthly discharge temperature at Dresden Units 2 and 3 from January 1998 through September 2001 was 26.8°C (80.3°F) with a range of monthly maximum temperatures from 12.8°C (55.1°F) in February 1999 to 38°C (100.5°F) in July 1999. During warmer months (May through October), river temperatures could support survival of thermophilic microorganisms; however, temperatures are generally below the range most conducive to their growth. Disinfection of the sewage treatment plant effluent from the Dresden site reduces the likelihood that a seed source or inoculant would be introduced to the cooling canals, cooling pond, or the Illinois River. Additional cooling towers are scheduled to be added (Exelon 2002a), which will further reduce discharge temperatures.

Exelon corresponded with the Illinois Department of Public Health (IDPH), requesting information on any studies that the agency might have conducted concerning *N. fowleri* or other thermophilic microorganisms in the vicinity of the Dresden site and any concerns the agency might have relative to these organisms (Jury 2002a). IDPH responded that the agency had not conducted any sampling in the discharge area; but based on the reported average temperatures in the discharge canal, the IDPH did not anticipate that there would be any appreciable public health risk from thermophilic microorganisms attributable to the operations of Dresden Units 2 and 3 (Mudgett 2002).

The staff independently reviewed the Dresden Units 2 and 3 ER, visited the site, and reviewed the applicant's NPDES permit (IEPA 2000). Based on its review, the staff does not expect that operation of Dresden Units 2 and 3 cooling systems will change significantly over the license renewal term; and there is no reason to believe that discharge temperatures will increase, or that disinfection would cease. Thus, the staff concludes that potential effects of microbiological organisms on human health, resulting from the operation of the plant's cooling water discharge to the aquatic environment or in the vicinity of the site, are SMALL. The staff also concludes that the mitigation in place at the Dresden site (i.e., the management of the discharge temperatures into the Illinois River and sewage treatment) will control any potential growth of thermophilic microbiological organisms, and no further mitigation measures are warranted.

4.2 Transmission Lines

Five 345-kV transmission lines connecting Dresden Units 2 and 3 to the transmission system were identified in the final environmental statement (FES) for operation of Dresden Units 2 and 3 (AEC 1973). The applicant 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.

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 mi) and cover about 2440 ha (6030 ac). The corridors pass through land that is primarily flat farmland with a minimal 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. Commonwealth Edison plans to maintain these transmission lines indefinitely.

Exelon maintains 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. This allows the elimination of undesirable species while preserving grasses, herbs, forbs, shrubs, and other low-growing vegetation. Herbicide application is performed according to label specifications by certified applicators.

Category 1 issues in 10 CFR Part 51, Subpart A, Appendix B, Table B-1, that are applicable to transmission lines from Dresden Units 2 and 3 are listed in Table 4-3. Exelon stated in its ER that it is not aware of any new and significant information associated with the renewal of the Dresden Units 2 and 3 operating licenses (OLs). The staff has not identified any significant new information during its independent review of the Exelon ER, the staff's site visit, the scoping process, or its evaluation of other available information. Therefore, the staff concludes that there are no impacts related to these issues beyond those discussed in the GEIS. For all of those issues, the staff concluded in the GEIS that the impacts are SMALL, and that additional plant-specific mitigation measures are not likely to be sufficiently beneficial to be warranted.

Table 4-3. Category 1 Issues Applicable to the Dresden Transmission Lines During the Renewal Term

ISSUE—10 CFR Part 51, Subpart A, Appendix B, Table B-1	GEIS Section
TERRESTRIAL RESOURCES	
Power line right-of-way (ROW) management (cutting and herbicide application)	4.5.6.1
Bird collisions with power lines	4.5.6.2
Impacts of electromagnetic fields on flora and fauna (plants, agricultural crops, honeybees, wildlife, livestock)	4.5.6.3
Floodplains and wetlands on power line ROW	4.5.7
AIR QUALITY	
Air quality effects of transmission lines	4.5.2
LAND USE	
Onsite land use	4.5.3
Power line ROW	4.5.3

A brief description of the staff's review and GEIS conclusions, as codified in Table B-1, for each of these issues follows:

- Power line ROW management (cutting and herbicide application). Based on information in the GEIS, the Commission found that

  > The impacts of right-of-way maintenance on wildlife are expected to be of small significance at all sites.

  The staff has not identified any significant new information during its independent review of the Exelon ER, the staff's site visit, the scoping process, consultation with the U.S. Fish and Wildlife Service (FWS), or its evaluation of other information. Therefore, the staff concludes that there are no impacts of power line ROW maintenance during the renewal term beyond those discussed in the GEIS.

- Bird collisions with power lines. Based on information in the GEIS, the Commission found that

  > Impacts are expected to be of small significance at all sites.

The staff has not identified any significant new information during its independent review of the Exelon ER, the staff's site visit, the scoping process, consultation with the FWS, or its evaluation of other information. Therefore, the staff concludes that there are no impacts of bird collisions with power lines during the renewal term beyond those discussed in the GEIS.

- Impacts of electromagnetic fields on flora and fauna (plants, agricultural crops, honeybees, wildlife, livestock). Based on information in the GEIS, the Commission found that

  > No significant impacts of electromagnetic fields on terrestrial flora and fauna have been identified. Such effects are not expected to be a problem during the license renewal term.

  The staff has not identified any significant new information during its independent review of the Exelon ER, the staff's site visit, the scoping process, or its evaluation of other information. Therefore, the staff concludes that there are no impacts of electromagnetic fields on flora and fauna during the renewal term beyond those discussed in the GEIS.

- Floodplains and wetlands on power line ROWs. Based on information in the GEIS, the Commission found that

  > Periodic vegetation control is necessary in forested wetlands underneath power lines and can be achieved with minimal damage to the wetlands. No significant impact is expected at any nuclear power plant during the license renewal term.

  The staff has not identified any significant new information during its independent review of the Exelon ER, the staff's site visit, the scoping process, consultation with the FWS, or its evaluation of other information. Therefore, the staff concludes that there are no impacts of power line ROWs on floodplains and wetlands during the renewal term beyond those discussed in the GEIS.

- Air quality effects of transmission lines. Based on the information in the GEIS, the Commission found that

  > Production of ozone and oxides of nitrogen is insignificant and does not contribute measurably to ambient levels of these gases.

The staff has not identified any significant new information during its independent review of the Exelon ER, the staff's site visit, the scoping process, or its evaluation of other information. Therefore, the staff concludes that there are no air quality impacts of transmission lines during the renewal term beyond those discussed in the GEIS.

- Onsite land use. Based on the information in the GEIS, the Commission found that

  > Projected onsite land use changes required during . . . the renewal period would be a small fraction of any nuclear power plant site and would involve land that is controlled by the applicant.

  The staff has not identified any significant new information during its independent review of the Exelon ER, the staff's site visit, the scoping process, or its evaluation of other information. Therefore, the staff concludes that there are no onsite land-use impacts during the renewal term beyond those discussed in the GEIS.

- Power line ROW (land use). Based on information in the GEIS, the Commission found that

  > Ongoing use of power line right of ways would continue with no change in restrictions. The effects of these restrictions are of small significance.

  The staff has not identified any significant new information during its independent review of the Exelon ER, the staff's site visit, the scoping process, or its evaluation of other information. Therefore, the staff concludes that there are no impacts of power line ROWs during the renewal term beyond those discussed in the GEIS.

There is one Category 2 issue related to transmission lines, and another issue related to transmission lines is being treated as a Category 2 issue. These issues are listed in Table 4-4 and are discussed in Sections 4.2.1 and 4.2.2.

Table 4-4. Category 2 and Uncategorized Issues Applicable to the Dresden Transmission Lines During the Renewal Term

ISSUE—10 CFR Part 51, Subpart A, Appendix B, Table B-1	GEIS Section	10 CFR 51.53(c)(3)(ii) Subparagraph	SEIS Section
	HUMAN HEALTH		
Electromagnetic fields, acute effects (electric shock)	4.5.4.1	H	4.2.1
Electromagnetic fields, chronic effects	4.5.4.2	NA	4.2.2

4.2.1 Electromagnetic Fields—Acute Effects

In the GEIS, the Commission found that without a review of the conformance of each nuclear plant transmission line with National Electrical Safety Code (NESC) (Institute of Electrical and Electric Engineeers [IEEE] 1997) criteria, it is not possible to determine the significance of the electric shock potential. Evaluation of individual plant transmission lines is necessary because the issue of electric shock safety was not addressed in the licensing process for some plants. For other plants, land use in the vicinity of transmission lines may have changed; or power distribution companies may have chosen to upgrade line voltage. To comply with 10 CFR 51.53(c)(3)(ii)(H), the applicant must provide an assessment of the potential shock hazard if the transmission lines that were constructed for the specific purpose of connecting the plant to the transmission system do not meet the recommendations of the NESC for preventing electric shock from induced currents.

Five 345-kV transmission lines connecting Dresden Units 2 and 3 to the transmission system were identified in the FES for operation of Dresden Units 2 and 3 (AEC 1973). These lines included a pair of 1.8-km-long (1.1-mi-long) lines to existing transmission lines between the Pontiac substation (south) and the Electric Junction substation (north), a new line from Dresden to the Electric Junction substation (50 km [31.1 mi]), and a pair of new lines from Dresden to the Goodings Grove substation (48 km [29.8 mi]). Potential electric shock impacts of these lines were not addressed in the FES.

The applicant 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. Each of the seven lines has been reviewed to identify the configuration where the potential for current-induced shock would be the greatest. The electric field strength and induced current were calculated for each limiting configuration using the AC/DC LINE computer code produced by the Electric Power Research Institute (EPRI 1991).

The only line for which the calculated induced current exceeded the NESC 5-mA induced current standard was the line to the Pontiac substation. The location where the calculated induced current exceeded the standard is in a portion of line to the Pontiac substation that was not constructed to connect Dresden Units 2 and 3 to the transmission system. The calculated induced current was 5.2 mA, which, although greater than the NESC standard, is lower than the limiting current for ground-fault interrupts installed in homes.

The staff has reviewed the applicant's evaluation and computational results. Based on this review, the staff concludes that the impact of the potential for electric shock is SMALL, and that no further mitigation measures are warranted.

4.2.2 Electromagnetic Fields—Chronic Effects

In the GEIS, the chronic effects of 60-Hz electromagnetic fields from power lines were not designated as Category 1 or 2 and will not be until a scientific consensus is reached on the health implications of these fields.

The potential for chronic effects from these fields continues to be studied and is not known at this time. The National Institute of Environmental Health Sciences (NIEHS) directs related research through the U.S. Department of Energy. A 1999 NIEHS report contains the following conclusion:

> The NIEHS concludes that ELF-EMF [extremely low frequency-electromagnetic field] exposure cannot be recognized as entirely safe because of weak scientific evidence that exposure may pose a leukemia hazard. In our opinion, this finding is insufficient to warrant aggressive regulatory concern. However, because virtually everyone in the United States uses electricity and therefore is routinely exposed to ELF-EMF, passive regulatory action is warranted such as a continued emphasis on educating both the public and the regulated community on means aimed at reducing exposures. The NIEHS does not believe that other cancers or non-cancer health outcomes provide sufficient evidence of a risk to currently warrant concern (NIEHS 1999).

This statement is not sufficient to cause the staff to change its position with respect to the chronic effects of electromagnetic fields. The staff considers the GEIS finding of "not applicable" still appropriate and will continue to follow developments on this issue.

4.3 Radiological Impacts of Normal Operations

Category 1 issues in 10 CFR Part 51, Subpart A, Appendix B, Table B-1, that are applicable to Dresden Units 2 and 3 in regard to radiological impacts are listed in Table 4-5. Exelon stated in its ER (Exelon 2003a) that it is not aware of any new and significant information associated with the renewal of the Dresden Units 2 and 3 OLs.

The staff has not identified any significant new information during its independent review of the Exelon ER, the staff's site visit, the scoping process, or its evaluation of other information. Therefore, the staff concludes that there are no impacts related to these issues beyond those discussed in the GEIS. For all of those issues, the staff concluded in the GEIS that the impacts are SMALL, and that additional plant-specific mitigation measures are not likely to be sufficiently beneficial to be warranted.

Table 4-5. Category 1 Issues Applicable to Radiological Impacts of Normal Operations During the Renewal Term

ISSUE—10 CFR Part 51, Subpart A, Appendix B, Table B-1	GEIS Section
HUMAN HEALTH	
Radiation exposures to public (license renewal term)	4.6.2
Occupational radiation exposures (license renewal term)	4.6.3

A brief description of the staff's review and the GEIS conclusions, as codified in Table B-1, for each of these issues follows:

- Radiation exposures to public (license renewal term). Based on information in the GEIS, the Commission found that

  > Radiation doses to the public will continue at current levels associated with normal operations.

  The staff has not identified any significant new information during its independent review of the Exelon ER, the staff's site visit, the scoping process, or its evaluation of other available information. Therefore, the staff concludes that there are no impacts of radiation exposures to the public during the renewal term beyond those discussed in the GEIS.

- Occupational radiation exposures (license renewal term). Based on information in the GEIS, the Commission found that

  > Projected maximum occupational doses during the license renewal term are within the range of doses experienced during normal operations and normal maintenance outages and would be well below regulatory limits.

  The staff has not identified any significant new information during its independent review of the Exelon ER, the staff's site visit, the scoping process, or its evaluation of other available information. Therefore, the staff concludes that there are no impacts of occupational radiation exposures during the renewal term beyond those discussed in the GEIS.

There are no Category 2 issues related to radiological impacts of routine operations.

In another venue [an NRC scoping meeting on July 10, 2003, to update the GEIS (NUREG-1437) that was held in Oaklawn, IL], a member of the public raised concerns regarding effluent releases from the Dresden Nuclear Power Plant. The concern related to information indicating that Dresden had the highest airborne radioactive emissions of the 72 US nuclear sites. Nuclear power plants are designed to release radiological effluents to the environment. The amount of radioactive material released to the environment does vary from facility to facility and is dependent on the type of facility, the size of the facility, the length of time the facility has operated and other factors. Liquid and gaseous effluent releases must meet requirements in 10 CFR Part 20, Appendix B, Table 2. These limits are designed to be protective of the health and safety of the public and the environment. As part of the environmental review for the Dresden license renewal application, the NRC staff reviewed reports from the Dresden environmental program for the last several years. Based on the data, releases to the environment were well below regulatory limits (see Section 2.2.7). NRC routinely performs inspections of the licensee's environmental monitoring program. The procedures and results of the monitoring programs are inspected and reviewed by NRC staff to ensure requirements are being met. Therefore, even if Dresden has higher releases relative to other nuclear power plants, the amount of radioactive material released to the environment is still well within regulatory requirements and protective of the health and safety of the public.

4.4 Socioeconomic Impacts of Plant Operations During the License Renewal Period

Category 1 issues in 10 CFR Part 51, Subpart A, Appendix B, Table B-1, that are applicable to socioeconomic impacts during the renewal term are listed in Table 4-6. Exelon stated in its ER that it is not aware of any new and significant information associated with the renewal of Dresden Units 2 and 3 OLs (Exelon 2003a). The staff has not identified any significant new information during its independent review of the Exelon ER, the staff's site visit, the scoping process, or its evaluation of other information. Therefore, the staff concludes that there are no impacts related to these issues beyond those discussed in the GEIS (NRC 1996). For these issues, the staff concluded in the GEIS that the impacts are SMALL, and that additional plant-specific mitigation measures are not likely to be sufficiently beneficial to be warranted.

Table 4-6. Category 1 Issues Applicable to Socioeconomics During the Renewal Term

ISSUE—10 CFR Part 51, Subpart A, Appendix B, Table B-1	GEIS Section
SOCIOECONOMICS	
Public services: public safety, social services, and tourism and recreation	4.7.3; 4.7.3.3; 4.7.3.4; 4.7.3.6
Public services: education (license renewal term)	4.7.3.1
Aesthetic impacts (license renewal term)	4.7.6
Aesthetic impacts of transmission lines (license renewal term)	4.5.8

A brief description of the staff's review and the GEIS conclusions, as codified in Table B-1, for each of these issues follows:

- Public services: public safety, social services, and tourism and recreation. Based on information in the GEIS, the Commission found that

    Impacts to public safety, social services, and tourism and recreation are expected to be of small significance at all sites.

    The staff has not identified any significant new information during its independent review of the Exelon ER, the staff's site visit, the scoping process, or its evaluation of other available information. Therefore, the staff concludes that there are no impacts on public safety, social services, and tourism and recreation during the renewal term beyond those discussed in the GEIS.

- Public services: education (license renewal term). Based on information in the GEIS, the Commission found that

    Only impacts of small significance are expected.

    The staff has not identified any significant new information during its independent review of the Exelon ER, the staff's site visit, the scoping process, or its evaluation of other available information. Therefore, the staff concludes that there are no impacts on education during the renewal term beyond those discussed in the GEIS.

- Aesthetic impacts (license renewal term). Based on information in the GEIS, the Commission found that

    No significant impacts are expected during the license renewal term.

    The staff has not identified any significant new information during its independent review of the Exelon ER, the staff's site visit, the scoping process, or its evaluation of other available information. Therefore, the staff concludes that there are no aesthetic impacts during the renewal term beyond those discussed in the GEIS.

- Aesthetic impacts of transmission lines (license renewal term). Based on information in the GEIS, the Commission found that

    No significant impacts are expected during the license renewal term.

    The staff has not identified any significant new information during its independent review of the Exelon ER, the staff's site visit, the scoping process, or its evaluation of other available information. Therefore, the staff concludes that there are no aesthetic impacts of transmission lines during the renewal term beyond those discussed in the GEIS.

Table 4-7 lists the Category 2 socioeconomic issues, which require plant-specific analysis and environmental justice, which was not addressed in the GEIS.

Table 4-7. Environmental Justice and GEIS Category 2 Issues Applicable to Socioeconomics During the Renewal Term

ISSUE—10 CFR Part 51, Subpart A, Appendix B, Table B-1	GEIS Section	10 CFR 51.53(c)(3)(ii) Subparagraph	SEIS Section
	SOCIOECONOMICS		
Housing Impacts	4.7.1	I	4.4.1
Public services: public utilities	4.7.3.5	I	4.4.2
Offsite land use (license renewal term)	4.7.4	I	4.4.3
Public Services, transportation	4.7.3.2	J	4.4.4
Historic and archaeological resources	4.7.7	K	4.4.5
Environmental Justice	Not addressed[a]	Not addressed[a]	4.4.6

(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. Therefore, environmental justice must be addressed in the licensee's ER and the staff's environmental impact statement.

4.4.1 Housing Impacts During Operations

In determining housing impacts, the applicant chose to follow Appendix C of the GEIS (NRC 1996), which presents a population characterization method that is based on two factors, "sparseness" and "proximity" (GEIS, Section C.1.4 [NRC 1996, 1999b]). Sparseness measures population density within 32 km (20 mi) of the site, and proximity measures population density and city size within 80 km (50 mi). Each factor has categories of density and size (GEIS Table C.1), and a matrix is used to rank the population category as low, medium, or high (GEIS Figure C.1).

According to the U.S. Bureau of the Census (USBC) 2000 information, the population living within 32 km (20 mi) of the Dresden site was estimated to be approximately 338,000 (Exelon 2003). This translates to about 103 persons/km^2 (270 persons/mi^2) living on the land area present within a 32-km (20-mi) radius of the Dresden site. This concentration falls into the GEIS sparseness Category 4 (i.e., having greater than or equal to 46 persons/km^2

[120 persons/mi^2]). As estimated from the USBC 2000 information, at least 7 million people live within 80 km (50 mi). This equates to a population density of 350 persons/km^2 (900 persons/mi^2) within 80 km (50 mi). Applying the GEIS proximity measures (NRC 1996), Dresden is classified as Category 4 (i.e., having greater than or equal to 73 persons/km^2 [190 persons/mi^2]) within 80 km (50 mi) of the site. According to the GEIS, these sparseness and proximity scores identify that Dresden is located in a high-population area.
In 10 CFR Part 51, Subpart A, Appendix B, Table B-1, NRC concluded that impacts on housing availability are expected to be of small significance at plants located in a high-population area where growth control measures are not in effect. The Dresden site is located in a high-population area and, although both Grundy and Will counties and their municipal governments attempt to direct growth within the established growth boundaries without sprawl, growth control measures are not in effect.

SMALL impacts result when no discernible change in housing availability occurs, changes in rental rates and housing values are similar to those occurring statewide, and no housing construction or conversion is required to meet new demand (NRC 1996). The GEIS assumes that no more than a total additional staff of 60 permanent workers might be needed at each unit during the license renewal period to perform routine maintenance and other activities. Exelon expects to add no more than 60 total employees to the permanent staff during license renewal to perform these routine activities. This addition of 60 permanent workers, plus 111 indirect jobs (Exelon 2003a), would result in an increased demand for a total of 171 housing units around the Dresden site (or 123 housing units for Grundy and Will counties).[a] The demand for the existing housing units could be met with the construction of new housing or the use of existing, unoccupied housing. In an area that has a population of more than 500,000, this demand would not create a discernible change in housing availability, change in rental rates or housing values, or spur much new construction or conversion. As a result, Exelon concludes that the impacts would be SMALL, and that mitigation measures would not be necessary (Exelon 2003).[b]

The staff reviewed the available information relative to housing impacts and Exelon's conclusions. Based on this review, the staff concludes that the impact on housing during the license renewal period would be SMALL, and that no further mitigation measures are warranted.

(a) This assumes that 72 percent of the new hires would reside in the two counties (see Section 2.2.8.1).

(b) Exelon's estimate of 123 housing units is likely to be an extreme "upper bound" estimate. Most of the potentially new jobs would most likely be filled by existing area residents, thus creating no, or little, net demand for housing.

4.4.2 Public Services: Public Utility Impacts During Operations

Impacts on public utility services are considered SMALL if there is little or no change in the ability of the system to respond to the level of demand and, thus, there is no need to add capital facilities. Impacts are considered MODERATE if overtaxing of service capabilities occurs during periods of peak demand. Impacts are considered LARGE if existing levels of service (e.g., water or sewer services) are substantially degraded and additional capacity is needed to meet ongoing demands for services. The GEIS indicates that, in the absence of new and significant information to the contrary, the only impacts on public utilities that could be significant are impacts on public water supplies (NRC 1996).

Analysis of impacts on the public water supply system considered both plant demand and plant-related population growth. Section 2.2.2 describes the Dresden Units 2 and 3 permitted withdrawal rate and actual use of water. Because Exelon plans no refurbishment in conjunction with this license renewal, plant demand would not change beyond current demands (Exelon 2003).

Exelon assumed an increase of 60 permanent employees during license renewal, the generation of 171 new jobs, and a net overall population increase of approximately 326 persons and 123 households as a result of those jobs,[a] all of which would create SMALL impacts. The plant-related population increase would require an additional 118 m^3/d (26,080 gpd) of potable water (Exelon 2003a).[b] This amount is within the residual capacity of the existing water systems that service Grundy and Will counties. The current approximate average daily demand for both counties combined is 186,000 m^3/d (41 million gpd), with a maximum daily capacity of 529,000 m^3/d (116 million gpd). The additional 118 m^3/d is less than 0.01 percent of the current demand. The staff finds that the impact of increased water use on area water systems is SMALL, and that no further mitigation measures are warranted.

4.4.3 Offsite Land Use During Operations

Offsite land use during the license renewal term is a Category 2 issue (10 CFR Part 51, Subpart A, Appendix B, Table B-1). Table B-1 of 10 CFR Part 51, Subpart A, Appendix B, notes that "significant changes in land use may be associated with population and tax revenue changes resulting from license renewal."

(a) Calculated by assuming that the average number of households is 1 per new job and household size is 2.65 persons per household (Exelon 2003a).

(b) Calculated assuming that the average American uses between 50 to 80 gallons of water for personal use per day; 326 people x 80 gal per person per day = 26,080 gpd (118 m^3/d).

Section 4.7.4 of the GEIS defines the magnitude of land-use changes as a result of plant operation during the licence renewal term as follows:

SMALL—Little new development and minimal changes to an area's land-use pattern.

MODERATE—Considerable new development and some changes to the land-use pattern.

LARGE—Large-scale new development and major changes in the land-use pattern.

Exelon has identified a maximum of 60 additional employees during the license renewal term plus an additional 111 indirect jobs (for a total of 171) in the region (Exelon 2003a). As stated in Section 3.7.5 of the GEIS (NRC 1996), the staff found that, if plant-related population growth is less than 5 percent of the study area's total population, offsite land-use changes would be SMALL, especially if the study area has established patterns of residential and commercial development, a population density of at least 23 persons/km^2 (60 persons/mi^2), and at least one urban area with a population of 100,000 or more within 80 km (50 mi). In this case, population growth will be less than 5 percent of the total population of Grundy and Will counties. Each county in the area has established patterns of residential and commercial development guided by comprehensive plans, a population density of 901 persons /mi^2 within an 80-km (50-mi) radius, and one urban area (Chicago) with a metropolitan area population of 8.9 million (Exelon 2003a). Consequently, the staff concludes that population changes resulting from license renewal are likely to result in SMALL offsite land-use impacts.

Tax revenue can affect land use because it enables local jurisdictions to be able to provide the public services (e.g., transportation and utilities) necessary to support development. Section 4.7.4.1 of the GEIS states that the assessment of tax-driven land-use impacts during the license renewal term should consider (1) the size of Exelon's payments relative to the community's total revenues, (2) the nature of the community's existing land-use patterns, and (3) the extent to which the community already has public services in place to support and guide development (NRC 1996). If Exelon's tax payments are projected to be SMALL relative to the community's total revenue, tax-driven land-use changes during Dresden's license renewal term would be SMALL, especially where the community has pre-established patterns of development and has provided adequate public services to support and guide development. Section 4.7.2.1 of the GEIS states that if tax payments by the plant owner are less than 10 percent of the taxing jurisdiction's revenue, the significance level would be SMALL. If Exelon's tax payments are projected to be MODERATE to LARGE relative to the community's total revenue, new tax-driven land-use changes would be MODERATE to LARGE (NRC 1996).

Exelon pays annual property taxes to Grundy and Will counties. Dresden property taxes provided between 13 and 20 percent ($9.3 million to $12.8 million) of Grundy County's total levee extension, and the same percentages of the county's total collections available for distribution between 1997 and 2000. Dresden is expected to contribute less of an overall percentage of Grundy County's tax base as the surrounding area continues to grow. In the case of Will County, Dresden property taxes provided less than 1 percent of total levee extension and collections available for distribution (Exelon 2003a). Therefore, the overall impact of Dresden taxes on Will and Grundy counties is considered SMALL. The continued operation during the relicensing period would result in continuing tax revenues, which is beneficial to the local community.

Exelon does not anticipate major refurbishment or construction during the license renewal period and, therefore, does not anticipate any increase in the assessed value of Dresden due to refurbishment-related improvements nor any related tax-increase-driven changes to offsite land-use and development patterns. If the operating license for Dresden was not renewed and the station was decommissioned, the impacts to the tax base of the surrounding communities and their economic structures could be significant, as discussed in Section 8.4.7 of the GEIS (NRC 1996). However, based on the information presented above, the staff concludes that tax-related land-use impacts related to renewing the operating license for Dresden are likely to be SMALL.

4.4.4 Public Services: Transportation Impacts During Operations

On October 4, 1999, 10 CFR 51.53(c)(3)(ii)(J) and 10 CFR Part 51, Subpart A, Appendix B, Table B-1 were revised to clearly state that "Public Services: Transportation Impacts During Operations" is a Category 2 issue (see NRC 1999b for more discussion of this clarification). The issue is treated as such in this SEIS.

Expected population growth in the area around the Dresden site is not due directly to increases in employment at Dresden Units 2 and 3. The permanent employment associated with Dresden Units 2 and 3 is currently about 990 employees (Exelon 2003a). During refueling outages, which occur about once a year, as many as 760 additional workers are hired on a temporary basis. The "upper bound" potential increase in permanent staff during the license renewal term is 60 additional workers, or approximately 6 percent of the current permanent and contract work force of approximately 990. The local employees do not regard the associated annual traffic increase as a problem (see Section 2.1.1.2). Based on these facts, Exelon concluded that the impacts on transportation during the license renewal term would be SMALL, and that no further mitigation measures are warranted.

The staff reviewed Exelon's assumptions and resulting conclusions. The staff concludes that any impact of Dresden employees on transportation service degradation is likely to be SMALL and no further mitigation measures are warranted.

4.4.5 Historic and Archaeological Resources

The National Historic Preservation Act (NHPA) requires that Federal agencies take into account the effects of their undertakings on historic properties (16 USC 470 et seq.). The historic preservation review process mandated by Section 106 of the NHPA is outlined in regulations issued by the Advisory Council on Historic Preservation at 36 CFR Part 800. Renewal of an OL is an undertaking that could potentially affect historic properties. Therefore, according to the NHPA, the NRC is to make a reasonable effort to identify historic properties in the areas of potential effects. If no historic properties are present or affected, the NRC is required to notify the State Historic Preservation Officer (SHPO) at the Illinois Historic Preservation Agency (IHPA) before proceeding. If it is determined that historic properties are present, the NRC is required to assess and resolve possible adverse effects of the undertaking.

Although no surveys have been conducted to date at the Dresden site, and the potential exists for significant cultural resources to be present within the site boundaries, it does not appear that the proposed license renewal will adversely affect cultural resources. The applicant has indicated that no refurbishment or replacement activities, including additional land-disturbing activities at the plant site or along existing transmission corridors, are planned for the license renewal period (Exelon 2003a). Therefore, continued operation of the Dresden Units 2 and 3 would likely protect any cultural resources present within the Dresden site boundary by protecting those lands from development and providing secured access. There is a potential for significant cultural resources to be present at the site, based on its location and the types of findings recorded nearby (e.g., the Briscoe Mounds). Therefore, when conducting normal operations and maintenance activities which could inadvertantly affect cultural resources, the applicant should exercise appropriate care. Any ground-disturbing activity in an undisturbed area should be preceded by an evaluation of cultural resources in consultation with the Illinois Historic Preservation Agency and appropriate Native American tribes as required under Section 106 of the NHPA. During this enviromnental review, Exelon upgraded their procedures to include the following two provisions (Exelon 2003b):

> Contact the IHPA (SHPO) for guidance on requirements for an archaeological survey when any undertaking would disturb sediments at the station at depths below previous disturbance, or below the present surface in previously undisturbed areas. [Note: previous disturbance is defined by the documented disturbance area and depth for projects previously reviewed by the NRC and determined to be not significant. Areas or sediments that extend beyond these boundaries are previously undisturbed.]
>
> Once guidance is received from the IHPA, adhere to that guidance.

Based on this preliminary analysis of cultural resources, the staff concludes that the impact of continued operation of Dresden Units 2 and 3 during the license renewal period is SMALL, and that mitigation is not necessary.

4.4.6 Environmental Justice

Environmental justice refers to a Federal policy in which Federal actions should not result in disproportionately high and adverse impacts on minority[a] or low-income populations. Executive Order 12898 (59 FR 7629) directs Federal executive agencies to consider environmental justice under NEPA. The Council on Environmental Quality (CEQ) has provided guidance for addressing environmental justice (CEQ 1997). Although the Commission is not subject to the Executive Order, it has voluntarily committed to undertake environmental justice reviews. Specific guidance is provided in the NRC Office of Nuclear Reactor Regulation Office Instruction LIC-203, *Procedural Guidance for Preparing Environmental Assessments and Considering Environmental Issues* (NRC 2001).

For the purpose of the staff's review, a minority population is defined to exist if the percentage of minorities within the census block groups[b] in each state within the 80 km (50 mi) potentially affected by the license renewal of Dresden Units 2 and 3, exceeds by 20 percentage points the corresponding percentage of minorities in the state of which it is a part, or if the corresponding percentage of minorities within the census block group is at least 50 percent. A low-income population is defined to exist if the percentage of low-income population within a census block group exceeds by 20 percentage points the corresponding percentage of low-income population in the state of which it is a part, or if the corresponding percentage of low-income population within a census block group is at least 50 percent. For census tract and block groups within Grundy and Will counties, for example, the percentage of minority and low-income populations is compared to the percentage of minority and low-income populations in Illinois overall.

The scope of the review as defined in NRC Guidance (NRC 2001) should include an analysis of impacts on minority and low-income populations, the location and the significance of any

(a) The NRC guidance for performing environmental justice reviews defines "minority" as American Indian or Alaskan Native, Asian, Native Hawaiian or other Pacific Islander, Black races, or Hispanic ethnicity.

(b) A census block group is a combination of census blocks, which are statistical subdivisions of a census tract. A census block is the smallest geographic entity for which the U.S. Bureau of the Census (USBC) collects and tabulates decennial census information. A census tract is a small, relatively permanent statistical subdivision of counties delineated by local committees of census data users in accordance with USBC guidelines for the purpose of collecting and presenting decennial census data. Census block groups are subsets of census tracts (USBC 1999).

environmental impacts during operations on populations that are particularly sensitive, and any additional information pertaining to mitigation. The descriptions to be provided by this review should state whether these impacts are likely to be disproportionately high and adverse. The review should also evaluate the significance of such impacts.

The staff examined the geographic distribution of minority populations and low-income populations recorded during the 2000 census within 80 km (50 mi) of Dresden, encompassing 19 counties in Illinois (i.e., Bureau, Cook, DeKalb, DuPage, Ford, Grundy, Iroquois, Kane, Kankakee, Kendall, La Salle, Lee, Livingston, McLean, Marshall,Ogle, Putnam, Will, and Woodford), and two counties in Indiana (Lake and Newton). The analysis was also supplemented by inquiries to the planning department and social service agencies in Grundy and Will counties.[a]

Exelon conducted its analysis for minority and low-income populations using the convention of including a census tract or block group if any part of its area lay within 80 km (50 mi) of Dresden. Exelon used USBC 2000 census data to determine the minority characteristics on a block group level, but it used 1990 tract data for the low-income analysis because USBC 2000 low-income data was not available (Exelon 2003a). However, the NRC staff used USCB 2000 census data for the low-income analysis. Using these conventions, the 80-km (50-mi) radius included 1693 census tracts and 5503 block groups. The criterion of "more than 20 percentage points" was used to determine whether a census tract or block group should be counted as containing a minority or low-income population. Figures 4-1 and 4-2 show the distribution of census block groups for the minority and low-income populations, respectively (shaded areas).

Based on the criterion of "more than 20 percentage points greater," Exelon determined that Black minority populations exist in 1470 block groups; American Indian or Alaskan native minority populations exist in one block group; Asian minority populations exist in 83 block groups; Hispanic-ethnicity minority populations exist in 1004 block groups; and all other single minorities, multi-racial minorities, and aggregate of minority races exist in 2658 block groups (Exelon 2003a). Figure 4-1 shows the locations of census block groups with minority populations.

By the NRC criteria (50 percent of population, or at least 20 percentage points greater than the state), eight counties in Illinois (Cook, DeKalb, DuPage, Iroquois, Kane, Kankakee, La Salle and Will) and one county in Indiana (Lake) contain census tracts within 80 km (50 mi) of

(a) Grundy and Will counties were the focus of the inquiry because all of both counties lie within the 80-km (50-mi) radius and are nearest the Dresden site. The staff concludes that any findings or environmental justice issues in these counties would warrant further field inquiries in more distant counties.

Dresden that contain low-income populations. Figure 4-2 shows the locations of census tracts with low-income populations.

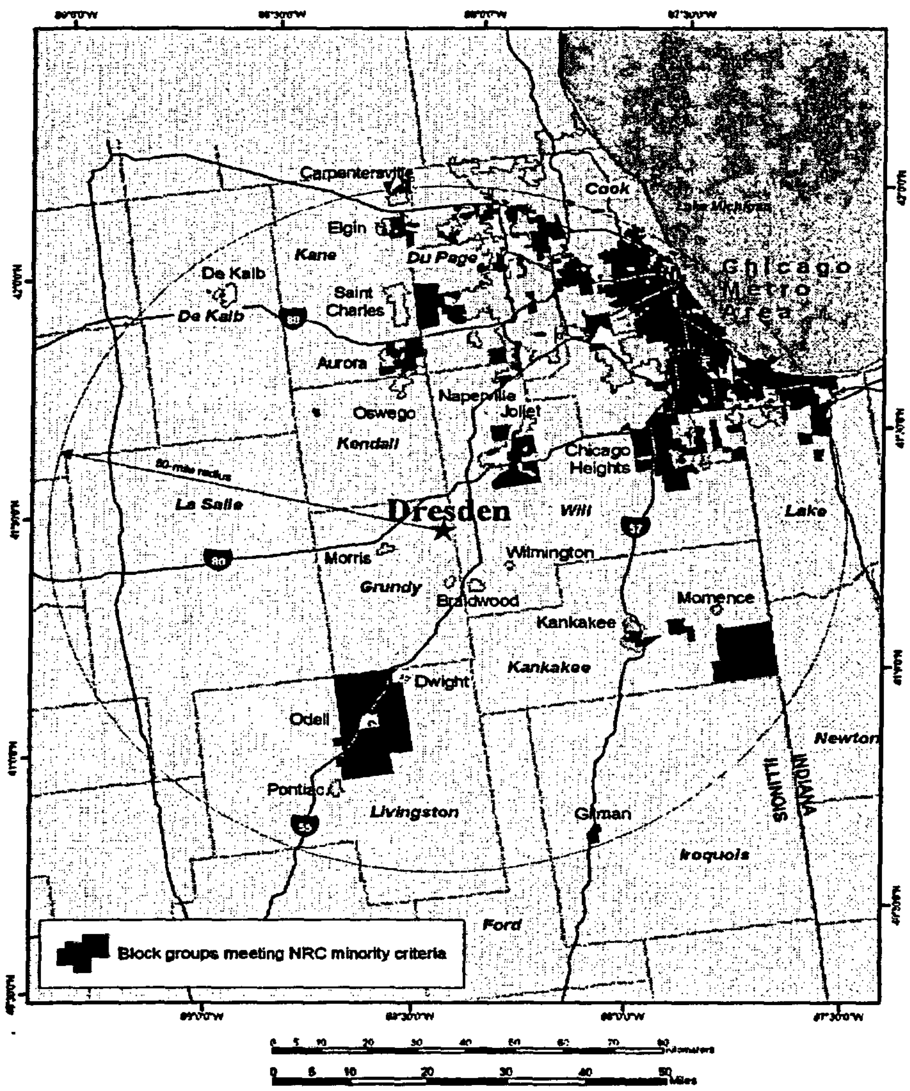

Figure 4-1. Geographic Distribution of Minority Populations (shown in shaded areas) Within 80 km (50 mi) of the Dresden Site Based on 2000 Census Block Group Data

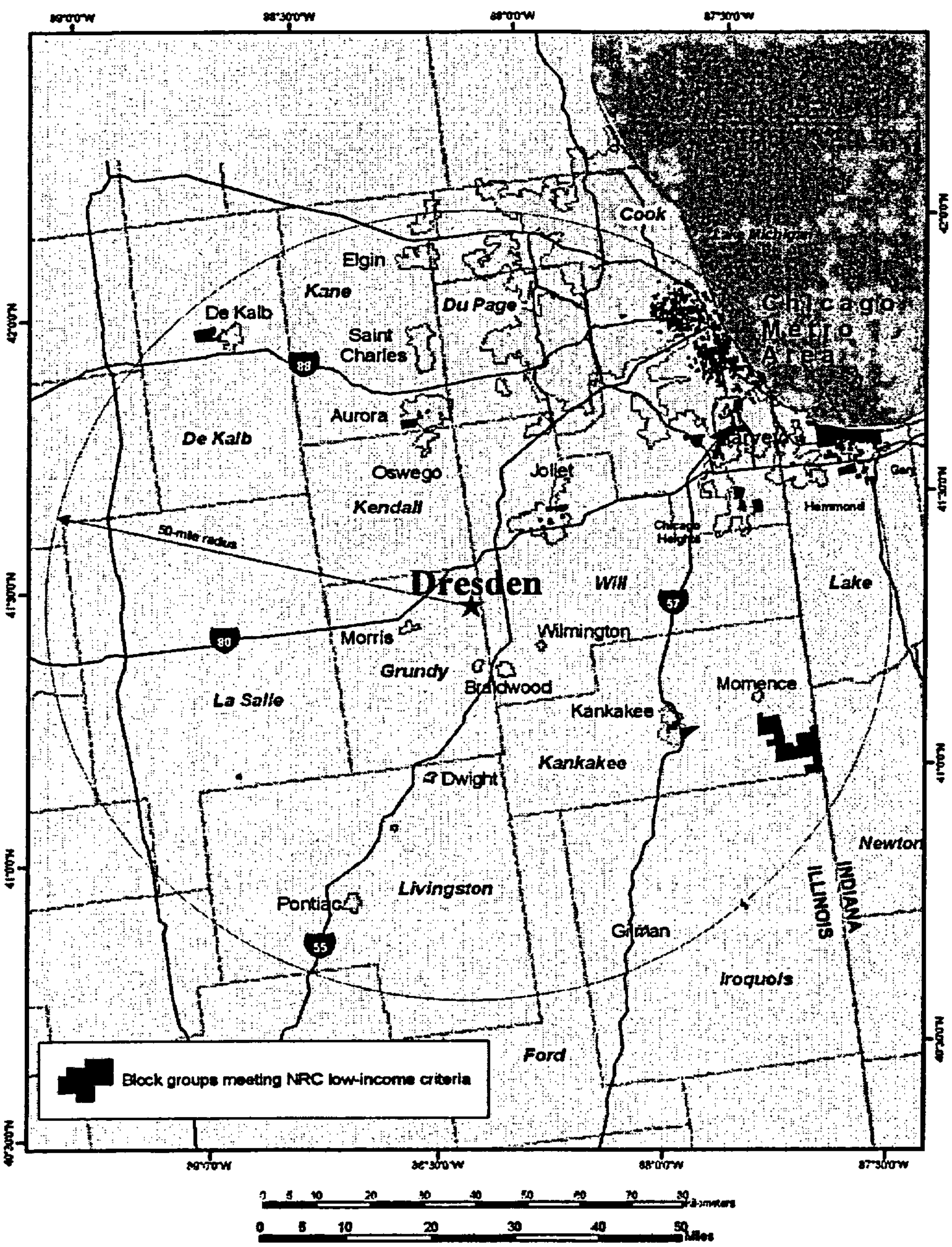

Figure 4-2. Geographic Distribution of Low-Income Populations (shown in shaded areas) Within 80 km (50 mi) of the Dresden Site Based on 2000 Census Block Group Data

With the locations of minority and low-income populations identified, the staff proceeded to evaluate whether any of the environmental impacts of the proposed action could affect these populations in a disproportionate manner. Based on NRC guidance (2001), the staff examined air, land, and water resources within about 80 km (50 mi) of Dresden. Within that area, a few potential environmental impacts could affect human populations; all of these were considered SMALL for the general population. These include:

- Microbiological organisms (discussed in Section 4.1.4)

- Electric shock (discussed in Section 4.2.1)

- Groundwater-use conflicts (discussed in Section 4.5)

- Postulated accidents (discussed in Chapter 5 and Appendix G of this SEIS and Chapter 5 of the GEIS).

The pathways through which the environmental impacts associated with the Dresden Units 2 and 3 license renewal can affect human populations are discussed in each associated section. The staff then evaluated whether minority and low-income populations could be disproportionately affected by these impacts. The staff found no unusual resource dependencies or practices, such as subsistence agriculture, hunting, or fishing, through which the populations could be disproportionately affected. In addition, the staff did not identify any location-dependent disproportionate impacts affecting these minority and low-income populations. The staff concludes that offsite impacts from Dresden to minority and low-income populations would be SMALL, and that no further mitigation measures are warranted.

4.5 Groundwater Use and Quality

Dresden is located within the Central Lowland Province that consists of a glaciated lowland stretching from the Appalachian Plateau on the east to the Great Plains on the west. Groundwater resources in the region are developed from four aquifer systems: the glacial drift aquifer (i.e., the alluvial aquifer), the shallow dolomite aquifer located mainly in Silurian rock, the Cambrian-Ordovician aquifer, and the Mt. Simon aquifer (AEC 1973). The alluvial aquifer is hydraulically connected to the cooling pond but is isolated from the Cambrian-Ordovician aquifer from which Dresden withdraws water (AEC 1973).

Dresden has three groundwater wells. During 2000, the two primary wells for plant operations, Wells 1 and 2, pumped at a combined average rate of 0.27 m^3/min (72 gpm). These wells are approximately 457 m (1500 ft) deep and provide processing, washing, cooling, condensing, boiler feed, and sanitary water for employees. Well 3 is 49 m (160 ft) deep and pumps up to 2 L/s (30 gpm); however, it is typically used only 10 minutes per day with an average daily yield of 0.8 L/min (0.2 gpm). This well supplies water for the wastewater treatment plant operation. Therefore, the total groundwater production rate for Dresden is approximately 0.27 m^3/min (72 gpm). Withdrawal of groundwater at this rate has not caused any conflicts in the past and is not anticipated to cause a conflict in the future. If a conflict were to arise in the future, alternative water supplies from surface water sources are available. Also, Dresden does not use Ranney wells; therefore, the issue of groundwater-use conflicts for plants using Ranney wells does not apply.

A Category 1 issue in 10 CFR Part 51, Subpart A, Appendix B, Table B-1, applicable to Dresden Units 2 and 3 groundwater use and quality is identified in Table 4-8. Exelon stated in its ER that it is not aware of any new and significant information associated with the renewal of the Dresden Units 2 and 3 OLs (Exelon 2003a). The staff has not identified any significant new information during its independent review of the ER, the staff's site visit, scoping process, or its evaluation of other available information. Therefore, the staff concludes that there are no impacts related to this issue beyond those discussed in the GEIS. For this issue, the staff concludes that the impacts are SMALL, and that additional plant-specific mitigation measures are not likely to be sufficiently beneficial to be warranted.

Table 4-8. Category 1 Issue Applicable to Groundwater Use and Quality During the Renewal Term

ISSUE—10 CFR Part 51, Subpart A, Appendix B, Table B-1	GEIS Section
GROUNDWATER USE AND QUALITY	
Groundwater-use conflicts (potable and service water; plants that use <100 gpm).	4.8.1.1; 4.8.1.2

A brief description of the staff's review and the GEIS conclusions, as codified in Table B-1, follows:

- Groundwater-use conflicts (potable and service water; plants that use less than 100 gpm). Based on information in the GEIS, the Commission found that plants using less than 100 gpm are not expected to cause any groundwater-use conflicts.

As discussed below, Dresden site groundwater use is approximately 0.27 m^3/min (72 gpm) (less than 100 gpm). The staff has not identified any significant new information during its independent review of the Exelon ER, the staff's site visit, the scoping process, or its evaluation of other available information. Therefore, the staff concludes that there are no groundwater-use conflicts during the renewal term beyond those discussed in the GEIS.

There are two Category 2 issues related to groundwater use and quality that are applicable to Dresden Units 2 and 3 and require a site-specific assessment before license renewal. These issues are listed in Table 4-9 and discussed below.

Table 4-9. Category 2 Issues Applicable to Groundwater Use and Quality During the Renewal Term

ISSUE—10 CFR Part 51, Subpart A, Appendix B, Table B-1	GEIS Section	10 CFR 51.53(c)(3)(ii) Subparagraph	SEIS Section
GROUNDWATER USE AND QUALITY			
Ground-water-use conflicts (plants using cooling towers withdrawing makeup water from a small river)	4.8.1.3	A	4.5.1
Groundwater quality degradation (cooling ponds at inland sites)	4.8.3	D	4.5.2

4.5.1 Groundwater-Use Conflicts (Plants Using Cooling Towers Withdrawing Makeup Water from a Small River)

One groundwater-use issue concerns plants that have cooling towers and withdraw makeup water from a small river. Surface-water withdrawals from small water bodies during low-flow conditions may result in groundwater-use conflicts with nearby groundwater users. The impact of consumptive loss on nearby groundwater users is associated with the difference it could potentially cause in aquifer recharge, especially if other new groundwater or upstream surface-water users begin withdrawals. Section 2.2.2 describes Dresden site surface water withdrawals from the Kankakee River. As described in Section 2.1.3, Dresden Units 2 and 3 normally operate with a once-through cooling system. However, because groundwater flows towards Kankakee River, groundwater withdrawals would not be impacted by changes in river flow.

Dresden pumps groundwater for use as potable water and is not connected to a municipal system. Seventy-two percent of the permanent employees of Dresden reside in Grundy and Will counties. At the present time, the water supply systems in Grundy and Will counties are operating substantially below their maximum capacities. At the current and proposed levels of operation, each community could absorb new employees without jeopardizing their water supplies.

The staff reviewed the relevant technical reports and the ER relative to potential groundwater-use conflicts due to consumptive loss of aquifer recharge. Based on this review, the staff has concluded that the potential impacts are SMALL, and that no further mitigation measures are warranted.

4.5.2 Groundwater Quality Degradation (Cooling Ponds at Inland Sites)

A second groundwater-use issue concerns the use of cooling ponds at inland sites. Dresden, an inland site, has a cooling pond that covers about 516 ha (1275 ac), with an average depth of 3 m (10 ft). A five-year water quality study during the period 1969 to 1973 (ComEd 1974) found that there was little difference in water quality between the samples of water from the intake location and those from the cooling pond discharge. Another study in 1981 (ComEd 1981) found that during low flow periods of the Kankakee River when constituent concentration would be high, the discharge water from the cooling pond was of better quality than the intake water. This difference in water quality may be attributable to solids deposition in the cooling pond sediments, and it may have no contribution to groundwater quality. However, if there were any contribution or transfer of contaminants collected in the pond to groundwater, it would be to the glacial drift aquifer contiguous with the Kankakee River. Thus, some constituents from the river that are concentrated in the pond could return to the river by way of the glacial drift aquifer. Any impact to groundwater would be localized and would only affect a shallow aquifer that is not used for domestic water supply. The cooling pond is isolated from the Cambrian-Ordovician aquifer (AEC 1973), which is the source for municipal and industrial water in the area.

The staff reviewed the relevant technical documents and the Dresden ER relative to potential groundwater degradation due to the operation of a cooling pond. Based on this review, the staff has concludes that the potential impacts are SMALL, and that no further mitigation measures are warranted.

4.6 Threatened or Endangered Species

Threatened or endangered species are listed as a Category 2 issue in 10 CFR Part 51, Subpart A, Appendix B, Table B-1. This issue is listed in Table 4-10.

Table 4-10. Category 2 Issue Applicable to Threatened or Endangered Species During the Renewal Term

ISSUE—10 CFR Part 51, Subpart A, Appendix B, Table B-1	GEIS Section	10 CFR 51.53(c)(3)(ii) Subparagraph	SEIS Section
THREATENED OR ENDANGERED SPECIES (FOR ALL PLANTS)			
Threatened or endangered species	4.1	E	4.6

The issue of threatened or endangered species present at the Dresden site requires consultation with appropriate agencies to determine whether any such species are present and whether they would be adversely affected by continued operation of the nuclear plant during the license renewal term. The staff is curently consulting with the FWS under provisions of Section 7 of the Endangered Species Act concerning the potential impacts of an additional 20 years of operation and maintenance activities at Dresden Units 2 and 3 on Federally listed species. The results of that consultation will be incorporated in the final SEIS. The presence of threatened or endangered species in the vicinity of the Dresden site is discussed in Sections 2.2.5 and 2.2.6.

Exelon has no plans to conduct refurbishment or construction at the Dresden site during the license renewal period. Therefore, there would be no refurbishment-related impacts to special status species, and no analysis of refurbishment-related impacts is needed. For the reasons set forth below, the staff concludes that the impact on endangered, threatened, or candidate species of an additional 20 years of operation and maintenance of Dresden Units 2 and 3 and associated transmission lines would be SMALL, and that no further mitigation measures are warranted.

4.6.1 Aquatic Species

The Hine's emerald dragonfly (*Somatochlora hineana*) is the only Federally listed aquatic species that occurs in the vicinity of the Dresden site. This species is aquatic during its egg and larval 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 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, and pond, and other habitats with slow-flowing water and thin soils over dolomite bedrock. The species has not been found to occur on or in the vicinity of the Dresden site.

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 applicant has corresponded with FWS regarding potential impacts of license renewal on threatened and endangered species (Jury 2002b). FWS indicated that it had no objection to the proposed license renewal action (Millar 2002).

The staff has reviewed the information provided by the applicant concerning endangered and threatened species that could be affected by continued operation and maintenance of Dresden Units 2 and 3 and associated transmission lines. No refurbishment activities are currently planned by the applicant and, therefore, disturbance of protected species or their habitats on the Dresden site is not anticipated. Current transmission line ROW maintenance practices favor native species and reduce the likelihood of adverse impacts to sensitive habitats (e.g., wetlands and streams) and any species that may be present within the ROW. Based on this information, the staff's preliminary conclusion is that the impact on endangered or threatened aquatic species of an additional 20 years of operation and maintenance of the Dresden Units 2 and 3 and associated transmission line would be SMALL, and no further mitigation measures are warranted.

4.6.2 Terrestrial Species

Federally listed or candidate species that are known from Grundy County, and that, therefore, could possibly occur on or in the vicinity of the Dresden site, are the eastern prairie fringed orchid and the bald eagle. Adverse impacts to either of these species that would result from continued operations of Dresden Units 2 and 3 are unlikely. Eastern prairie fringed orchid prefers mesic to wet prairie habitat, and no such habitat is known to exist on the Dresden site. Undeveloped portions of the site have not been surveyed for this species, but these areas are not affected by ongoing plant operations, and no refurbishment activities that could disturb these areas are planned. Bald eagles are occasional winter visitors to open water bodies on and adjacent to the Dresden site and may be especially attracted to these areas when other large water bodies are frozen. In the winter, water without ice cover provides foraging areas for the bald eagle, and the normal plant operations that maintain these open areas can be considered beneficial to eagles.

Listed and candidate species that occur in counties traversed by transmission lines associated with Dresden Units 2 and 3 include the decurrent false aster, eastern prairie fringed orchid, lakeside daisy, leafy prairie clover, Mead's milkweed, prairie bush clover, Hine's emerald dragonfly, bald eagle, and Indiana bat. The eastern massasauga, a small rattlesnake, is a candidate for Federal listing and also has the potential to be found along portions of associated transmission line ROWs. These species are associated with prairie, wetlands, or open water habitats and could occur in portions of the ROWs that cross these habitats. Although most of the land crossed by transmission lines are devoted to agriculture, several segments of the line cross natural areas that could contain suitable habitat for these species.

Current Exelon ROW management practices 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. Disturbance to wetlands habitats and stream crossings are avoided and would be limited to occasional tree trimming or removal needed to prevent contact with transmission lines (Cunningham 2003).

The applicant has corresponded with FWS regarding potential impacts of license renewal on threatened and endangered species (Jury 2002b, 2002c). FWS indicated that they had no objection to the proposed license renewal action (Millar 2002).

The staff has reviewed the information provided by the applicant concerning endangered and threatened species that could be affected by continued operation and maintenance of Dresden Units 2 and 3 and associated transmission lines. No refurbishment activities are currently planned by the applicant and, therefore, disturbance of protected species or their habitats on the Dresden site is not anticipated. Current transmission line ROW maintenance practices favor native species and reduce the likelihood of adverse impacts to sensitive habitats (e.g., wetlands, streams) and any listed species that could be present within the ROWs. Based on this information, the staff's preliminary conclusion is that the impact on endangered or threatened terrestrial species of an additional 20 years of operation and maintenance of the Dresden Units 2 and 3 and associated transmission lines would be SMALL, and that no further mitigation measures are warranted.

4.7 Evaluation of Potential New and Significant Information on Impacts of Operations During the Renewal Term

The staff has not identified significant new information on environmental issues listed in 10 CR Part 51, Subpart A, Appendix B, Table B-1, related to operation during the renewal term. The staff reviewed the discussion of environmental impacts associated with operation during the renewal term in the GEIS and conducted its own independent review, including public scoping meetings, to identify issues with signfidant new information. Processes for identification and evaluation of new information are described in Section 1.2.2, License Evaluation Process.

4.8 Cumulative Impacts of Operations During the Renewal Term

The staff considered potential cumulative impacts during the evaluation of information applicable to each of the potential impacts of operations of Dresden Units 2 and 3 during the renewal term identified within the GEIS. For the purposes of this analysis, past actions were those related to the resources at the time of the plant licensing and construction, present actions are those related to the resources at the time of current operation of the power plant, and future actions are considered to be those that are reasonably foreseeable through the end of plant operation. Therefore, the analysis considers potential impacts through the end of the current license term as well as the 20-year renewal license term. The geographical area over which past, present, and future actions that could contribute to cumulative impacts is dependent on the type of action considered and is described below for each impacted area.

The impacts of the proposed action, as described in Section 4.0, are combined with other past, present, and reasonably foreseeable future actions at Dresden regardless of what agency (Federal or non-Federal) or person undertakes such other actions. These combined impacts are defined as "cumulative" in 40 CFR 1508.7 and include individually minor but collectively significant actions taking place over a period of time. It is possible that an impact that may be SMALL by itself could result in a MODERATE or LARGE impact when considered in combination with the impacts of other actions on the affected resource. Likewise, if a resource is regionally declining or imperiled, even a SMALL individual impact could be important if it contributes to or accelerates the overall resource decline.

4.8.1 Cumulative Impacts Resulting from Operation of the Plant Cooling System

For the purposes of this analysis, the geographic area considered for cumulative impacts resulting from operation of the Dresden Units 2 and 3 cooling system is the Illinois River, bounded by the dam at Dresden Island, and the confluence of the Des Plaines River with the Kankakee River, and the Kankakee River from the confluence with the Des Plaines River to a point immediately east of the Dresden cooling pond. As discussed in Section 4.1, the staff found no significant new information that would indicate that the conclusions regarding any of the cooling system-related Category 1 issues related to Dresden are inconsistent with the conclusions in the GEIS (NRC 1996). Additionally, the staff determined that none of the cooling system-related Category 2 issues is likely to have greater than a SMALL impact on local water quality and aquatic resources.

The cumulative effects of past actions have resulted in the existing conditions on local water quality and aquatic resources. Section 2.2 discusses the environmental impacts of the plant on the environment, including changes and modifications within the Illinois, Des Plaines, and Kankakee Rivers that have had the greatest effects on aquatic resources. Thermal loading on the receiving waters has been acceptable in the past although the conditions have been marginal during rare periods of drought and hot weather. Cooling towers have been installed to better manage thermal loading and additional towers are scheduled to be added.

The river water supply is adequate to meet the needs of the facility for cooling purposes, even during the lowest historical flow rates. There are no cumulative impacts on water supply.

The staff, while preparing this assessment, assumed that other industrial, commercial, or public installations could be located in the general vicinity of the Dresden site prior to the end of Dresden Units 2 and 3 operations. The discharge of water to the Illinois River from these facilities would be regulated by the IEPA. The discharge limits are set considering the overall or cumulative impact of all of the other regulated activities in the area. Compliance with the CWA and its NPDES permits minimizes Dresden's cumulative effects on aquatic resources. Continued operation of Dresden Units 2 and 3 will require renewed discharge permits from the IEPA, which will address changing requirements so that cumulative water quality objectives are served. Therefore, the staff concludes that the potential cumulative impacts of cooling system operation contributed by the continued operation of Dresden Units 2 and 3 will be SMALL, and that no further mitigation measures are warranted.

4.8.2 Cumulative Impacts Resulting from Continued Operation of the Transmission Lines

The continued operation of the electrical transmission facilities associated with relicensing of Dresden Units 2 and 3 was evaluated to determine if there is a potential for interactions with other past, present, and future actions that could result in adverse cumulative impacts to terrestrial resources (e.g., wildlife populations and the size and distribution of habitat areas), wetlands, floodplains, or aquatic resources. For the purposes of this analysis, the geographic area that encompasses the past, present, and foreseeable future actions that could contribute to adverse cumulative effects is the area within 80 km (50 mi) of the Dresden site as depicted in Figure 2-1.

As described in Section 4.2, the staff found no new and significant information indicating that the conclusions regarding any of the transmission line-related Category 1 issues related to Dresden Units 2 and 3 are inconsistent with the conclusions in the GEIS. The applicant uses vegetation management practices (Cunningham 2003) that are protective of wildlife and habitat resources, including floodplains and wetlands, to maintain its ROWs. Transmission line maintenance activities are not expected to alter wetland or floodplain hydrology or adversely affect vegetation characteristics of these habitats. Therefore, continued operation and maintenance of these ROWs is not likely to contribute to a regional decline in wetland or floodplain resources. The maintenance procedures ensure minimal disturbance to wildlife and, in some cases, improve the habitat within the ROWs relative to many of the surrounding land uses (Exelon 2003a).

Therefore, the staff has determined that the cumulative impacts of the continued operation of the transmission lines associated with Dresden will be SMALL, and that no further mitigation is warranted.

4.8.3 Cumulative Radiological Impacts

EPA and NRC established radiological dose limits for protection of the public and workers from both instantaneous and cumulative effects of exposure to radiation and radioactive materials. These dose limits are codified in 40 CFR Part 190 and 10 CFR Part 20. For the purpose of this analysis, the area within 80 km (50 mi) radius of the Dresdan site was included. As stated in Section 2.2.7, Exelon has conducted a radiological environmental monitoring program (REMP) around the Dresden site since 1974. The REMP measures radiation and radioactive materials from all sources, including Dresden. Additionally, in Sections 2.2.7 and 4.3, the staff concluded that impacts of radiation exposure to the public and workers (occupational) from operation of Dresden Units 2 and 3 during the renewal term are SMALL. Hence, the monitoring program and staff's conclusion considered cumulative impacts. The NRC and the State of Illinois would regulate any reasonably foreseeable future actions in the vicinity of Dresden site that could contribute to cumulative radiological impacts.

Therefore, the staff concludes that cumulative radiological impacts of continued operations of Dresden would be SMALL, and that no further mitigation measures are warranted.

4.8.4 Cumulative Socioeconomic Impacts

Much of the analyses of socioeconomic impacts presented in Section 4.4 of this SEIS already incorporate cumulative impact analysis because the metrics used for quantification only make sense when placed in the total or cumulative context. For instance, the impact of the total number of additional housing units that may be needed can only be evaluated with respect to the total number that will be available in the impacted area. Therefore, the geographical area of the cumulative analysis varies, depending on the particular impact considered, and may depend on specific boundaries, such as taxation jurisdictions, or may be distance related, as in the case of environmental justice.

The continued operation of Dresden Units 2 and 3 is not likely to add to any cumulative socioeconomic impacts beyond those already evaluated in sections 4.4. In other words, the impacts of issues, such as transportation or offsite land use, are likely to be non-detectable beyond the regions previously evaluated and will quickly decrease with increasing distance from the site. The staff determined that the impacts on housing, public utilities, public services, and environmental justice would all be SMALL. The staff determined that the impact on offsite land use is SMALL because no refurbishment actions are planned at dresden, and no new incremental sources of plant-related tax payments are expected that could influence land use by fostering considerable growth. There are no reasonably foreseeable scenarios that would alter these conclusions in regard to cumulative impacts.

With regard to cultural resources, although no archaeological or architectural surveys have been conducted to date at the Dresden site, and the potential exists for significant cultural resources to be present within the site boundaries, it does not appear that the proposed license renewal will adversely affect cultural resources. The applicant has indicated that no refurbishment or replacement activities, including additional land-disturbing activities, at the plant site (or along existing transmission corridors) are planned for the license renewal period (Exelon 2003a). The applicant has also indicated that the decommissioning of Dresden Unit 1 will be completed at the same time as the decommissioning of Dresden Units 2 and 3 (Exelon 2003a). Therefore, continued operation of Dresden Units 2 and 3 would likely protect any cultural resources present within the Dresden site boundary by protecting those lands from development and providing secured access. However, because there is a strong potential for significant cultural resources to be present at the site (on the basis of its location and the types of archaeoloical sites recorded nearby—e.g., the Briscoe Mounds—and the history of the Dresden site itself with respect to Dresden Unit 1), care should be taken by the applicant during normal operations and maintenance activities that could inadvertently affect cultural resources. Any ground-disturbing activity in an undisturbed area should be preceded by an evaluation of cultural resources in consultation with the IHPA and appropriate Native American tribes as required under Section 106 of the NHPA. Any plans to decommission Dresden Unit 1 prior to the termination of the OL for Dresden Units 2 and 3, must be preceded by a historic evaluation of Unit 1 and must undergo Section 106 consultation with the IHPA. On the basis of this preliminary analysis of cultural resources, the contribution to a cumulative mpact on cutural resources by continued operation of Dresden Units 2 and 3 during the license renewal period as proposed (Exelon 2003a) is considered SMALL.

4.8.5 Cumulative Impacts on Groundwater Use and Quality

The Dresden site is located within the Central Lowland Province that consistes of a glaciated lowland stretching from the Appalachian Plateau on the east to the Great Plains on the west. Dresden is situated in a subdivision called the Kankakee Plain, a level to gently undulating plain near the intersection of the Des Plains and the Kankakee Rivers. Groundwater resources in the region are developed from four aquifer systems. These consist of the glacial drift aquifer, the shallow dolomite aquifer, the Cambrian-Ordovician aquifer, and the Mt. Simon aquifer (AEC 1973). The Cambrian-Ordovician aquifer is the main source of groundwater supply for municipal and industrial use in the area. The Dresden cooling pond is hydraulically connected to the glacial drift aquifer (an alluvial aquifer) but is isolated from the the Cambrian-Ordovician aquifer.

Dresden has three groundwater wells. Two are installed to depths of approximately 1500 ft below ground surface within the Cambrian-Ordovician aquifer (AEC 1973). The third well is installed to a depth of approximately 160 ft in the shallow dolomite aquifer. These wells provide water for processing, washing, boiler feed, and sanitary use. The total rate of use is about

72 gpm, which may be easily sustainable. This rate of use has not caused any adverse impacts with respect to local water availability. Although the groundwater supply is adequate at the present time, the facility could substitute surface-water supply for some of the facility needs, if required in the future.

A groundwater quality issue addresses the use of cooling ponds at inland sites and the potential impact of groundwater degradation. Dresden has a cooling pond covering about 516 ha (1275 ac), with an average depth of 3 m (10 ft). Studies to date indicate that there is little difference in water quality between samples of water at the intake location and from the cooling pond discharge although under low flow conditions, there can be some deposition of solids in the cooling pond sediments. However, if there is any contribution or transfer of constituents collected in the pond to groundwater, it would be to the glacial drift aquifer, which is contiguous with the Kankakee River. Thus, some constituents from the river, that are concentrated in the pond, could return to the river by way of the glacial drift aquifer, and there would not be any cumulative impact on groundwater quality. Any impact to groundwater would be localized and tempary, in a shallow aquifer that is not used for beneficial water supply. The cooling pond is isolated from the Cambrian-Ordovician aquifer (AEC 1973), the source for municipal and industrial water in the area. On the basis of this analysis of groundwaer impacts, the contribution to the cumulative impact on groundwater resources by continued operation of the Dresden Units 2 and 3 during the license renewal period as prosed (Exelon 2003a is considered SMALL.

4.8.6 Cumulative Impacts on Threatened or Endangered Species

The geographic area considered in the analysis of potential cumulative impacts to threatened or endangered species includes those Illinois counties that contain the Dresden site and its associated transmission line ROWs (DuPage, Grundy, Kendall, La Salle, Livingston, Tazewell, Will, and Woodford counties). The waters of the Illinois, Des Plaines, and Kankakee Rivers in the vicinity of the Dresden site. As discussed in Sections 2.2.5 and 2.2.6, there are several threatened or endangered species that could occur within this area. The staff's preliminary findings, presented in Section 4.6, are that continued operation of Dresden Units 2 and 3 would have a SMALL impact on these species. The staff's findings will be documented in a biological assessment and forwarded to the FWS for the agency's concurrence. No critical habitat, as designated by the Endangered Species Act, occurs in the area affected by the Dresden site; therefore, cumulative impacts on critical habitats are not addressed.

4.8.6.1 Aquatic Species

The Hine's emerald dragonfly (*Somatochlora hineana*) is the only Federally listed aquatic species that may occur in the area of the Dresden site and its associated transmission lines. As discussed in Section 4.6.1, the Hine's emerald dragonfly is associated with wetland habitats dominated by grass or sedges and fed by mineral sources (FWS 2001). This species could occur in portions of the ROWs that cross these habitats. As discussed in Sections 2.1.7 and 4.6.1, Exelon ROW management practices (Cunningham 2003) favor native species and reduce the likelihood of adverse impacts to sensitive habitats (e.g., wetlands and streams) and any species that may be present within the ROW.

The staff has determined that the cumulative impacts to aquatic threatened or endangered species due to continued operation of Dresden Units 2 and 3 and associated transmission lines would be SMALL, and that no further mitigation measures are warranted.

4.8.6.2 Terrestrial Species

Nine Federally listed terrestrial species and one candidate for listing may occur in the area of the Dresden site and its associated transmission lines (Table 2-2). These species include the decurrent false aster, eastern prairie fringed orchid, lakeside daisy, leafy prairie clover, Mead's milkweed, prairie bush clover, Hine's emerald dragonfly, bald eagle, and Indiana bat. The eastern massasauga, a small rattlesnake, is a candidate for Federal listing.

Listed and candidate species in the project area are associated with prairie, wetland, or open water habitats. These species could occur in portions of the ROWs that cross these habitats. Although most of the land crossed by transmission lines is devoted to agriculture, several segments of the line cross natural areas that could contain suitable habitat for these species. As discussed in Sections 2.1.7 and 4.6.2, Exelon ROW management practices (Cunningham 2003) reduce the probability of impacts to these habitats and could benefit those species dependent on prairie habitat.

Listed or candidate species that could occur on or in the vicinity of the Dresden site are the eastern prairie fringed orchid and the bald eagle. Adverse impacts to either of these species resulting from continued operations of Dresden Units 2 and 3 are unlikely. Undeveloped portions of the Dresden site that could support the eastern prairie fringed orchid are not affected by ongoing plant operations, and no refurbishment activities that could disturb these areas are planned. The bald eagle is an occasional winter visitor to open water bodies on and adjacent to the Dresden site and may be especially attracted to these areas when other large water bodies are frozen. In the winter, water without ice cover provides foraging areas for the bald eagle, and the normal plant operations that maintain these open areas can be considered beneficial to eagles. Consequently, continued operation of Dresden Units 2 and 3 is not expected to contribute to adverse cumulative impacts on either the eastern prairie fringed orchid or the bald eagle.

The staff has determined that the cumulative impacts to terrestrial threatened or endangered species due to continued operation of Dresden Units 2 and 3 and associated transmission lines would be SMALL, and that additional mitigation measures would not be warranted.

4.9 Summary of Impacts During the Renewal Term

Neither Exelon nor the staff is aware of information that is both new and significant related to any of the applicable Category 1 issues associated with the Dresden operation during the renewal term. Consequently, the staff concludes that the environmental impacts associated with these issues are bounded by the impacts described in the GEIS. For each of these issues, the GEIS concludes that the impacts would be SMALL and that additional plant-specific mitigation measures are not likely to be sufficiently beneficial to warrant implementation.

Plant-specific environmental evaluations were conducted for 15 Category 2 issues applicable to Dresden operation during the renewal term and for environmental justice and chronic effects of electromagnetic fields. For 15 issues and environmental justice, the staff concludes that the potential environmental impact of renewal term operations of Dresden would be of SMALL significance in the context of the standards set forth in the GEIS and that no further mitigation measures are warranted. In addition, the staff determined that a consensus has not been reached by appropriate Federal health agencies regarding chronic adverse effects from electromagnetic fields. Therefore, no evaluation of this issue is required.

4.10 References

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

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

36 CFR Part 800. Code of Federal Regulations, Title 36, *Parks, Forests, and Public Property,* Part 800, "Protection of Historic and Cultural Resources."

40 CFR Part 190. Code of Federal Regulations, Title 40, *Protection of Environment,* Part 190, "Environmental Radiation Protection Standards for Nuclear Power Operations."

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

59 FR 7629. Executive Order 12898. "Federal Actions to Address Environmental Justice in Minority and Low-Income Populations." *Federal Register.* Vol. 59, No. 32, p. 7629. February 16, 1994.

35 Illinois Administrative Code 302.211

Clean Water Act. 33 USC 1326, et seq. (also known as the Federal Water Pollution Control Act of 1977.)

Commonwealth Edison Company (ComEd). 1944. Evidence to Support a 316(a) Demonstration Dresden Generating Station. Prepared by Commonwealth Edison Company, Chicago. Illinois. June 21.

Commonwealth Edison Company (ComEd). 1977. *Dresden Generating Station Cooling Water Intake Impact Report.* Prepared by Commonwealth Edison Company, Chicago. Illinois. February 28.

Commomwealth Edison Company (ComEd). 1981. *Water Quality Study in the Dresden Cooling Pond during Indirect Open Cycle Operations, June 15–September 30, 1981.* December 17, 1981.

Commonwealth Edison Company (ComEd). 1987. *Final Report Dresden Station Aquatic Monitoring 1986.* Prepared by Environmental Science and Engineering, Inc., St. Louis, Missouri. January.

Commonwealth Edison Company (ComEd). 1999. *NPDES Noncompliance for Dresden Nuclear Power Station.* November 8.

Commonwealth Edison Company (ComEd). 2000. *Final Report Dresden Station Aquatic Monitoring 1999, River Mile 266.0-274.4.* Prepared by EA Engineering, Science and Technology, Chicago, Illinois. November.

Council on Environmental Quality (CEQ). 1997. *Environmental Justice: Guidance under the National Environmental Policy Act.* Executive Office of the President, Washington, D.C.

Cunningham, E. 2003. *ComEd Transmission Vegetation Management Program.*

Electric Power Research Institute (EPRI). 1991. *TL Workstation Code, Volume 7: AC/DC LINE User's Manual.* Version 1.0. Palo Alto, California.

Endangered Species Act (ESA). 16 USC 1536, et seq.

Exelon Generation Company, LLC (Exelon), Dresden Power Station. 2002a. *Application for a Joint Construction and Operating Permit, Supplemental Cooling Tower, Dresden Generating Station, Facility Identification Number: 063806AAC, Application 01120031.* Memo # DGBLTR 02-0025. December 2.

Exelon Generation Company, LLC (Exelon). 2002b. *Final Report Dresden Station Aquatic Monitoring 2001 Upper Illinois Waterway River Mile 270-5-273.4.* Prepared by EA Engineering, Science and Technology, Chicago, Illinois. October.

Exelon Generating Company, LLC (Exelon). 2003a. *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.

Exelon Generating Company, LLC (Exelon). 2003b. Email from Mr. William Maher, Exelon, to the NRC staff which documents Exelon's completion of procedure changes to address SHPO issues.

Geolytics. 2000. *Census 2000 Block Groups.* Data from the U.S. Bureau of the Census 2000.

Illinois Environmental Protection Agency (IEPA). 2000. *National Pollutant Discharge Elimination System (NPDES) Permit No. IL0002224, Fact Sheet and Public Notice No. DEL:99122901.* Springfield, Illinois. April 25.

Illinois Pollution Control Board (IPCB). 1974. PCB Order 73-359. January 17.

Illinois Pollution Control Board (IPCB). 1981. PCB Order 73-1345. July 9.

Institute of Electrical and Electric Engineers (IEEE). 1997. National Electrical Safety Code (NESC). Institute of Electrical and Electric Engineers. New York, New York.

Jury, K. R. 2002a. Letter from K. R. Jury, Exelon Generation Company, Warrenville, Illinois, to Clint Mudgett, Illinois Department of Public Health, Springfield, Illinois. Subject: "Dresden Nuclear Power Station Units 2 and 3, License Renewal: Request for Information on Thermophilic Microorganisms." January 11.

Jury, K. R. 2002b. Letter from K. R. Jury, Exelon Generation Company, Warrenville, Illinois, to J. Millar, U.S. Fish and Wildlife Service, Rock Island, Illinois. Subject: "Dresden Nuclear Power Station Units 2 and 3 License Renewal: Request for Information on Threatened or Endangered Species." January 11.

Jury, K. R. 2002c. Letter from K. R. Jury, Exelon Generation Company, Warrenville, Illinois, to K. Shank, Illinois Department of Natural Resources, Springfield, Illinois. Subject: "Dresden Nuclear Power Station Units 2 and 3 License Renewal: Request for Information on State-Listed Species and Important Habitats." February 22.

Millar, J. 2002. Letter from J. Millar, U.S. Fish and Wildlife Service, Rock Island Illinois, to K. R. Jury, Exelon Generation Company, Warrenville, Illinois. Subject: "Dresden Nuclear Power Station Units 2 and 3 License Renewal: Request for Information on Threatened or Endangered Species." February 12.

Mudgett, C. C. 2002. Letter from Clinton Mudgett, Illinois Department of Public Health, to K. R. Jury, Exelon Generation Company, Warrenville, Illinois. (Reply to K. R. Jury [2002a]). February 7.

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

National Historic Preservation Act (NHPA) of 1966. 16 USC 470, et seq.

National Institute of Environmental Health Sciences (NIEHS). 1999. *NIEHS Report on Health Effects from Exposure to Power Line Frequency and Electric and Magnetic Fields.* Publication No. 99-4493. Research Triangle Park, North Carolina.

U.S. Atomic Energy Commission (AEC). 1973. *Final Environmental Statement Related to Operation of Dresden Nuclear Power Station, Units 2 and 3, Commonwealth Edison Company.* Docket Nos. 50-237 and 50-249. Directorate of Licensing. Washington, D.C.

U.S. Bureau of the Census (USBC). 1999. Decennial Management Division Glossary. April 1999. Available at <http://www.census.gov/dmd/www/glossary.html>

U.S. Fish and Wildlife Service (FWS). 2001. *Hine's Emerald Dragonfly (Somatochlora hineana) Recovery Plan.* Fort Snelling, MN.

U.S. Geological Service (USGS). 2000. *Discharge Tables 20000, 05543500 Illinois River at Marseilles, Illinois.* Accessed at <http://il.water.usgs.fov/annrep_2000/data/dis2000/05543500.htm> on May 11, 2003.

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.

U.S. Nuclear Regulatory Commission (NRC). 1999a. *Generic Environmental Impact Statement for License Renewal of Nuclear Plants, Calvert Cliffs Nuclear Power Plant, Supplement 1, NUREG-1437.* Washington, D.C. February.

U.S. Nuclear Regulatory Commission (NRC). 1999b. *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). 2001. *Procedural Guidance for Preparing Environmental Assessments and Considering Environmental Issues.* Appendix D to NRR Office Instruction LIC-203. Washington, D.C. June 21.

5.0 Environmental Impacts of Postulated Accidents

Environmental issues associated with postulated accidents 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 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 characteristic.

(2) Single significance level (i.e., SMALL, MODERATE, or LARGE) has been assigned to the impacts (except for collective offsite 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 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.

This chapter describes the environmental impacts from postulated accidents that might occur during the license renewal term.

5.1 Postulated Plant Accidents

Two classes of accidents are evaluated in the GEIS. These are design-basis accidents (DBAs) and severe accidents, as discussed below.

(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 Addendum 1.

5.1.1 Design-Basis Accidents

In order to receive NRC approval to operate a nuclear power facility, an applicant must submit a safety analysis report (SAR) as part of the application. The SAR presents the design criteria and design information for the proposed reactor and comprehensive data on the proposed site. The SAR also discusses various hypothetical accident situations and the safety features that are provided to prevent and mitigate accidents. The NRC staff reviews the application to determine whether the plant design meets the Commission's regulations and requirements and includes, in part, the nuclear plant design and its anticipated response to an accident.

DBAs are those accidents that both the licensee and the NRC staff evaluate to ensure that the plant can withstand normal and abnormal transients, and a broad spectrum of postulated accidents without undue hazard to the health and safety of the public. A number of these postulated accidents are not expected to occur during the life of the plant but are evaluated to establish the design basis for the preventive and mitigative safety systems of the facility. The acceptance criteria for DBAs are described in 10 CFR Part 50 and 10 CFR Part 100.

The environmental impacts of DBAs are evaluated during the initial licensing process, and the ability of the plant to withstand these accidents is demonstrated to be acceptable before issuance of the operating license (OL). The results of these evaluations are found in license documentation such as the staff's safety evaluation report (SER), the final environmental statement (FES), the licensee's updated final safety analysis report (UFSAR), and Section 5.1 of this supplemental environmental impact statement (SEIS). The licensee is required to maintain the acceptable design and performance criteria throughout the life of the plant, including any extended-life operation. The consequences for these events are evaluated for the hypothetical maximum exposed individual; as such, changes in the plant environment will not affect these evaluations. Because of the requirements that continuous acceptability of the consequences and aging management programs be in effect for license renewal, the environmental impacts as calculated for DBAs should not differ significantly from initial licensing assessments over the life of the plant, including the license renewal period. Accordingly, the design of the plant relative to DBAs during the extended period is considered to remain acceptable, and the environmental impacts of those accidents were not examined further in the GEIS.

The Commission has determined that the environmental impacts of DBAs are of SMALL significance for all plants because the plants were designed to successfully withstand these accidents. Therefore, for the purposes of license renewal, design-basis accidents are designated as a Category 1 issue in 10 CFR Part 51, Subpart A, Appendix B, Table B-1. The early resolution of the DBAs make them a part of the current licensing basis of the plant; the current licensing basis of the plant is to be maintained by the licensee under its current license and, therefore, under the provisions of 10 CFR 54.30, is not subject to review under license renewal. This issue, applicable to Dresden, is listed in Table 5-1.

Table 5-1. Category 1 Issue Applicable to Postulated Accidents During the Renewal Term

ISSUE—10 CFR Part 51, Subpart A, Appendix B, Table B-1	GEIS Section
POSTULATED ACCIDENTS	
Design-basis accidents	5.3.2; 5.5.1

Based on information in the GEIS, the Commission found that

> The NRC staff has concluded that the environmental impacts of design-basis accidents are of small significance for all plants.

Exelon Generation Company, LLC (Exelon) stated in its Environmental Report (ER) (Exelon 2003a) that it is not aware of any new and significant information associated with the renewal of the Dresden OL. The staff has not identified any significant new information during its independent review of the Dresden ER, the staff's site visit, the scoping process, or its evaluation of other available information. Therefore, the staff concludes that there are no impacts of design-basis accidents during the renewal term beyond those discussed in the GEIS.

5.1.2 Severe Accidents

Severe nuclear accidents are those that are more severe than DBAs because they could result in substantial damage to the reactor core, whether or not there are serious offsite consequences. The GEIS assessed the impacts of severe accidents during the license renewal period, using the results of existing analyses and site-specific information to conservatively predict the environmental impacts of severe accidents for each plant during the renewal period.

Based on information in the GEIS, the Commission found that

> The probability weighted consequences of atmospheric releases, fallout onto open bodies of water, releases to ground water, and societal and economic impacts from severe accidents are small for all plants. However, alternatives to mitigate severe accidents must be considered for all plants that have not considered such alternatives.

Therefore, the Commission has designated mitigation of severe accidents as a Category 2 issue in 10 CFR Part 51, Subpart A, Appendix B, Table B-1. This issue, applicable to Dresden, is listed in Table 5-2.

Table 5-2. Category 2 Issue Applicable to Postulated Accidents During the Renewal Term

ISSUE—10 CFR Part 51, Subpart A, Appendix B, Table B-1	GEIS Sections	10 CFR 51.53(c)(3)(ii) Subparagraph	SEIS Section
	POSTULATED ACCIDENTS		
Severe Accidents	5.3.3; 5.3.3.2; 5.3.3.3; 5.3.3.4; 5.3.3.5; 5.4; 5.5.2	L	5.2

The staff has not identified any significant new information with regard to the consequences from severe accidents during its independent review of the Dresden ER (Exelon 2003a), the staff's site visit, the scoping process, or its evaluation of other available information. Therefore, the staff concludes that there are no impacts of severe accidents beyond those discussed in the GEIS. However, in accordance with 10 CFR 51.53(c)(3)(ii)(L), the staff has reviewed severe accident mitigation alternatives (SAMAs) for Dresden. The results of the staff's review are discussed in Section 5.2.

5.2 Severe Accident Mitigation Alternatives (SAMAs)

10 CFR 51.53(c)(3)(ii)(L) requires that license renewal (LR) applicants consider alternatives to mitigate severe accidents if the staff has not previously evaluated SAMAs for the applicant's plant in an environmental impact statement (EIS) or related supplement or in an environmental assessment. The purpose of this consideration is to ensure that plant changes (i.e., hardware, procedures, and training) with the potential for improving severe accident safety performance are identified and evaluated. SAMAs have not been previously considered for Dresden; therefore, the remainder of Chapter 5 addresses those alternatives.

5.2.1 Introduction

This section presents a summary of the SAMA evaluation for Dresden conducted by Exelon and described in the ER (Exelon 2003a) and of the NRC's review of that evaluation. The details of the review are described in the NRC staff evaluation that was prepared by the staff with contract assistance from Information Systems Laboratories, Inc. The entire evaluation is presented in Appendix G.

The SAMA evaluation for Dresden was a four-step process. In the first step, Exelon quantified the level of risk associated with potential reactor accidents using the plant-specific probabilistic risk assessment and other risk models.

The second step was the examination of the major risk contributors to identify areas where plant improvements might have the greatest chance to reduce risk. Then possible ways of reducing those risks were identified. Common ways of reducing risk are changes to components, systems, procedures, and training. Exelon identified 265 potential SAMAs. Using a set of screening criteria, the number of SAMAs requiring further consideration was reduced to 50. Preliminary cost estimates were made for these 50 SAMAs, and any SAMAs costing more than the maximum attainable benefit (discussed in Section 5.2.3) were removed from further consideration.

In the third step, the benefits and costs for the remaining candidate SAMAs were estimated. Estimates were made of how much each proposed SAMA could reduce risk. Those estimates were developed in terms of dollars in accordance with NRC guidance for performing regulatory analyses (NRC 1997). The costs of implementing the proposed SAMAs were also estimated.

Finally in the fourth step, the costs and benefits of each of the remaining SAMAs were compared to determine whether the SAMA was cost-beneficial, meaning the benefits of the SAMA were greater than the costs (a positive cost-benefit). In the final analysis, Exelon concluded that none of these 265 SAMAs were cost-beneficial for Dresden. However, the staff concluded that two of the SAMAs may be cost-beneficial.

Each of these four steps is discussed in more detail in the sections that follow.

5.2.2 Estimate of Risk

Exelon submitted an assessment of SAMAs for Dresden as part of the ER (Exelon 2003a). This assessment was based on the most recent Dresden Probabilistic Risk Assessment (PRA) (including the Level 1 and 2 analyses), a plant-specific offsite consequence analysis performed using the MELCOR Accident Consequence Code System (MACCS2)(essentially a Level 3 PRA model), and insights from the Dresden Individual Plant Examination (IPE) (ComEd 1996) and Individual Plant Examination of External Events (IPEEE) (ComEd 1997; 2000). The SAMA analysis is based on the most recent PRA model available at the time of the ER, referred to as the 2002 update. The scope of the Dresden PRA does not include external events. The baseline core damage frequency (CDF) for Dresden is approximately 1.9×10^{-6} per year, based on internally-initiated events. Exelon did not include the contribution to CDF from external events in these estimates even though the risk from external events is significantly higher for Dresden than the risk from internal events. Exelon concluded that the existing IPEEE and fire evaluations had adequately identified potential plant improvements to address external events.

The breakdown of CDF by initiating event/accident class is summarized in Table 5-3. Loss of offsite power and transients (such as a loss of turbine building closed cooling water) are the dominant contributors to the CDF.

Table 5-3. Dresden Core Damage Frequency

Initiating Event/Accident Class	CDF (Per Year)	% Contribution to CDF
Loss of Offsite Power (LOOP)[a] (dual-unit and single-unit)	7.8×10^{-7}	41
Transients	6.3×10^{-7}	34
Loss of Multiple DC Buses	1.5×10^{-7}	8
Loss-of-Coolant Accident (LOCA)	1.1×10^{-7}	6
Internal Flooding	5.7×10^{-8}	3
Manual Shutdown	5.7×10^{-8}	3
Others	5.7×10^{-8}	3
Loss of Service Water	3.8×10^{-8}	2
Interfacing Systems LOCA (ISLOCA)	1.9×10^{-9}	0.1
Total CDF (from internal events)	**1.9×10^{-6}**	**100**

[a] Includes station blackout (SBO)

Table 5-4. Breakdown of Population Dose by Containment Release Mode

Containment Release Mode	Population Dose (Person-Rem[a] Per Year)	% Contribution
Early containment failure	8.04	79
Late containment failure	2.14	21
Containment Bypass	0.05	<1
No Containment Failure	~0	~0
Total Population Dose	**10.23**	**100**

[a] One person-Rem = 0.01 person-Sv

Exelon estimated the dose from all postulated accidents to the population within 80 km (50 mi) of the Dresden site to be approximately 0.1023 person-Sv (10.23 person-rem). The breakdown of the population dose by containment release mode is summarized in Table 5-4. Early and late containment failures dominate the population dose.

The staff has reviewed Exelon's data and evaluation methods and concludes that the quality of the risk analyses is adequate to support an assessment of the risk reduction potential for the candidate SAMAs. Accordingly, the staff based its assessment of offsite risk on the CDF and offsite doses provided by Exelon.

5.2.3 Potential Plant Improvements

Once the most risk significant parts of the plant design and operation were identified, Exelon searched for ways to reduce those risks. To identify potential plant improvements, Exelon reviewed improvements identified in the Dresden IPE and IPEEE and subsequent PRA revision processes, SAMA analyses submitted for other nuclear power plants, and NRC and industry documents discussing potential plant improvements. Exelon identified 265 potential risk-reducing improvements to plant components, systems, procedures, and training (SAMAs).

All but 50 of these SAMAs were removed from further consideration because: (1) the SAMA was not applicable at Dresden due to design differences, (2) the SAMA had already been implemented at Dresden, (3) the SAMA was sufficiently similar to other SAMAs and was combined with another SAMA, or (4) the SAMA would not provide a significant safety benefit or has implementation costs greater than any possible risk benefit. A preliminary cost estimate was prepared for each of the remaining 50 SAMAs.

The preliminary cost estimate of each of these 50 remaining SAMAs was compared to the maximum attainable benefit (MAB) of 456 thousand dollars. The MAB is the dollar value of the benefit that would be achieved if the plant risk and population dose from postulated accidents could be reduced to zero. If the cost of a SAMA exceeded the MAB, it could not be cost-beneficial because no single SAMA could eliminate all the risk. Using this comparison, all but 10 of the candidate SAMAs were removed from further consideration. In response to a request for additional information by the staff concerning the impact of external events and uncertainties on the SAMA identification process (NRC 2003), Exelon re-evaluated the SAMAs using a MAB of two million dollars (Exelon 2003b). Based on the re-evaluation, Exelon identified a total of 12 candidate SAMAs for further examination (the 10 SAMAs identified through the original screening, plus 2 additional SAMAs identified through the re-screening).

The staff reviewed Exelon's screening methods and results and concluded that they were systematic and comprehensive.

5.2.4 Evaluation of Risk Reduction and Costs of Improvements

Exelon evaluated the risk reduction potential of the remaining 12 SAMAs. Bounding calculations were made for most of these SAMAs; bounding calculations overestimate the benefit and are conservative. The benefits - the estimated dollar value of these risk reductions - were developed by calculating and adding the averted public exposure, offsite property damage, occupational exposure, and onsite costs associated with each SAMA (Exelon 2003a & b).

The staff reviewed Exelon's bases for calculating the risk reduction for the various plant improvements and concluded that the rationale and assumptions for estimating risk reduction are reasonable and generally conservative. Therefore, the staff based its estimates of averted risk for the various SAMAs on Exelon's risk reduction estimates. However, the staff concluded that the benefit estimates should be increased by a factor of five to account for the potential impacts of external events.

The staff reviewed the cost estimates and concluded that the cost ranges provided by Exelon were reasonable and appropriate for use in the SAMA evaluation.

5.2.5 Cost-Benefit Comparison

For the 12 candidate SAMAs identified through the screening process, a more detailed assessment and cost estimate were developed. Exelon applied a multiplier of five to the averted cost estimates (for internal events) for each SAMA, and characterized the result as an upper bound averted cost estimate. Based on a comparison of averted costs and potential implementation costs, four of the SAMAs were retained for further analysis. Exelon re-examined each of these SAMAs to ensure that the averted cost estimates from the internal events analysis appropriately represent the potential (realistic) benefit rather than the maximum benefit, and revised the estimated averted costs and implementation costs accordingly. As a result of this reassessment, the cost-benefit analysis showed that none of the candidate SAMAs were cost-beneficial. Therefore, Exelon's final conclusion was that there were no cost-beneficial SAMAs (Exelon 2003b).

The staff reviewed Exelon's calculation methods and logic arguments in the final cost-benefit comparisons and concluded that Exelon's original benefit estimates should be increased by a factor of five to account for the potential impact of external events. Based on this evaluation, and the use of realistic estimates of averted costs and implementation costs, none of the SAMAs appear to be cost-beneficial. However, two SAMAs could be cost-beneficial given a more detailed evaluation of the external events benefits or when uncertainties are taken into account: SAMA 3b, development of procedures to use a cross connect to the other unit's low pressure coolant injection system as an alternate source of water for containment spray; and

SAMA 11, procedural changes to align low pressure coolant injection or core spray to the condensate storage tank on loss of suppression pool cooling.

5.2.6 Conclusions

The staff reviewed the Exelon SAMA analysis and concluded that the methods used and the implementation of those methods were sound. The treatment of SAMA benefits and costs, the generally large negative net benefits, and the inherently small baseline risks support the general conclusion that the SAMA evaluations performed by Exelon are reasonable and sufficient for the license renewal submittal. However, the staff concluded that two SAMAs could be cost-beneficial given a more detailed evaluation of the external events benefits or when uncertainties are taken into account: SAMA 3b, development of procedures to use a cross connect to the other unit's low pressure coolant injection system as an alternate source of water for containment spray; and SAMA 11, procedural changes to align low pressure coolant injection or core spray to the condensate storage tank on loss of suppression pool cooling. However, these SAMAs do not relate to adequately managing the effects of aging during the period of extended operation. Therefore, they need not be implemented as part of license renewal pursuant to 10 CFR Part 54. Exelon has not made any commitment to implement these two SAMAs.

-The staff concludes that none of the other candidate SAMAs are cost-beneficial. This conclusion is consistent with the low residual level of risk indicated in the Dresden PRA and the fact that Dresden has already implemented many plant improvements identified from the IPE and IPEEE process.

5.3 References

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

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"

10 CFR Part 100. Code of Federal Regulations, Title 10, *Energy*, Part 100, "Reactor Site Criteria"

Commonwealth Edison Company (ComEd). 1996. Letter from John B. Hosmer (ComEd) to U. S. NRC Document Control Desk. Subject: Dresden Station Units 2 and 3, Response to NRC

Review of Individual Plant Examination Submittal – Internal Events, NRC Docket Nos. 50-237 and 50-249, June 28, 1996.

Commonwealth Edison Company (ComEd). 1997. Letter from J. M. Heffley (ComEd) to Nuclear Regulatory Commission Document Control Desk. Subject: Dresden Nuclear Power Station Units 2 and 3 Final Report - Individual Plant Examination of External Events (IPEEE) Generic Letter 88-20, Supplement 4, December 30, 1997.

Commonwealth Edison Company (ComEd). 2000. Letter from Preston Swafford (ComEd) to USNRC Document Control Desk. Subject: Dresden Nuclear Power Station, Units 2 and 3, Facility Operating License Nos. DPR-19 and DPR-25, NRC Docket Nos. 50-237 and 50-249, Request for Additional Information Regarding Individual Plant Examination of External Events, March 30, 2000.

Exelon Generation Company, LLC (Exelon). 2003a. *Applicant's Environmental Report–Operating License Renewal Stage, Dresden Nuclear Power Station Units 2 and 3.* Exelon Generation Company, LLC, Warrenville, Illinois. January 2003.

Exelon Generation Company, LLC (Exelon). 2003b. Letter from Patrick R. Simpson, Exelon, to USNRC Document Control Desk. Subject: Dresden Nuclear Power Station, Units 2 and 3, Facility Operating License Nos. DPR-19 and DPR-25, NRC Docket Nos. 50-237 and 50-249, Response to Request for Additional Information – License Renewal Environmental Report for Dresden Nuclear Power Station, Units 2 and 3, July 23, 2003.

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., 1996.

U.S. Nuclear Regulatory Commission (NRC). 1997. *Regulatory Analysis Technical Evaluation Handbook.* NUREG/BR-0184, Washington, D.C., 1997.

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., 1999.

U.S. Nuclear Regulatory Commission (NRC). 2003. Letter from Louis L. Wheeler, U.S. NRC to John Skolds, Exelon. Subject: Request for Additional Information (RAI) Related to the Staff's Review of the License Renewal Environmental Report for the Dresden Nuclear Power Station, Units 2 and 3, May 23, 2003.

6.0 Environmental Impacts of the Uranium Fuel Cycle and Solid Waste Management

Environmental issues associated with the uranium fuel cycle and solid waste management 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 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 characteristic.

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

This chapter addresses the issues that are related to the uranium fuel cycle and solid waste management during the license renewal term that are listed in Table B-1 of 10 CFR Part 51, Subpart A, Appendix B, and are applicable to Dresden Units 2 and 3. The generic potential impacts of the radiological and nonradiological environmental impacts of the uranium fuel cycle and transportation of nuclear fuel and wastes are described in detail in the GEIS, based, in part, on the generic impacts provided in 10 CFR 51.51(b), Table S-3, "Table of Uranium Fuel Cycle Environmental Data," and in 10 CFR 51.52(c), Table S-4, "Environmental Impact of

(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.

Transportation of Fuel and Waste to and from One Light-Water-Cooled Nuclear Power Reactor." The staff also addresses the impacts from radon-222 and technetium-99 in the GEIS.

6.1 The Uranium Fuel Cycle

Category 1 issues in 10 CFR Part 51, Subpart A, Appendix B, Table B-1, that are applicable to Dresden Units 2 and 3 from the uranium fuel cycle and solid waste management are listed in Table 6-1.

In its Environmental Report (ER), Exelon Generation Company, LLC (Exelon) stated that it is not aware of any new and significant information associated with the renewal of the Dresden Units 2 and 3 operating licenses (Exelon 2003). The staff has not identified any significant new information during its independent review of the Exelon ER, the staff's site visit, the scoping process, or its evaluation of other available information. Therefore, the staff concludes that there are no impacts related to these issues beyond those discussed in the GEIS. For these issues, the staff concluded in the GEIS that the impacts are SMALL except for the collective offsite radiological impacts from the fuel cycle and from HLW and spent fuel disposal, as discussed below, and that additional plant-specific mitigation measures are not likely to be sufficiently beneficial to be warranted.

A brief description of the staff review and the GEIS conclusions, as codified in Table B-1, 10 CFR Part 51, for each of these issues follows:

- Offsite radiological impacts (individual effects from other than the disposal of spent fuel and high-level waste). Based on information in the GEIS, the Commission found that

  > Offsite impacts of the uranium fuel cycle have been considered by the Commission in Table S-3 of this part (10 CFR 51.51[b]). Based on information in the GEIS, impacts on individuals from radioactive gaseous and liquid releases, including radon-222 and technetium-99, are small.

  The staff has not identified any new and significant information during its independent review of the Exelon ER, the staff's site visit, the scoping process, or its evaluation of other available information. Therefore, the staff concludes that there are no offsite radiological impacts of the uranium fuel cycle during the renewal term beyond those discussed in the GEIS.

The staff has not identified any new and significant information during its independent review of the Exelon ER, the staff's site visit, the scoping process, or its evaluation of other available information. Therefore, the staff concludes that there are no offsite radiological impacts of the uranium fuel cycle during the renewal term beyond those discussed in the GEIS.

Table 6-1. Category 1 Issues Applicable to the Uranium Fuel Cycle and Solid Waste Management During the Renewal Term

ISSUE—10 CFR Part 51, Subpart A, Appendix B, Table B-1	GEIS Section
URANIUM FUEL CYCLE AND WASTE MANAGEMENT	
Offsite radiological impacts (individual effects from other than the disposal of spent fuel and high-level waste)	6.1; 6.2.1; 6.2.2.1; 6.2.2.3; 6.2.3; 6.2.4; 6.6
Offsite radiological impacts (collective effects)	6.1; 6.2.2.1; 6.2.3; 6.2.4; 6.6
Offsite radiological impacts (spent fuel and high-level waste)	6.1; 6.2.2.1; 6.2.3; 6.2.4; 6.6
Nonradiological impacts of the uranium fuel cycle	6.1; 6.2.2.6; 6.2.2.7; 6.2.2.8; 6.2.2.9; 6.2.3; 6.2.4; 6.6
Low-level waste storage and disposal	6.1; 6.2.2.2;6.4.2; 6.4.3; 6.4.3.1; 6.4.3.2; 6.4.3.3; 6.4.4; 6.4.4.1; 6.4.4.2; 6.4.4.3; 6.4.4.4; 6.4.4.5; 6.4.4.5.1; 6.4.4.5.2; 6.4.4.5.3; 6.4.4.5.4; 6.4.4.6;6.6
Mixed waste storage and disposal	6.4.5.1; 6.4.5.2; 6.4.5.3; 6.4.5.4; 6.4.5.5; 6.4.5.6; 6.4.5.6.1; 6.4.5.6.2; 6.4.5.6.3; 6.4.5.6.4; 6.6
Onsite spent fuel	6.1; 6.4.6; 6.4.6.1; 6.4.6.2; 6.4.6.3; 6.4.6.4; 6.4.6.5; 6.4.6.6; 6.4.6.7; 6.6
URANIUM FUEL CYCLE AND WASTE MANAGEMENT	
Nonradiological waste	6.1; 6.5; 6.5.1; 6.5.2; 6.5.3; 6.6
Transportation	6.1; 6.3.1; 6.3.2.3; 6.3.3; 6.3.4; 6.6, Addendum 1

- Offsite radiological impacts (collective effects). Based on information in the GEIS, the Commission found that

  The 100-year-environmental-dose commitment to the United States population from the fuel cycle, HLW, and spent fuel disposal excepted, is calculated to be about 14,800 person-rem (148 person Sv), or 12 cancer fatalities, for each additional 20-year power-reactor operating term. Much of this, especially the contribution of radon releases from mines and tailing piles, consists of tiny doses summed over large populations. This same dose calculation can theoretically be extended to include many tiny doses over additional thousands of years as well as doses outside the United States. The result of such a calculation would be thousands of cancer fatalities from the fuel cycle, but this result assumes that even tiny doses have some statistical adverse health effect that will not ever be mitigated (for example, no cancer cure in the next thousand years), and that these doses projected over thousands of years are meaningful. However, these assumptions are questionable. In particular, science cannot rule out the possibility that there will be no cancer fatalities from these tiny doses. For perspective, the doses are very small fractions of regulatory limits and even smaller fractions of natural background exposure to the same populations.

  Nevertheless, despite all the uncertainty, some judgment about the regulatory National Environmental Policy Act (NEPA) implications of these matters should be made, and it is nonsensical to repeat the same judgment in every case. Even taking the uncertainties into account, the Commission concludes that these impacts are acceptable in that these impacts would not be sufficiently large to require the NEPA conclusion, for any plant, that the option of extended operation under 10 CFR Part 54 should be eliminated. Accordingly, while the Commission has not assigned a single level of significance for the collective effects of the fuel cycle, this issue is considered Category 1.

  The staff has not identified any new and significant information during its independent review of the Exelon ER, the staff's site visit, the scoping process, or its evaluation of other available information. Therefore, the staff concludes that there are no offsite radiological impacts (collective effects) from the uranium fuel cycle during the renewal term beyond those discussed in the GEIS.

- Offsite radiological impacts (spent fuel and HLW disposal). Based on information in the GEIS, the Commission found that

  For the HLW and spent fuel disposal component of the fuel cycle, there are no current regulatory limits for offsite releases of radionuclides for the current candidate repository site. However, if we assume that limits are developed along the lines of the 1995 National Academy of Sciences (NAS) report, "Technical Bases for Yucca Mountain Standards," and that in accordance with the Commission's Waste Confidence Decision, 10 CFR 51.23, a repository can and likely will be developed at some site which will comply with such limits, peak doses to virtually all individuals will be 100 millirems (mrem) (1 millisieverts [mSv]) per year or less. However, although the Commission has reasonable confidence that these assumptions will prove correct, there is considerable uncertainty because the limits are yet to be developed, no repository application has been completed or reviewed, and uncertainty is inherent in the models used to evaluate possible pathways to the human environment. The NAS report indicated that 100 mrem (1 mSv) per year should be considered as a starting point for limits for individual doses, but it notes that some measure of consensus exists among national and international bodies that the limits should be a fraction of the 100 mrem (1 mSv) per year. The lifetime individual risk from 100 mrem (1 mSv) annual dose limit is about 3×10^{-3}.

Estimating cumulative doses to populations over thousands of years is more problematic. The likelihood and consequences of events that could seriously compromise the integrity of a deep geologic repository were evaluated by the Department of Energy in the "Final Environmental Impact Statement: Management of Commercially Generated Radioactive Waste," October 1980 (U.S. Department of Energy [DOE 1980]). The evaluation estimated the 70-year whole-body dose commitment to the maximum individual and to the regional population that resulted from several modes of breaching a reference repository in the year of closure, after 1000 years, after 100,000 years, and after 100 million years. Subsequently, the NRC and other federal agencies have expended considerable effort to develop models for the design and for the licensing of a HLW repository, especially for the candidate repository at Yucca Mountain. More meaningful estimates of doses to population may be possible in the future as more is understood about the performance of the proposed Yucca Mountain repository. Such estimates would involve very great uncertainty, especially with respect to cumulative population doses over thousands of years. The standard proposed by the NAS is a limit on maximum individual dose. The relationship of potential new regulatory requirements, based on the NAS report, and cumulative population impacts has not been determined, although the report articulates the view that protection of individuals will adequately protect the population for a repository at Yucca Mountain. However, EPA's generic repository standards in 40 CFR Part 191 generally provide an indication of the order of magnitude of cumulative risk to population that could result from the licensing of a Yucca Mountain repository, assuming the ultimate standards will be within the range of

> standards now under consideration. The standards in 40 CFR Part 191 protect the population by imposing "containment requirements" that limit the cumulative amount of radioactive material released over 10,000 years. Reporting performance standards that will be required by EPA are expected to result in releases and associated health consequences in the range between 10 and 100 premature cancer deaths with an upper limit of 1000 premature cancer deaths worldwide for a 100,000 metric tonne (MT) repository.
>
> Nevertheless, despite all the uncertainty, some judgment as to the regulatory NEPA implications of these matters should be made and it makes no sense to repeat the same judgment in every case. Even taking the uncertainties into account, the Commission concludes that these impacts are acceptable in that these impacts would not be sufficiently large to require the NEPA conclusion, for any plant, that the option of extended operation under 10 CFR Part 54 should be eliminated. Accordingly, while the Commission has not assigned a single level of significance for the impacts of spent fuel and HLW disposal, this issue is considered Category 1.

Since the GEIS was originally issued in 1996, the EPA has published radiation protection standards for Yucca Mountain, Nevada, at 40 CFR Part 197, "Public Health and Environmental Radiation Protection Standards for Yucca Mountain, Nevada," on June 13, 2001 (66 FR 32132). The Energy Policy Act of 1992 (42 USC 10101 et seq.) directs that the NRC adopt these standards into its regulations for reviewing and licensing the repository. The NRC published its regulations at 10 CFR Part 63, on November 2, 2001 (66 FR 55792). These standards include the following: (1) 0.15-mSv/yr (15-mrem/yr) dose limit for members of the public during the storage period prior to repository closure; (2) 0.15-mSv/yr (15-mrem/yr) dose limit for the reasonably maximally exposed individual for 10,000 years following disposal; (3) 0.15-mSv/yr (15-mrem/yr) dose limit for the reasonably maximally exposed individual as a result of a human intrusion at or before 10,000 years after disposal; and (4) a groundwater protection standard that states for 10,000 years of undisturbed performance after disposal, radioactivity in a representative volume of ground water will not exceed (a) 0.0002 megabecquerels per liter (Mbq/L)(5 picocuries per liter [pCi/L]) radium-226 and radium-228, (b) 0.0006 Mbq/L (15 pCi/L) (gross alpha activity), and (c) 0.04 mSv/yr (4 mrem/yr) to the whole body or any organ (from combined beta and photon emitting radionuclides).

On July 23, 2002, the President signed into law House Joint Resolution 87 designating Yucca Mountain site as the repository for spent nuclear fuel. This development does not cause the staff to change its position with respect to the impact of spent fuel and HLW disposal. The staff still considers the Category 1 classification of this issue in the GEIS to be appropriate.

The staff has not identified any new and significant information during its independent review of the Exelon ER, the staff's site visit, the scoping process, or its evaluation of other available information. Therefore, the staff concludes that there are no offsite radiological impacts related to spent fuel and HLW disposal during the renewal term beyond those discussed in the GEIS.

- Nonradiological impacts of the uranium fuel cycle. Based on information in the GEIS, the Commission found that

  The nonradiological impacts of the uranium fuel cycle resulting from the renewal of an operating license for any plant are found to be small.

The staff has not identified any new and significant information during its independent review of the Exelon ER, the staff's site visit, the scoping process, or its evaluation of other available information. Therefore, the staff concludes that there are no nonradiological impacts of the uranium fuel cycle during the renewal term beyond those discussed in the GEIS.

- Low-level waste storage and disposal. Based on information in the GEIS, the Commission found that

  The comprehensive regulatory controls that are in place and the low public doses being achieved at reactors ensure that the radiological impacts to the environment will remain small during the term of a renewed license. The maximum additional onsite land that may be required for low-level waste storage during the term of a renewed license and associated impacts will be small. Nonradiological impacts on air and water will be negligible. The radiological and nonradiological environmental impacts of long-term disposal of low-level waste from any individual plant at licensed sites are small. In addition, the Commission concludes that there is reasonable assurance that sufficient low-level waste disposal capacity will be made available when needed for facilities to be decommissioned consistent with NRC decommissioning requirements.

The staff has not identified any new and significant information during its independent review of the Exelon ER, the staff's site visit, the scoping process, or its evaluation of other available information. Therefore, the staff concludes that there are no impacts of low-level waste storage and disposal associated with the renewal term beyond those discussed in the GEIS.

- Mixed waste storage and disposal. Based on information in the GEIS, the Commission found that

  The comprehensive regulatory controls and the facilities and procedures that are in place ensure proper handling and storage, as well as negligible doses and exposure to toxic materials for the public and the environment at all plants. License renewal will not increase the small, continuing risk to human health and the environment posed by mixed waste at all plants. The radiological and nonradiological environmental impacts of long-term disposal of mixed waste from any individual plant at licensed sites are small. In addition, the Commission concludes that there is reasonable assurance that sufficient mixed waste disposal capacity will be made available when needed for facilities to be decommissioned consistent with NRC decommissioning requirements.

  The staff has not identified any new and significant information during its independent review of the Exelon ER, the staff's site visit, the scoping process, or its evaluation of other available information. Therefore, the staff concludes that there are no impacts of mixed waste storage and disposal associated with the renewal term beyond those discussed in the GEIS.

- Onsite spent fuel. Based on information in the GEIS, the Commission found that

  The expected increase in the volume of spent fuel from an additional 20 years of operation can be safely accommodated on site with small environmental effects through dry or pool storage at all plants if a permanent repository or monitored retrievable storage is not available.

  The staff has not identified any new and significant information during its independent review of the Exelon ER, the staff's site visit, the scoping process, or its evaluation of other available information. Therefore, the staff concludes that there are no impacts of onsite spent fuel associated with license renewal beyond those discussed in the GEIS.

- Nonradiological waste. Based on information in the GEIS, the Commission found that

  No changes to generating systems are anticipated for license renewal. Facilities and procedures are in place to ensure continued proper handling and disposal at all plants.

  The staff has not identified any new and significant information during its independent review of the Exelon ER, the staff's site visit, the scoping process, or its evaluation of other available information. Therefore, the staff concludes that there are no nonradiological waste impacts during the renewal term beyond those discussed in the GEIS.

- Transportation. Based on information in the GEIS, the Commission found that

  The impacts of transporting spent fuel enriched up to 5 percent uranium-235 with average burnup for the peak rod to current levels approved by NRC up to 62,000 megawatt-days per metric ton of uranium (MWd/MTU) and the cumulative impacts of transporting HLW to a single repository, such as Yucca Mountain, Nevada, are found to be consistent with the impact values contained in 10 CFR 51.52(c), Summary Table S-4, "Environmental Impact of Transportation of Fuel and Waste to and from One Light-Water-Cooled Nuclear Power Reactor." If fuel enrichment or burnup conditions are not met, the applicant must submit an assessment of the implications for the environmental impact values reported in Sec. 51.52.

  Dresden Units 2 and 3 meet the fuel enrichment and burn-up conditions set forth in Addendum 1 to the GEIS. The staff has not identified any new and significant information during its independent review of the Exelon ER, the staff's site visit, the scoping process, or its evaluation of other available information. Therefore, the staff concludes that there are no impacts of transportation associated with license renewal beyond those discussed in the GEIS.

There are no Category 2 issues for the uranium fuel cycle and solid waste management.

6.2 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."

10 CFR Part 63. Code of Federal Regulations, Title 10, *Energy*, Part 63, "Disposal of High-Level Radioactive Wastes in a Geologic Repository at Yucca Mountain, Nevada."

40 CFR Part 191. Code of Federal Regulations, Title 40, *Protection of Environment*, Part 191, "Environmental Radiation Protection Standards for Management and Disposal of Spent Nuclear Fuel, High-Level and Transuranic Radioactive Waste."

40 CFR Part 197. Code of Federal Regulations, Title 40, *Protection of Environment*, Part 197, "Public Health and Environmental Radiation Protection Standards for Management and Disposal for Yucca Mountain, Nevada."

66 FR 32132. "Public Health and Environmental Radiation Protection Standards for Yucca Mountain, NV." *Federal Register*. Vol. 66, No.114. June 13, 2001.

66 FR 55792. "Disposal of High-Level Radioactive Wastes in a Proposed Geologic Repository at Yucca Mountain, Nevada." *Federal Register*. Vol. 66, No. 213. November 2, 2001.

Energy Policy Act of 1992. 42 USC 10101, et seq.

Exelon Generation Company, LLC (Exelon). 2003. *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.

National Academy of Sciences (NAS). 1995. *Technical Bases for Yucca Mountain Standards*. Washington, D.C.

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

U.S. Department of Energy (DOE). 1980. *Final Environmental Impact Statement: Management of Commercially Generated Radioactive Waste*. DOE/EIS-0046F. Washington, D.C.

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.

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.

7.0 Environmental Impacts of Decommissioning

Environmental issues associated with decommissioning, which result from continued plant operation during the renewal term, 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 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 characteristic.

(2) A single significance level (i.e., SMALL, MODERATE, or LARGE) has been assigned to the impacts (except for collective offsite 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 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. There are no Category 2 issues related to decommissioning.

Category 1 issues in Table B-1 of 10 CFR Part 51, Subpart A, Appendix B, that are applicable to Dresden Units 2 and 3 decommissioning following the renewal term are listed in Table 7-1. Exelon Generation Company, LLC (Exelon) stated in its Environmental Report (ER) that it is aware of no new and significant information regarding the environmental impacts of Dresden Units 2 and 3 license renewal (Exelon 2003). The staff has not identified any significant new information during its independent review of the Exelon ER, the staff's site visit, the scoping process, or its evaluation of other available information. Therefore, the staff concludes that there are no impacts related to these issues beyond those discussed in the GEIS. For all of

(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.

these issues, the staff concluded in the GEIS that the impacts are SMALL, and additional plant-specific mitigation measures are not likely to be sufficiently beneficial to be warranted.

Table 7-1. Category 1 Issues Applicable to the Decommissioning of Dresden Units 2 and 3 Following the Renewal Term

ISSUE—10 CFR PART 51, SUBPART A, APPENDIX B, TABLE B-1	GEIS Section
DECOMMISSIONING	
Radiation doses	7.3.1; 7.4
Waste management	7.3.2; 7.4
Air quality	7.3.3; 7.4
Water quality	7.3.4; 7.4
Ecological resources	7.3.5; 7.4
Socioeconomic impacts	7.3.7; 7.4

A brief description of the staff's review and the GEIS conclusions, as codified in Table B-1, for each of the issues follows:

- Radiation doses. Based on information in the GEIS, the Commission found that

  > Doses to the public will be well below applicable regulatory standards regardless of which decommissioning method is used. Occupational doses would increase no more than 1 man-rem (0.01 person-Sv) caused by buildup of long-lived radionuclides during the license renewal term.

  The staff has not identified any new and significant information during its independent review of the Exelon ER, the staff's site visit, the scoping process, or its evaluation of other available information. Therefore, the staff concludes that there are no radiation doses associated with decommissioning following license renewal beyond those discussed in the GEIS.

- Waste management. Based on information in the GEIS, the Commission found that

  > Decommissioning at the end of a 20-year license renewal period would generate no more solid wastes than at the end of the current license term. No increase in the quantities of Class C or greater than Class C wastes would be expected.

  The staff has not identified any new and significant information during its independent review of the Exelon ER, the staff's site visit, the scoping process, or its evaluation of other available information. Therefore, the staff concludes that there are no impacts of solid waste associated with decommissioning following the license renewal term beyond those discussed in the GEIS.

- Air quality. Based on information in the GEIS, the Commission found that

  > Air-quality impacts of decommissioning are expected to be negligible either at the end of the current operating term or at the end of the license renewal term.

  The staff has not identified any new and significant information during its independent review of the Exelon ER (Exelon 2003), the staff's site visit, the scoping process, or its evaluation of other available information. Therefore, the staff concludes that there are no impacts of license renewal on air quality during decommissioning beyond those discussed in the GEIS.

- Water quality. Based on information in the GEIS, the Commission found that

  > The potential for significant water-quality impacts from erosion or spills is no greater whether decommissioning occurs after a 20-year license renewal period or after the original 40-year operation period, and measures are readily available to avoid such impacts.

  The staff has not identified any new and significant information during its independent review of the Exelon ER (Exelon 2003), the staff's site visit, the scoping process, or its evaluation of other available information. Therefore, the staff concludes that there are no impacts of the license renewal term on water quality during decommissioning beyond those discussed in the GEIS.

- Ecological resources. Based on information in the GEIS, the Commission found that

  > Decommissioning after either the initial operating period or after a 20-year license renewal period is not expected to have any direct ecological impacts.

  The staff has not identified any new and significant information during its independent review of the Exelon ER, the staff's site visit, the scoping process, or its evaluation of other available information. Therefore, the staff concludes that there are no impacts of the license renewal term on ecological resources during decommissioning beyond those discussed in the GEIS.

- Socioeconomic Impacts. Based on information in the GEIS, the Commission found that

  > Decommissioning would have some short-term socioeconomic impacts. The impacts would not be increased by delaying decommissioning until the end of a 20-year relicense period, but they might be decreased by population and economic growth.

The staff has not identified any new and significant information during its independent review of the Exelon ER (Exelon 2003), the staff's site visit, the scoping process, or its evaluation of other available information. Therefore, the staff concludes that there are no impacts of license renewal on the socioeconomic impacts of decommissioning beyond those discussed in the GEIS.

7.1 References

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

Exelon Generation Company, LLC (Exelon). 2003. *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.

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.

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.

8.0 Environmental Impacts of Alternatives to Operating License Renewal

This chapter examines the potential environmental impacts associated with denying the renewal of the operating licenses (OLs) (i.e., the no-action alternative) for Dresden Units 2 and 3; the potential environmental impacts from electric generating sources other than Dresden Units 2 and 3; the possibility of purchasing electric power from other sources to replace power generated by Dresden Units 2 and 3 and the associated environmental impacts; the potential environmental impacts from a combination of generating and conservation measures; and other generation alternatives that were deemed unsuitable for replacement of power generated by Dresden Units 2 and 3. The environmental impacts are evaluated using the U.S. Nuclear Regulatory Commission's (NRC's) three-level standard of significance—SMALL, MODERATE, or LARGE—that were developed using the Council on Environmental Quality guidelines and set forth in a footnote 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.

The impact categories evaluated in this chapter are the same as those used in the *Generic Environmental Impact Statement for License Renewal of Nuclear Plants* (GEIS), NUREG-1437, Volumes 1 and 2 (NRC 1996; 1999)[a] with the additional impact category of environmental justice.

8.1 No-Action Alternative

The NRC's regulations implementing the National Environmental Policy Act (NEPA) specify that the no-action alternative be discussed in a NRC environmental impact statement (EIS) (10 CFR Part 51, Subpart A, Appendix A4). For license renewal, the no-action alternative refers to a scenario in which the NRC would not renew the OLs for Dresden Units 2 and 3; and Exelon Generation Company, LLC (Exelon) would then decommission Dresden Units 2 and 3 when plant operations cease.

(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.

The no-action alternative is a conceptual alternative resulting in a net reduction in electricity generation; there would be no replacement power and, therefore, no environmental impacts from replacement power. In actual practice, the power lost by not renewing the OLs for Dresden Units 2 and 3 would likely be replaced by (1) demand-side management (DSM) and energy conservation, (2) electricity generated from other sources, either by Exelon or by another generator, or (3) some combination of these alternatives. Any replacement power would produce environmental impacts in addition to those discussed under the no-action alternative. Environmental impacts of these other sources are discussed in this section.

Exelon will be required to comply with the NRC decommissioning requirements whether or not the OLs are renewed and, therefore, must comply under the no-action alternative. If the OLs for Dresden Units 2 and 3 are renewed, decommissioning activities could be postponed for up to an additional 20 years. If the OLs are not renewed, Exelon would conduct decommissioning activities according to the requirements in 10 CFR 50.82.

The environmental impacts associated with decommissioning under both license renewal and the no-action alternative would be bound by the discussion of impacts in Chapter 7 of the GEIS, Chapter 7 of this supplemental environmental impact statement (SEIS); the *Final Generic Environmental Impact Statement on Decommissioning of Nuclear Facilities*, NUREG-0586, dated August 1988; and the supplement to the decommissioning GEIS (NRC 2002). The impacts of decommissioning after 60 years of operation are not expected to be significantly different from those occurring after 40 years of operation.

The environmental impacts associated with the no-action alternative are summarized in Table 8-1. Implementation of the no-action alternative would also have certain positive impacts in that adverse environmental impacts associated with the current operation of Dresden Units 2 and 3 (for example, any adverse ecological impacts) would be eliminated or reduced.

- Land Use. Temporary changes in onsite land use for portions of the site could occur during decommissioning. Temporary changes may include the addition or the expansion of staging and laydown areas or construction of temporary buildings and parking areas. No offsite land-use changes are expected as a result of decommissioning. The impacts of the no-action alternative on land use are considered SMALL.

Table 8-1. Summary of Environmental Impacts of the No-Action Alternative

Impact Category	Impact	Comment
Land Use	SMALL	Impacts expected to be temporary.
Ecology	SMALL	Impacts on ecology would be expected to be temporary and largely mitigated by using best management practices.
Water Use and Quality	SMALL	Water use would decrease. Water quality unlikely to be adversely affected.
Air Quality	SMALL	Greatest impact would likely be from fugitive dust; impact could be mitigated by good management practices.
Waste	SMALL	Low-level radioactive waste would be disposed of in licensed facilities. A permanent disposal facility for high-level waste is not currently available.
Human Health	SMALL	Radiological doses to workers and members of the public would be expected to be within regulatory limit and comparable to, or lower than, doses from operating plants. Occupational injuries would be possible, but injury rates at nuclear power plants are below the U.S. average industrial rate.
Socioeconomic	LARGE	SMALL impacts on employment partly due to proximity to Chicago metropolitan area. LARGE impacts on tax revenue of Grundy County.
Aesthetics	SMALL	Positive impact from eventual removal of buildings and structures. Some noise impact during decommissioning operations.
Historic and Archaeological Resources	SMALL	Impacts primarily confined to land utilized during plant operations. No direct impact to other lands on site.
Environmental Justice	SMALL	Impacts on minority and low-income communities would be similar to those experienced by the population as a whole.

- Ecology. Impacts on aquatic ecology at the Dresden site could result from removal of in-water pipes and structures or the filling of the intake and discharge canals. Impacts to aquatic ecology would likely be short-term and could be mitigated. The aquatic environment is expected to recover naturally. Impacts on terrestrial ecology could occur as a result of land disturbance for additional laydown yards, stockpiles, and support facilities. However, land disturbance is expected to be minimal and would result in relatively short-term impacts that could be mitigated using best management practices. The land is expected to recover naturally. The impacts of the no-action alternative on ecology are considered SMALL.

- Water Use and Quality. Cessation of plant operations would result in a beneficial reduction in water use because reactor cooling will no longer be required. As the number of plant staff is reduced, the demand for potable water is expected to decrease also. Overall, the impacts of the no-action alternative on water use and quality are considered SMALL.

- Air Quality. Decommissioning activities that can adversely affect air quality include dismantlement of systems and equipment, demolition of buildings and structures, and the operation of internal combustion engines. The most likely adverse impact would be the generation of fugitive dust. Best management practices, such as seeding and wetting, could be used to minimize the generation of fugitive dust. Overall, the impacts of the no-action alternative on air quality are considered SMALL.

- Waste. Decommissioning activities would result in the generation of radioactive and nonradioactive waste. The volume of low-level radioactive waste (LLW) could vary greatly depending on the waste treatment and volume reduction procedures used. Low-level radioactive waste must be disposed of in a facility licensed by the NRC or a State with authority delegated by the NRC. Recent advances in volume reduction and waste processing have significantly reduced waste volumes.

  A permanent repository for high-level waste (HLV) is not currently available. The NRC has made a generic determination that, if necessary, spent fuel generated in any reactor can be stored safely and without significant environmental impacts for at least 30 years beyond the licensed life for operation (which may include the term of a revised or renewed license) of that reactor in its spent fuel pool or at either onsite or offsite independent spent fuel storage installations (10 CFR 51.23[a]). Overall, the impacts of the no-action alternative on waste are considered SMALL.

- Human Health. Radiological doses to occupational workers during decommissioning activities are estimated to average approximately 5 percent of the dose limits in 10 CFR Part 20 and to be similar to, or lower than, the doses experienced by workers in operating nuclear power plants. Collective doses to members of the public and to the maximally exposed individual as a result of decommissioning activities are estimated to be well below the limits in 10 CFR Part 20, and to be similar to, or lower than, the doses received from operating nuclear power plants. Occupational injuries to workers engaged in decommissioning activities are possible. Overall, the impacts of the no-action alternative on human health are considered SMALL.

- Socioeconomic. If Dresden Units 2 and 3 cease operation, there would be a decrease in employment and tax revenues associated with the closure. These impacts would be most concentrated in Grundy and Will counties with smaller impacts in adjoining counties. There would be some adverse impacts on local housing values and the local economy in Grundy and Will counties, and other adjoining counties to a lesser extent, under the no-action alternative.

  Tax revenue losses as a result of the closure of Dresden Units 2 and 3 would occur in Grundy and Will counties. For the years 1997 through 2000, property taxes from Dresden Units 2 and 3 provided between 13 and 20 percent of Grundy County's total levee extension and between 13 and 21 percent of Grundy County's total collections available for distribution (Exelon 2003). For the years 1997 through 2000, property taxes from Dresden Units 2 and 3 provided less than 1 percent of Will County's total levee extension and less than 1 percent of Will County's total collections available for distribution (Exelon 2003). Hence, nonrenewal of the operating license for Dresden Units 2 and 3 could have significant impacts on the tax base of Grundy County but not of Will County. However, because of changes in the regulation of the electricity sector in Illinois, tax payments will go down in Grundy County by some portion even under license renewal although likely significantly less than under the no-action alternative.

  The no-action alternative would result in the loss of plant payrolls 20 years earlier than if the OLs were renewed. Dresden Units 2 and 3 currently support approximately 870 permanent employees and approximately 120 to 130 contract workers (Exelon 2003). Because approximately 72 percent of employees who work at the Dresden site live in Grundy and Will counties (Exelon 2003), primary employment impacts would be concentrated in these counties. However, the proximity to the Chicago metropolitan area would mitigate much of the employment impact. Most secondary employment impacts and impacts on population would also be concentrated in Grundy and Will counties. Exelon employees working at the Dresden site currently contribute time and money toward community involvement, including schools, churches, charities, and other civic activities. It is likely that with a reduced presence in the community following decommissioning, Exelon's community involvement efforts in the region would be lessened.

  Overall, the no-action alternative would have a LARGE socioeconomic impact because of the importance of the tax revenue from Dresden Units 2 and 3 to Grundy County.

- Aesthetics. Decommissioning would result in the eventual dismantlement of buildings and structures at the site resulting in a positive aesthetic impact. Noise would be generated during decommissioning operations that may be detectable off site; however, the impact is unlikely to be of significance, and noise would cease altogether following decommissioning. Overall, the impacts of the no-action alternative on aesthetics are considered SMALL.

- Historic and Archaeological Resources. The potential for future adverse impacts to known or unrecorded cultural resources at the Dresden site following decommissioning would depend on the future use of the site land and on an analysis and determinations of the historic status of the plant, including the units for decommissioning. There is one known archaeological site on Dresden site proper. This site was examined in 1973 by a professional archaeologist, Dr. Robert Hall of the University of Illinois, who determined that disturbance caused by construction was minimal (Exelon 2003).

  According to the applicant, decommissioning of Dresden Unit 1 will occur simultaneously with the decommissioning of Dresden Units 2 and 3 (Exelon 2003). A no-action decision could initiate decommissioning activities within the next eight years as license expiration approaches for Units 2 and 3. Dresden Unit 1, listed as an American Nuclear Society Nuclear Historic Landmark, will be over 50 years of age and is likely to meet the eligibility criteria for listing on the National Register of Historic Places (NRHP). An evaluation of historical significance of Dresden Unit 1, pursuant to the National Historic Preservation Act, would be required prior to activities that could adversely affect the property, i.e., decommissioning, dismantling, or modifying the facility/reactor. Should Dresden Unit 1 be determined eligible for the NRHP, its decommissioning would constitute an adverse effect. Development and implementation of a mitigation plan, in consultation with the Illinois State Historical Preservation Office (SHPO), would be required. Overall, the impacts of the no-action alternative on historic and archaeological resources are considered SMALL.

- Environmental Justice. Current operations at the Dresden site have no disproportionate impacts on the minority and low-income populations of the surrounding counties, and no environmental pathways have been identified that would cause disproportionate impacts. Closure of Dresden Units 2 and 3 would result in decreased employment opportunities and reduced tax revenues in Grundy County with possible small negative and disproportionate impacts on minority or low-income populations. Because the Dresden site is located in the economically vital Chicago metropolitan area with extensive employment opportunities, these effects are likely to be offset. The impacts of closure on minority and low-income populations would be offset by other local employment opportunities. Overall, the impacts of the no-action alternative on minority or low-income populations are considered SMALL.

8.2 Alternative Energy Sources

This section discusses the environmental impacts associated with alternative sources of electricity to replace the electricity generated by Dresden Units 2 and 3, assuming that the OLs for Dresden Units 2 and 3 are not renewed. According to Exelon, the capacity of Dresden Units 2 and 3 is approximately 1824 MW(e), based on the two units each having a capacity of 912 MW(e) (Exelon 2003). The Energy Information Administration (EIA), a component of the U.S. Department of Energy (DOE), estimates the peak summer capacity of Dresden Units 2 and 3 as 1568 MW(e) (DOE/EIA 2003c). For the remainder of this section, the staff considered the total capacity of Dresden Units 2 and 3 to be 1824 MW(e).

The order of presentation of alternative energy sources in Section 8.2 does not imply which alternative would be most likely to occur or to have the least environmental impacts. The following generation alternatives are considered in detail:

- Coal-fired generation at the Dresden site and at an alternate site (Section 8.2.1)

- Natural-gas-fired generation at the Dresden site and at an alternate site (Section 8.2.2)

- Nuclear generation at the Dresden site and at an alternate site (Section 8.2.3).

The alternative of purchasing power from other sources to replace power generated at Dresden Units 2 and 3 is discussed in Section 8.2.4. Other power-generation alternatives and conservation alternatives considered by the staff and found to be unreasonable replacements for Dresden Units 2 and 3 are discussed in Section 8.2.5. Section 8.2.6 discusses the environmental impacts of a combination of generation and conservation alternatives.

Each year, EIA issues an Annual Energy Outlook. The *Annual Energy Outlook 2002 with Projections to 2020* was issued in December 2001 (DOE/EIA 2001a). In this report, EIA projected that combined-cycle[(a)] or combustion turbine technology fueled by natural gas is likely to account for approximately 88 percent of new electric generating capacity through the year 2020 (DOE/EIA 2001a). Both technologies are designed primarily to supply peak and intermediate capacity, but combined-cycle technology can also be used to meet baseload[(b)]

(a) In the combined-cycle unit, hot combustion gases in a combustion turbine rotate the turbine to generate electricity. Waste combustion heat from the combustion turbine is routed through a heat-recovery boiler to make steam to generate additional electricity.

(b) A baseload plant normally operates to supply all or part of the minimum continuous load of a system and consequently produces electricity at an essentially constant rate. Nuclear power plants are commonly used for baseload generation; that is, these units generally run near full load.

requirements. Coal-fired plants were projected by EIA to account for approximately 9 percent of new capacity during this period. Coal-fired plants are generally used to meet baseload requirements. Renewable energy sources, primarily wind, geothermal, and municipal solid waste units, were projected by EIA to account for the remaining 3 percent of capacity additions. EIA projected that oil-fired plants will account for very little new generation capacity in the United States through the year 2020 because of higher fuel costs and lower efficiencies (DOE/EIA 2001a). EIA's projections were based on the assumption that providers of new generating capacity will seek to minimize cost while meeting applicable environmental requirements. Combined-cycle plants were projected by EIA to have the lowest generation cost in 2005 and 2020, followed by coal-fired plants, and then by wind generation (DOE/EIA 2001a).

EIA also projected that new nuclear power plants will not account for any new generation capacity in the United States through the year 2020 because natural-gas- and coal-fired plants are projected to be more economical (DOE/EIA 2001a). In spite of this projection, a new nuclear plant alternative for replacing power generated by Dresden Units 2 and 3 is considered in Section 8.2.3. Since 1997, the NRC has certified three new standard designs for nuclear power plants under the procedures in 10 CFR Part 52, Subpart B. The submission to the NRC of these three applications for certification indicates continuing interest in the possibility of licensing new nuclear power plants. The NRC has established a new organization to prepare for and manage future reactor and site licensing applications.

Note that this section discusses the impacts of alternative generation technologies. It does not address the impacts of decommissioning. Further, it does not consider the impacts to the Dresden site of building alternate generation elsewhere, when such options are addressed. The no-action alternative, discussed in Section 8.1, covers the impacts at the Dresden site of shutting down Dresden Units 2 and 3.

8.2.1 Coal-Fired Generation

The environmental impacts of the coal-fired alternative are examined in this section for the Dresden site and at an alternate site. Unless otherwise indicated, the assumptions and numerical values used in this section are from the Exelon Environmental Report (ER) (Exelon 2003). The staff reviewed this information and compared it to environmental impact information in the GEIS, as well as other relevant information and sources where appropriate. Although the OL renewal period is only 20 years, the impact of operating the coal-fired alternative for 40 years is considered (as a reasonable projection of the operating life of a coal-fired plant). The staff assumed that Dresden Units 2 and 3 would remain in operation while the coal-fired alternative was constructed.

The coal-fired alternative is analyzed both for the existing Dresden site and for an unnamed alternate site. Siting a new coal-fired plant where an existing nuclear plant is located would reduce many construction impacts (NRC 1996). Further, siting a new facility at the existing Dresden site would allow it to take advantage of existing infrastructure. Hence, although the staff considered an alternate site, it is unlikely that it would be beneficial to place a new coal-fired facility at an alternate site based purely on environmental grounds.

The staff assumes the construction of three 550-MW(e) units for a combined capacity of 1650 MW(e), as potential replacements for Dresden Units 2 and 3, which is consistent with Exelon's ER (Exelon 2003).[a] Exelon chose this size to be consistent with the natural-gas-fired alternative, which was chosen to match "standard" sizes for new combined-cycle facilities. The assumption of 1650 MW(e) understates the environmental impacts of replacing the 1824 MW(e) from Dresden Units 2 and 3. The remaining capacity would be made up from other sources. As a rough estimate, if a coal-fired plant of exactly 1824 MW(e) were to be built, any impacts (e.g., pollutant emissions) in this section might simply be adjusted upwards accordingly. However, given these adjustments, the staff has determined that the differences in impacts between 1650 MW(e) and 1824 MW(e) of coal-fired generation would not be significant and would not change the impact levels.

Exelon assumes the coal-fired plant would use tangentially fired, dry-bottom combustors with an associated heat rate[b] of 10,200 Btu/kWh (a thermodynamic efficiency of approximately 30 percent) and a capacity factor[c] of 0.85 (Exelon 2003). According to Exelon, the coal-fired plant would consume approximately 6.3 million MT (6.9 million tons) per year of pulverized bituminous coal with an ash content of approximately 6.9 percent (Exelon 2003). For emissions control, the facility would be outfitted with low nitrogen oxide (NO_x) burners, overfire air and selective catalytic reduction for NO_x control; fabric filters for control of particulates; and a wet scrubber using lime for the control of sulfur oxides (SO_x).

The coal-fired alternative would require converting a significant quantity of land to industrial use for the power plant, coal storage, landfill disposal of ash, spent catalytic reduction catalyst (used for control of NO_x emissions), and scrubber sludge. The Dresden site is adequate to support these requirements. The Dresden site consists of approximately 1012 ha (2500 ac) owned by

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(a) The coal-fired units would have a rating of 583 gross MW(e) and 550 net MW(e). The difference between "gross" and "net" is the electricity consumed on site.

(b) Heat rate is a measure of generating station thermal efficiency. It is generally expressed in British thermal units (Btu) per net kilowatt-hour (kWh). It is computed by dividing the total Btu content of fuel burned for electricity-generation by the resulting net kWh generation.

(c) The capacity factor is the ratio of electricity generated for the period of time considered to the energy that could have been generated at continuous full-power operation during the same period.

Exelon and 7 ha (17 ac) of river frontage leased from the State of Illinois (Exelon 2003). The GEIS asserts that approximately 700 ha (1700 ac) would be required to build a 1000-MW(e), coal-fired power plant at a greenfield site (NRC 1996). Locating a coal-fired power plant at an existing nuclear site would significantly lower this land requirement and would allow the new facility to take advantage of existing infrastructure at the Dresden site, including the existing cooling system, switchyard, offices, intake and discharge, and transmission rights-of-way. Exelon estimates that the coal-fired alternative would require approximately 75 ha (180 ac) for waste disposal and approximately 120 ha (300 ac) for the power block and coal storage area. Even if the actual requirement were well above this level of approximately 195 ha (480 ac), the existing Dresden site should be able to support a new coal-fired facility.

Two coal and lime delivery options are most appropriate for the Dresden site: barge and rail. The Dresden site location lends itself to coal delivery by barge, which is a common practice along the Illinois waterway. The coal-fired alternative would require construction of a barge offloading facility on the Dresden Pool and a conveyor system to the Dresden coal yard. These new facilities would result in greater construction impacts than upgrading the existing rail line (Exelon 2003). The alternative would trade barge traffic impacts for rail traffic impacts. The staff agrees with Exelon that such a trade-off provides no obvious environmental benefit, and the barge alternative is considered in this section. A coal slurry pipeline is another potential alternative for delivering coal. However, such a pipeline would need to cover a great distance to reach a suitable coal mining area or the coal would need to be transported by alternate means (e.g., rail) to a site closer to the Dresden site for introduction into the pipeline. The coal slurry pipeline alternative for delivering coal is not further evaluated.

8.2.1.1 Closed-Cycle Cooling System

For purposes of this SEIS, the staff assumed a coal-fired plant at the Dresden site would use the existing modified, closed-cycle cooling system. The system uses a large cooling pond to cool water either for reuse (closed-cycle) or for discharge into the Illinois River (indirect open-cycle). The system is currently run in closed-cycle for approximately one-half of the year and in indirect open-cycle for the other half (Exelon 2003). Recently, Exelon has added cooling towers to eliminate the need to derate Dresden in summer months when thermal discharges into the Illinois River are too high. A true open-cycle system would not significantly cool the water before discharge into the Illinois River or other water body. Hence, the staff concluded that the current operating procedure would constitute the closed-cycle option. At an alternate site, the staff assumed that the coal-fired alternative would also use a closed-cycle cooling system with cooling towers.

The overall impacts of the coal-fired generating system using a closed-cycle cooling system are discussed in the following sections and summarized in Table 8-2. For completeness, the staff also considered the impacts of a fully open-cycle cooling system with no cooling pond at an alternate site. Additional impacts from the use of an open-cycle cooling system are considered in Section 8.2.1.2.

Table 8-2. Summary of Environmental Impacts of Coal-Fired Generation at the Dresden Site and an Alternate Site Using a Closed-Cycle Cooling System

	Dresden Site		Alternate Site	
Impact Category	**Impact**	**Comments**	**Impact**	**Comments**
Land Use	MODERATE	Would use unused portion of Dresden site. Would require approximately 195 ha (480 ac) for power block, coal storage, and waste disposal. Would use any existing infrastructure (e.g., transmission lines). Additional land impacts for coal and limestone mining.	MODERATE to LARGE	Potentially 1150 ha (2800 ac) for new coal facility, including power block, infrastructure, coal storage, and waste disposal. Additional land impacts for coal and limestone mining. Total impact would depend on whether the alternate site is previously disturbed.
Ecology	MODERATE	Would use undeveloped areas at Dresden site. There would be potential for significant habitat loss and fragmentation and reduced productivity and biological diversity.	MODERATE to LARGE	Impact would depend on location and ecological conditions of site and transmission line route. There would be potential for habitat loss and fragmentation and reduced productivity and biological diversity.
Water Use and Quality	SMALL	Would use existing modified closed-cycle cooling system and continue current very limited groundwater use.	SMALL to MODERATE	Impact would depend on volume of water withdrawal, the constituents of the discharge water, and the characteristics of surface-water body or groundwater source.

Table 8-2. (Contd)

	Dresden Site		Alternate Site	
Impact Category	**Impact**	**Comments**	**Impact**	**Comments**
Air Quality	MODERATE	Sulfur oxides: 6000 MT/yr (6600 tons/yr) — Actual impact would depend on emissions offsets Nitrogen oxides: 1561 MT/yr (1721 tons/yr) — Actual impact would depend on emissions offsets Carbon monoxide: 1561 MT/yr (1721 tons/yr) Particulates: 216 MT/yr (238 tons/yr) particulates, 50 MT/yr (55 tons/yr) PM_{10} Other: Some hazardous air pollutants, CO_2 emissions contribute to global warming	MODERATE	Same emissions as Dresden site, although offsets for SO_2 and NO_x would depend on location.
Waste	MODERATE	Total ash production would be 431,000 MT (475,000 tons) annually, but 87 percent of this ash would be recycled. Facility would also generate 311,000 MT (343,000 tons) of scrubber sludge.	MODERATE	Same impacts as Dresden site.
Human Health	SMALL	Impacts are uncertain, but are considered SMALL in the absence of more quantitative data.	SMALL	Same impacts as for Dresden site.

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2 **Table 8-2. (Contd)**

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		Dresden Site		Alternate Site	
4					
5	**Impact Category**	**Impact**	**Comments**	**Impact**	**Comments**
6	Socioeconomic	SMALL to MODERATE	During construction, impacts would be SMALL to MODERATE. Upwards of 2500 workers might be required at peak of the 5-year construction period.	SMALL to LARGE	Construction impacts at alternate site would be similar to those at Dresden site, but would depend on whether new site is located near a major metropolitan area.
7			During operation, employment would be decreased from approximately 1000 permanent and contract to closer to 250. All employment impacts would be tempered by proximity to Chicago metropolitan area. Tax base would be preserved.		Grundy County would lose significant portion of tax base.
8			Transportation impacts during operation would be SMALL due to the smaller workforce. Transportation impacts associated with construction workers would be SMALL to MODERATE.		Transportation impacts would be similar to those at Dresden site.
9	Aesthetics	MODERATE	MODERATE aesthetic impact due to impact of plant buildings and structures, along with noise impacts from plant operation.	MODERATE to LARGE	Impacts would similar to those at Dresden site, but would also include any aesthetic impacts from building new transmission line(s). Impacts would depend on location.

Table 8-2. (Contd)

	Dresden Site		Alternate Site	
Impact Category	Impact	Comments	Impact	Comments
Historic and Archaeological Resources	SMALL to MODERATE	Studies would likely be needed to identify, evaluate, and address mitigation of the potential impacts of new plant construction on cultural resources at developed and undeveloped sites.	SMALL to MODERATE	Alternate location would necessitate cultural studies. Studies would likely be needed to identify, evaluate, and address mitigation of the potential impacts of new plant construction on cultural resources at developed and undeveloped sites
Environmental Justice	SMALL	No environmental pathways or locations have been identified that would result in disproportionately high and adverse environmental impacts on minority and low-income populations. Impacts on minority and low-income communities should be similar to those experienced by the population as a whole.	SMALL to LARGE	Impacts vary depending on population distribution and characteristics at new site. Impacts on Dresden site would be identical to those in the no-action alternative.

- **Land Use**

For siting a new facility at the Dresden site, the existing infrastructure would be used to the extent practicable, thus limiting the amount of new construction that would be required. Specifically, the staff assumed that the new coal-fired facility would use the existing cooling system, switchyard, offices, and transmission rights-of-way. If the coal-fired facility is built at the existing Dresden site, Exelon estimates that construction of the power block and coal storage area would impact approximately 120 ha (300 ac) of land and associated terrestrial habitat (Exelon 2003). Exelon further estimates that ash and scrubber waste disposal over a 40-year facility lifetime would require approximately 75 ha (180 ac) (Exelon 2003). In total, the facility is expected to require approximately 195 ha (480 ac) of land. The GEIS estimates on the order of 690 ha (1700 ac) for a greenfield, 1000-MW(e), coal-fired power plant, well above the estimates from Exelon for the 1650-MW(e) power plant. A portion of this difference may be due to the potential use of existing infrastructure at the Dresden site.

The coal-fired alternative at the Dresden site would require construction of a barge offloading facility on the Dresden Pool and a conveyor system to the Dresden coal yard requiring the conversion of river-front land to industrial use.

For an alternate greenfield site, the land use will be above the 690 ha (1700 ac) assumed in the GEIS for a new 1000-MW(e), coal-fired power plant, assuming scaling of the GEIS estimates. A new site would require land for the power block, for coal storage and handling, and for waste products. Additional land could be required for a transmission line and for a rail spur to the plant site, depending on the infrastructure in existence at the alternate site.

Regardless of whether the coal-fired plant is built at the Dresden or at an alternate site, additional land-use changes would occur off site in an undetermined coal-mining area to supply coal for the plant. In the GEIS, the staff estimated that approximately 8900 ha (22,000 ac) would be affected for mining the coal and disposing of the waste to support a 1000-MW(e) coal-fired plant during its operational life (NRC 1996). Partially offsetting this offsite land use would be the elimination of the need for uranium mining to supply fuel for Dresden Units 2 and 3. In the GEIS, the staff estimated that approximately 400 ha (1000 ac) would be affected for mining the uranium and processing it during the operating life of a 1000-MW(e) nuclear power plant.

Overall, the impacts of the coal-fired plant at the Dresden site are considered MODERATE. Previously unused land would need to be converted to industrial use. Overall, the impacts of the coal-fired plant at an alternate site are considered MODERATE to LARGE, depending on whether the alternate site had been developed previously or not and what new infrastructure might be required.

- **Ecology**

Locating a coal-fired plant at the Dresden site could affect ecological resources because of the need to convert approximately 195 ha (480 ac) of currently unused land to industrial use for the plant, coal storage, and ash and scrubber sludge disposal. Impacts to terrestrial ecology would be somewhat reduced because some of the area to be developed would be land previously disturbed by site activities and, thus, of less ecological value. Use of cooling towers would reduce operational impacts on the aquatic ecosystem. Overall, the impacts of the coal-fired alternative at the Dresden site are considered MODERATE.

At an alternate site, the construction and operation of a coal-fired plant would result in some ecological impacts. Impacts to ecological resources could include habitat degradation, fragmentation, habitat loss, reduced ecosystem productivity, and a reduction in biological diversity. Construction and maintenance of transmission line(s) and a rail spur also would have ecological impacts. Use of make-up cooling water from a nearby surface-water body could have adverse aquatic resource impacts. Overall, the impacts of the coal-fired alternative at an alternate site are considered MODERATE to LARGE, depending on the ecological conditions on the site.

- **Water Use and Quality**

The coal-fired alternative at the existing site would use the existing modified, closed-cycle cooling system and would, therefore, have no incremental impacts on cooling water needs. Some erosion and sedimentation probably would occur during construction (NRC 1996). The three groundwater wells that supply limited specific uses at the Dresden site would continue to be used. Overall, the impacts of the coal-fired alternative at the Dresden site are considered SMALL.

At an alternate site, the cooling water would likely be drawn from a surface body of water. Plant discharges would consist mostly of cooling tower blowdown, characterized primarily by an increased temperature and increased concentration of dissolved solids relative to the receiving body of water and intermittent low concentrations of biocides (e.g., chlorine). Treated process waste streams and sanitary wastewater would also be discharged. All discharges would likely be regulated through a National Pollution Discharge Elimination System (NPDES) permit. Use of groundwater for a coal-fired plant at an alternate site is a possibility. There would be consumptive use of water due to evaporation from the cooling towers. Some erosion and sedimentation probably would occur during construction (NRC 1996). Overall, the impacts at an alternate site are considered SMALL to MODERATE.

- **Air Quality**

The air quality impacts of coal-fired generation are significantly higher than those of nuclear generation due to emissions of SO_x, NO_x, particulates, carbon monoxide, hazardous air pollutants, such as mercury, and naturally occurring radioactive materials.

The Dresden site is located in the Metropolitan Chicago Interstate Air Quality Control Region (40 CFR 81.75). This region is designated as in attainment or unclassified for all criteria pollutants with the exception of ozone[a] (40 CFR 81.314). Goose Lake Township, where the Dresden site is located, is in nonattainment for ozone.

A new coal-fired generating plant located at the Dresden site would likely need a prevention of significant deterioration (PSD) permit and an operating permit under the Clean Air Act. The plant would need to comply with the new source performance standards for such plants set forth in 40 CFR Part 60, Subpart Da, which consists of 40 CFR Part 60.40a through 40 CFR Part 60.49a. Standards establish limits for particulate matter and opacity (40 CFR 60.42a), sulfur dioxide (40 CFR 60.43a), and NO_x (40 CFR 60.44a).

Section 169A of the Clean Air Act (42 USC 7491) establishes a national goal of preventing future, and remedying existing, impairment of visibility in mandatory class I Federal areas when impairment results from man-made air pollution. In addition, EPA issued a new regional haze rule in 1999 (64 FR 35714). The rule specifies that for each mandatory class I Federal area located within a state, the state must establish goals that provide for reasonable progress towards achieving natural visibility conditions. The reasonable progress goals must provide for an improvement in visibility for the most-impaired days over the period of the implementation plan and ensure no degradation in visibility for the least-impaired days over the same period (40 CFR 51.308[d][1]). If a new coal-fired power station were located close to a mandatory class I Federal area, additional air pollution control requirements could be imposed. However, there are no mandatory class I Federal areas near the Dresden site. It is assumed that an alternate site would not be chosen near a mandatory class I Federal area.

The U.S. Environmental Protection Agency (EPA) has various regulatory requirements for visibility protection in 40 CFR Part 51, Subpart P, including a specific requirement for review of any new major stationary source in an area designated as attainment or unclassified under the Clean Air Act. As noted above, the Dresden site is in a region that is either attainment or unclassified for all criteria pollutants with the exception of ozone.

Impacts and issues for particular pollutants are below. (Unless otherwise stated, the impacts for particular pollutants would be the same at the Dresden site or at an alternate site.)

(a) Existing criteria pollutants under the Clean Air Act are ozone, carbon monoxide, particulates, sulfur dioxide, lead, and nitrogen oxide. Ambient air quality standards for criteria pollutants are set out at 40 CFR Part 50.

- Sulfur oxides. A new coal-fired power plant would be subject to the requirements in Title IV of the Clean Air Act. Title IV was enacted to reduce emissions of sulfur dioxide and NO_x, the two principal precursors of acid rain, by restricting emissions of these pollutants from power plants. Title IV caps aggregate annual power plant sulfur dioxide emissions and imposes controls on sulfur dioxide emissions through a system of marketable allowances. EPA issues one allowance for each ton of sulfur dioxide that a unit is allowed to emit. New units do not receive allowances but are required to have allowances to cover their sulfur dioxide emissions. Owners of new units must, therefore, acquire allowances from owners of other power plants by purchase or by reducing sulfur dioxide emissions at other power plants that they own. Allowances can be banked for use in future years. Because Exelon has no fossil-fired power plants (Exelon 2003), it would need to purchase allowances from the open market to operate a coal-fired power plant at the Dresden site. Whether the coal-fired alternative results in an aggregate increase in sulfur dioxide emissions would depend on whether the permits are purchased when there is a surplus of permits or when the market is constrained. In the latter case, the coal-fired alternative would result in no net increase in aggregate national sulfur dioxide emissions. Regardless, however, the coal-fired power plant would result in a local increase in sulfur dioxide emissions whether located at the Dresden site or an alternate site.

  Exelon states in its ER that the alternative coal-fired power plant would minimize air emissions through a combination of boiler technology and post-combustion pollution removal. Sulfur dioxide would be removed using lime in a flue gas desulfurization process (Exelon 2003). Exelon estimates that by using a wet scrubber control technology, 95 percent of the stack emissions of sulfur dioxide could be collected, so that total emissions, after scrubbing, would be approximately 6000 MT (6600 tons/year) of sulfur dioxide (Exelon 2003).

- Nitrogen oxides and volatile organic compounds. Ground-level ozone is a primary concern of the EPA. Ground level ozone is formed when oxides of nitrogen (NO_x) and volatile organic compounds (VOCs) react in the presence of sunlight. Ozone precursors such as these, and ozone itself, can be carried hundreds of miles from their source, potentially causing pollution over wide regions.

  In 1998, the EPA promulgated a rule requiring 21 states, including Illinois, to reduce NO_x emissions (63 FR 57356). The rule specifies total NO_x emissions (40 CFR 51.121e) for each state but leaves open the method of implementation. The emissions reduction measures are to be in place by May 31, 2004. In its State Implementation Plan (SIP), Illinois has chosen to implement a market-based emissions credit trading system for

NO_x. According to the system, NO_x emissions from large electricity generating units may not exceed 27,851 MT (30,701 tons) during each ozone season. A small percentage of NO_x credits was set aside for new sources (Exelon 2003). New NO_x emissions will, therefore, depend both on how many new credits are available and whether any purchases of credits are made in a constrained market. In the most extreme case, all of the credits would need to be purchased on the open market, and such purchases would result in reductions from sources elsewhere. Even in this case, however, NO_x emissions could simply move out of state. The staff assumed that, even if the coal-fired alternative were located at an alternate site, the alternate site would be in Illinois and, therefore, subject to the allowance system.

Section 407 of the Clean Air Act establishes technology-based emission limitations for NO_x emissions. The market-based allowance system used for sulfur dioxide emissions is not used for NO_x emissions. A new coal-fired power plant would be subject to the new source performance standards for such plants at 40 CFR 60.44a(d)(1). This regulation, issued on September 16, 1998 (63 FR 49453 [EPA 1998]), limits the discharge of any gases that contain nitrogen oxides (expressed as NO_x) in excess of 200 nanograms per joule (ng/J) of gross energy output (1.6 lb/MWh), based on a 30-day rolling average.

The Dresden site is located in Goose Lake Township of Grundy County. Goose Lake Township is designated as part of the Metropolitan Chicago Interstate Air Quality Control Region. Goose Lake Township has been classified by the EPA as being in nonattainment with ozone standards (40 CFR 81.314). The Illinois SIP calls for a market-based trading system to control VOCs in the metropolitan Chicago nonattainment area. According to the plan, for every ton of new VOC emissions, 1.3 tons must be removed (Exelon 2003).

If the coal-fired plant were constructed at the Dresden site, it would be subject to this market-based system. Exelon assumes that a coal-fired alternative would be able to obtain such offsets (Exelon 2003). If so, the coal-fired alternative would result in lower VOC emissions in the metropolitan Chicago nonattainment area. However, such emissions could easily move outside the area so that there might be an increase in total statewide VOC emissions. Whether there is an increase or not will depend on the nature of the offsets. If the coal-fired plant were constructed at an alternate site in an area considered unclassified or attainment, it would still be subject to EPA regulatory standards discussed above.

Exelon estimates that using the best available control technology, the total annual NO_x emissions for a new coal-fired power plant would be approximately 1561 MT (1721 tons/yr) (Exelon 2003). This level of NO_x emissions might not result in greater statewide emissions, depending on the nature of the credit purchases to cover these emissions. Exelon estimates that annual VOC emissions from the coal-fired alternative would be approximately 188 MT (207 tons/yr). The coal-fired alternative will most likely result in an increase in statewide VOC emissions and certainly in local VOC emissions.

- Particulates. Exelon estimates that the total annual stack emissions would include 216 MT (238 tons) of filterable total suspended particulates (particulates that range in size from less than 0.1 micrometer [μm] up to approximately 45 μm) (Exelon 2003). This would include 50 MT (55 tons/year) of particulate matter having an aerodynamic diameter less than or equal to 10 μm (PM_{10}) (Exelon 2003). Fabric filters, with a 99.9 percent removal efficiency, would be used to control particulates (Exelon 2003). In addition, coal-handling equipment would introduce fugitive particulate emissions.

  Construction of a coal-fired plant would generate fugitive dust. In addition, exhaust emissions would come from vehicles and motorized equipment used during the construction process.

- Carbon monoxide. Exelon estimates that the total carbon monoxide emissions would be approximately 1561 MT (1721 tons/yr) per year (Exelon 2003).

- Hazardous air pollutants including mercury. In December 2000, the EPA issued regulatory findings on emissions of hazardous air pollutants from electric utility steam-generating units (EPA 2000b). EPA determined that coal- and oil-fired electric utility steam-generating units are significant emitters of hazardous air pollutants. Coal-fired power plants were found by EPA to emit arsenic, beryllium, cadmium, chromium, dioxins, hydrogen chloride, hydrogen fluoride, lead, manganese, and mercury (EPA 2000b). EPA concluded that mercury is the hazardous air pollutant of greatest concern. EPA found that (1) there is a link between coal consumption and mercury emissions; (2) electric utility steam-generating units are the largest domestic source of mercury emissions; and (3) certain segments of the U.S. population (e.g., the developing fetus and subsistence, fish-eating populations) are believed to be at potential risk of adverse health effects due to mercury exposures resulting from consumption of contaminated fish (EPA 2000b). Accordingly, EPA added coal- and oil-fired electric utility steam-generating units to the list of source categories under Section 112(c) of the Clean Air Act for which emission standards for hazardous air pollutants will be issued (EPA 2000b).

- Uranium and thorium. Coal contains uranium and thorium. Uranium concentrations are generally in the range of 1 to 10 parts per million. Thorium concentrations are generally about 2.5 times greater than uranium concentrations (Gabbard 1993). One estimate is that a typical coal-fired plant released roughly 4.7 MT (5.2 tons) of uranium and 11.6 MT (12.8 tons) of thorium in 1982 (Gabbard 1993). The population dose equivalent from the uranium and thorium releases and daughter products produced by the decay of these isotopes has been calculated to be significantly higher than that from nuclear power plants (Gabbard 1993).

- Carbon dioxide. A coal-fired plant would have unregulated carbon dioxide emissions that would contribute to global warming. While these emissions have not traditionally been an important environmental concern, they are becoming increasingly relevant at both a national and an international level.

- Summary. The GEIS analysis did not quantify emissions from coal-fired power plants but implied that air impacts would be substantial. The GEIS also mentioned global warming from unregulated carbon dioxide emissions and acid rain from SO_x and NO_x emissions as potential impacts (NRC 1996). Adverse human health effects from coal combustion, such as cancer and emphysema, have been associated with the products of coal combustion. Overall, the air quality impacts of the coal-fired alternative at either the Dresden site or an alternate site are considered MODERATE. The impacts would be clearly noticeable but would not destabilize air quality.

- **Waste**

Coal combustion generates waste in the form of ash, and equipment for controlling air pollution generates additional ash, spent selective catalytic reduction catalyst, and scrubber sludge. Assuming 99.9 percent ash removal, the three 550-MW(e) coal-fired units would generate approximately 431,000 MT (475,000 tons) of this ash annually (Exelon 2003). According to Exelon, Illinois regulations encourage recycling of coal-combustion byproducts; and Exelon (then Commonwealth Edison) historically recycled 87 percent of its coal ash (Exelon 2003). Assuming continuation of this waste mitigation measure, the coal-fired plant would generate approximately 56,000 MT (62,000 tons) of ash per year for disposal (Exelon, 2003). In addition, approximately 311,000 MT (343,000 tons) per year of scrubber sludge would be generated by SO_x-control equipment (Exelon 2003). This equipment would use approximately 116,000 tons of calcium oxide (lime) in the scrubbing process to control SO_x emissions.

The waste would be disposed of on site, accounting for approximately 75 ha (180 ac) of land area over the 40-year plant life, assuming a waste depth of 9 m (30 ft) (Exelon 2003). Waste impacts to groundwater and surface water could extend beyond the operating life of the plant if leachate and runoff from the waste storage area occur. Disposal of the waste could noticeably affect land use and groundwater quality; but with appropriate management and monitoring, it would not destabilize any resources. After closure of the waste site and revegetation, the land could be available for other uses.

In May 2000, the EPA issued a "Notice of Regulatory Determination on Wastes from the Combustion of Fossil Fuels" (EPA 2000a). The EPA concluded that some form of national regulation is warranted to address coal combustion waste products because (1) the composition of these wastes could present danger to human health and the environment under certain conditions; (2) EPA has identified 11 documented cases of proven damages to human health and the environment by improper management of these wastes in landfills and surface impoundments; (3) present disposal practices are such that, in 1995, these wastes were being managed in 40 percent to 70 percent of landfills and surface impoundments without reasonable controls in place, particularly in the area of groundwater monitoring; and (4) EPA identified gaps in state oversight of coal combustion wastes. Accordingly, EPA announced its intention to issue regulations for disposal of coal combustion waste under subtitle D of the Resource Conservation and Recovery Act.

Overall, the waste impacts of the coal-fired alternative at the Dresden site or at an alternate site are considered MODERATE. The impacts would be clearly noticeable but would not destabilize any important resource.

- **Human Health**

Coal-fired power generation introduces worker risks from coal and limestone mining, worker and public risks from coal and lime/limestone transportation, worker and public risks from disposal of coal combustion wastes, and public risks from inhalation of stack emissions. Emission impacts can be widespread and health risks difficult to quantify. The coal alternative also introduces the risk of coal-pile fires and attendant inhalation risks.

The staff stated in the GEIS that there could be human health impacts (cancer and emphysema) from inhalation of toxins and particulates from coal-fired plants, but the staff did not identify the significance of these impacts (NRC 1996). In addition, the discharges of uranium and thorium from coal-fired plants can potentially produce radiological doses in excess of those arising from nuclear power plant operations (Gabbard 1993).

Regulatory agencies, including EPA and state agencies, set air emission standards and requirements based on human health impacts. These agencies also impose site-specific emission limits as needed to protect human health. As discussed previously, EPA has recently concluded that certain segments of the U.S. population (e.g., the developing fetus and subsistence, fish-eating populations) are believed to be at potential risk of adverse health effects due to mercury exposures from sources such as coal-fired power plants. However, in the absence of more quantitative data, human health impacts from radiological doses and inhaling toxins and particulates generated by burning coal are characterized as SMALL. This characterization holds for a coal-fired generation plant at the Dresden site and at an alternate site.

- **Socioeconomics**

Construction of the coal-fired plant would take approximately five years. The staff assumed that construction would take place while Dresden Units 2 and 3 continued operation and would be completed by the time Dresden Units 2 and 3 permanently ceased operations. The GEIS estimates a peak work force during construction of between 1200 and 2500 workers for a 1000-MW(e) power plant (NRC 1996). This work force would likely be larger for the 1650-MW(e) coal-fired alternative.

If the facility were constructed at the Dresden site, these workers would be in addition to the 870 permanent employees and approximately 120 to 130 contract workers who currently work at the Dresden site. During construction of the new coal-fired plant, surrounding communities would experience demands on housing and public services that could have SMALL to MODERATE impacts. These impacts would be tempered because the Dresden site is part of the economically vital Chicago metropolitan area. After construction, the nearby communities would be impacted by the loss of the construction jobs.

Exelon estimates that the new coal-fired plant would have a workforce of approximately 250 (Exelon 2003). If the coal-fired plant were constructed at the Dresden site and if Dresden Units 2 and 3 were decommissioned, there would be a loss of 620 permanent, high-paying jobs (from 870 for Dresden Units 2 and 3, down to 250 for the coal-fired alternative) along with the loss of 120 to 130 contract workers with a commensurate reduction in demand on socioeconomic resources and contribution to the regional economy. These impacts may be offset because the Dresden site is in the Chicago metropolitan area. The coal-fired alternative would provide a new tax base to offset the loss of tax base associated with decommissioning of Dresden Units 2 and 3. For all of these reasons, the appropriate characterization of nontransportation socioeconomic impacts for operating a coal-fired plant constructed at the Dresden site is considered SMALL.

The impacts of building the coal-fired plant at an alternate site would depend on the socioeconomic characteristics of the new site. If the site were near a large urban center, as the Dresden site is, then the impacts would be small. On the other hand, in the GEIS, the staff stated that socioeconomic impacts at a rural site would be larger than at an urban site because more of the peak construction workforce would need to move into the area to work (NRC 1996). Alternate sites would, therefore, need to be analyzed on a case-by-case basis. Socioeconomic impacts from construction of the new site could range from SMALL to LARGE, depending on the characteristics of the surrounding regions. Impacts from operating the facility could range from SMALL to MODERATE, depending on the characteristics of the surrounding regions.

For transportation related to commuting of plant operating personnel, the impacts are considered small. The maximum number of plant operating personnel would be approximately 250 compared to the current permanent workforce of 870 and contract workforce of 130 (Exelon 2003). Therefore, traffic impacts associated with plant personnel commuting to a coal-fired plant would be expect to be SMALL compared to the current impacts from Dresden Units 2 and 3. This would hold for both the Dresden site and an alternate site.

During the five-year construction period for the replacement coal-fired units, a large number of construction workers would be working at the site in addition to the workers currently at the Dresden site. The addition of these workers could place significant traffic loads on existing highways near either the Dresden site or an alternate site. Such impacts would be MODERATE.

At most alternate sites, coal and lime would likely be delivered by rail although barge delivery is feasible for a location on navigable waters. Transportation impacts would depend upon the site location. Socioeconomic impacts associated with rail transportation would likely be MODERATE to LARGE. Barge delivery of coal and lime/limestone would likely have SMALL socioeconomic impacts.

- **Aesthetics**

- The coal-fired power plant units (as much as 60 m [200 ft] tall), and exhaust stack (as much as 120 to 185 m [400 to 600 ft] high) would be visible off site during daylight hours.

Buildings and structures would also be visible at night because of outside lighting. The U.S. Federal Aviation Administration (FAA) generally requires that all structures exceeding an overall height of 61 m (200 ft) above ground level have markings and/or lighting so as not to impair aviation safety (FAA 2000). Visual impacts of buildings and structures could be mitigated by landscaping and by the use of an exterior color for the units that is consistent with the environment. Visual impact at night could be mitigated by reduced use of lighting, provided the lighting meets FAA requirements, and appropriate use of shielding. There would also be impacts from the barge off-loading facility for coal and limestone. At the Dresden site, visual aesthetic impacts are considered MODERATE.

At an alternate site, cooling towers would be required (up to 160 m [520 ft] high in the case of natural draft towers and up to 30 m [100 ft] high in the case of mechanical draft towers); and these towers and their associated plumes would also be visible off site. The aesthetic impacts could be mitigated if the plant were located in an industrial area adjacent to other power plants. There would also be significant aesthetic impact from a new transmission line and any rail line needed to deliver coal and lime. Overall, the visual aesthetic impacts associated with a replacement coal-fired power plant at an alternate site are considered MODERATE to LARGE and will depend on the exact location of the alternate site.

Coal-fired generation would introduce mechanical sources of noise that would be audible off site. Sources contributing to total noise produced by plant operation are classified as continuous or intermittent. Continuous sources include the mechanical equipment associated with normal plant operations. Intermittent sources include the equipment related to coal handling, solid-waste disposal, transportation related to coal and lime/limestone delivery, use of outside loudspeakers, and the commuting of plant employees. Noise impacts associated with rail delivery of coal and lime/limestone at an alternate site would be most significant for residents living in the vicinity of the facility and along the rail route. Although noise from passing trains significantly raises noise levels near the rail corridor, the short duration of the noise reduces its impact. The noise impacts of a coal-fired plant at the Dresden site are considered to be MODERATE. At an alternate site, these noise impacts would be SMALL to LARGE, depending on the site. Aesthetic impacts at the plant site would be mitigated if the plant were located in an industrial area adjacent to other power plants or industrial facilities.

- **Historic and Archaeological Resources**

At the Dresden site or an alternate site, a cultural resource inventory would likely be needed for any onsite property that has not been previously surveyed. Other lands, if any, that are acquired to support the plant would also likely need an inventory of cultural resources, identification and recording of existing historic and archaeological resources, and possible mitigation of adverse effects from subsequent ground-disturbing actions related to physical expansion of the plant site.

Before construction at the Dresden site or an alternate site, studies would likely be needed to identify, evaluate, and address mitigation of the potential impacts of new plant construction on cultural resources. The studies would likely be needed for all areas of potential disturbance at the proposed plant site and along associated corridors where new construction would occur (e.g., roads, transmission corridors, rail lines, or other rights-of-way). Historic and archaeological resource impacts need to be evaluated on a site-specific basis. The impacts can generally be effectively managed; and, as such, impacts would vary between SMALL to MODERATE, depending on what historic and archaeologic resources are present, and whether mitigation is necessary.

- **Environmental Justice**

No environmental pathways or locations have been identified that would result in disproportionately high and adverse environmental impacts on minority and low-income populations if a replacement coal-fired plant were built at the Dresden site. Other impacts, such as impacts on housing availability and prices during construction, might occur; and this could disproportionately affect minority and low-income populations. Closure of Dresden Units 2 and 3 would result in a decrease in employment of approximately 870 permanent operating employees and 120 to 130 contract employees (same as in the no-action case), but this would be largely offset by construction and operation of the replacement power plant. Resulting economic conditions could reduce employment prospects for minority or low-income populations. However, the Dresden site is located near an active urban area with many employment possibilities. Overall, impacts would be SMALL and would depend on the ability of minority or low-income populations to commute to other jobs outside the area. The impacts around the alternate site would depend upon the site chosen and the nearby population distribution. These impacts could vary between SMALL and LARGE.

8.2.1.2 Open-Cycle Cooling System

The environmental impacts of constructing a coal-fired generation system at an alternate site using an open-cycle cooling system are largely the same as the impacts for a coal-fired plant using a closed-cycle system. However, there are some environmental differences between the closed-cycle and once-through cooling systems. Table 8-3 summarizes the incremental differences.

Table 8-3. Incremental Impacts of Coal-Fired Generation at an Alternate Site with an Open-Cycle Cooling System Compared to Closed-Cycle Cooling

Impact Category	Change in Impacts from Closed-Cycle Cooling System
Land Use	10 to 12 ha (25 to 30 ac) less land would be required because cooling towers and associated infrastructure are not needed.
Ecology	Impacts would depend on ecology at the site. No impact to terrestrial ecology from cooling-tower drift. Increased water withdrawal with possible greater impact on aquatic ecology.
Surface-water Use and Quality	No discharge of cooling tower blowdown. Increased water withdrawal and more thermal load on receiving body of water.
Groundwater Use and Quality	No change.
Air Quality	No change.
Waste	No change.
Human Health	No change.
Socioeconomic	No change.
Aesthetics	Reduced aesthetic impact because cooling towers would not be used.
Historic and Archaeological Resources	Impacts would depend on the cultural resources identified at the site.
Environmental Justice	No change.

8.2.2 Natural-Gas-Fired Generation

The environmental impacts of the natural-gas alternative are examined in this section. Unless otherwise indicated, the assumptions and numerical values used in this section are from the Exelon ER (Exelon 2003). The staff reviewed this information and compared it to environmental impact information in the GEIS as well as other relevant information and sources when appropriate. Although the OL renewal period is only 20 years, the impact of operating the natural-gas-fired alternative for 40 years is considered as a reasonable projection of the operating life of a natural-gas-fired plant. The staff assumed that Dresden Units 2 and 3 would remain in operation while the natural-gas-fired plant was constructed.

Consistent with the Exelon ER (Exelon 2003), the staff assumed a combined-cycle[(a)] natural-gas facility based on three 550-MW(e) combined-cycle units, for a total facility size of 1650 MW(e) (Exelon 2003).[(b)] The 550-MW(e) units are a standard size; their use would minimize the cost of the new facility. Any shortfall in capacity would be made up from other sources. This assumption understates the environmental impacts of replacing the 1824 MW(e) from Dresden Units 2 and 3. As a rough estimate, if a natural-gas-fired plant of exactly 1824 MW(e) were to be built, any numerical impacts in this section might simply be adjusted upwards accordingly. However, given these adjustments, the staff has determined that the differences in impacts between 1650 MW(e) and 1824 MW(e) of coal-fired generation would not be significant and would not change the impact levels.

The natural-gas-fired alternative is analyzed both for the existing Dresden site and for an unnamed alternate site. Siting a new natural-gas-fired plant where an existing nuclear plant is located would result in fewer impacts. Hence, although the staff considered an alternate site, it is unlikely that it would be beneficial to place a new natural-gas-fired facility at an alternate site based purely on environmental grounds. The GEIS estimates that 45 ha (110 ac) would be required for a new 1000-MW(e) combined-cycle facility, a much smaller land requirement than for a new coal-fired facility. Exelon concluded in its ER that the Dresden site would be a reasonable site for location of a natural-gas-fired generating unit (Exelon 2003). Locating the natural-gas-fired alternative at an existing nuclear site would allow the new facility to take advantage of existing infrastructure at the Dresden site, including existing cooling system, switchyard, offices, intake and discharge, and transmission rights-of-way.

Exelon made the following estimates to describe the combined-cycle facility:

- Heat rate: 6120 Btu/kWh (Exelon 2003)
- Natural gas heating value: 1021 Btu/ft^3 (Exelon 2003)
- Capacity factor: 0.85 (Exelon 2003).

(a) In a combined-cycle unit, hot combustion gases in a combustion turbine rotate the turbine to generate electricity. Waste combustion heat from the combustion turbine is routed through a heat-recovery boiler to make steam to generate additional electricity.

(b) The natural-gas-fired units would have a rating of 572 gross MW(e) and 550 net MW(e). The difference between "gross" and "net" is the electricity consumed on site.

These assumptions were deemed by the staff to be consistent with current practice with combined-cycle facilities. For emissions control, the facility would be outfitted with standard technologies, which includes selective catalytic reduction and steam/water injection for NO_x control.

Operation of a new combined-cycle facility at the Dresden site would require a new gas line. Exelon estimated that approximately 3 km (2 mi) of 41-cm (16-in.) gas pipeline would be required (Exelon 2003). Exelon further estimated that this pipeline would require approximately 15 to 16 ha (36 to 40 ac) for an easement (Exelon 2003). The gas line requirements at an alternate site would depend on the characteristics and location of the alternate site.

8.2.2.1 Closed-Cycle Cooling System

For purposes of this SEIS, the staff assumed a natural-gas-fired plant would use the existing modified, closed-cycle cooling system at the Dresden site, or at least some portion of this system because the water requirements for a combined-cycle facility are significantly lower than those for a coal-fired facility or a nuclear facility. The existing system is discussed above in Section 8.2.1.1.

The overall impacts of the natural-gas-fired generating system using the existing, modified closed-cycle system at the Dresden site and at an alternate site are discussed in the following sections and summarized in Table 8-4. For completeness, the staff also considered the impacts of a fully open-cycle cooling system with no cooling pond. An open-cycle system might be considered if the natural-gas-fired alternative were built at an alternate site. Additional impacts from the use of an open-cycle cooling system are considered in Section 8.2.1.2. The extent of impacts from an alternate site would depend on the location.

- **Land Use**

  For siting a new facility at the Dresden site, the existing infrastructure would be used to the extent practicable, thus limiting the amount of new construction that would be required. Specifically, the staff assumed that the new combined-cycle facility would make use of the existing cooling system, switchyard, offices, and transmission rights-of-way. The GEIS assumes that approximately 45 ha (110 ac) would be needed for a 1000-MW(e) natural-gas facility (NRC 1996). Scaling up for the 1650-MW(e) facility considered by Exelon would increase the land requirement to about 74 ha (180 ac). According to Exelon, previously disturbed acreage already exists and is available at the Dresden site, minimizing land-use impacts (Exelon 2003).

Table 8-4. Summary of Environmental Impacts of Natural-Gas-Fired Generation at the Dresden Site and an Alternate Site Using a Closed-Cycle Cooling System

	Dresden Site		Alternate Site	
Impact Category	**Impact**	**Comments**	**Impact**	**Comments**
Land Use	SMALL to MODERATE	Upwards of 45 ha (110 ac) for power block, offices, roads, and parking areas. Additional impact for construction of underground gas pipeline.	SMALL to LARGE	Upwards of 45 ha (110 ac) for power block, offices, roads, and parking areas. Additional impact for construction and/or upgrade of an underground gas pipeline, if required, along with any needed transmission lines.
Ecology	SMALL to MODERATE	Would use undeveloped areas at Dresden site. There would be potential for significant habitat loss and fragmentation and reduced productivity and biological diversity.	SMALL to LARGE	Impact would depend on location and ecological conditions of site and transmission line route. There would be potential for habitat loss and fragmentation and reduced productivity and biological diversity.
Water Use and Quality	SMALL	Cooling water requirements would be significantly lower than with nuclear or coal-fired alternatives. If needed, could use existing modified closed-cycle cooling system. Facility would continue current very limited groundwater use.	SMALL to MODERATE	Impact would depend on volume of water withdrawal and discharge, the characteristics of surface water or groundwater source, and the new intake structures required.
Air Quality	MODERATE	Sulfur oxides: 121 MT/yr (133 tons/yr) Nitrogen oxides: 386 MT/yr (426 tons/yr). Impact depends on emissions offsets. Carbon monoxide: 80 MT/yr (88 tons/yr) Particulates: 74 MT/yr (82 tons/yr) PM_{10} Other: CO_2 emissions contribute to global warming.	MODERATE	Same emissions as Dresden site, although offsets for NO_x would depend on location.

1 **Table 8-4.** (Contd)

		Dresden Site		Alternate Site	
2					
3	**Impact Category**	**Impact**	**Comments**	**Impact**	**Comments**
4	Waste	SMALL	Minimal waste product from fuel combination.	SMALL	Impacts identical to those for Dresden site.
5	Human Health	SMALL	Impacts considered to be minor.	SMALL	Impacts identical to those for Dresden site.
6	Socioeconomic	SMALL to MODERATE	During construction, impacts would be SMALL. Peak workforce during 2- to 3-year construction period would be significantly smaller than for other steam-generation facilities.	SMALL to MODERATE	Construction impacts at alternate site would be similar to those at Dresden site, but would depend on whether new site is located near a major metropolitan area.
7			During operation, employment would be reduced from approximately 1000 permanent and contract workers to less than 100. All employment impacts would be tempered by proximity to Chicago metropolitan area. Tax base would be preserved.		Grundy County would lose significant portion of tax base
8			Transportation impacts during operation would be SMALL due to the smaller workforce. Transportation impacts associated with construction workers would be SMALL to MODERATE.		Transportation impacts would be similar to those at Dresden site.

Table 8-4. (Contd)

	Dresden Site		Alternate Site	
Impact Category	**Impact**	**Comments**	**Impact**	**Comments**
Aesthetics	MODERATE	MODERATE aesthetic impact due to impact of plant buildings and structures along with noise impact from plant operation. Visual impact would be similar to current Dresden Units 2 & 3.	MODERATE to LARGE	Impact would depend on location. Greatest impact likely would be from the new transmission line(s) that would be needed.
Historic and Archaeological Resources	SMALL to MODERATE	Studies would likely be needed to identify, evaluate, and address mitigation of the potential impacts of new plant construction on cultural resources at developed and undeveloped sites.	SMALL to MODERATE	Alternate location would necessitate cultural studies. Studies would likely be needed to identify, evaluate, and address mitigation of the potential impacts of new plant construction on cultural resources at developed and undeveloped sites.
Environmental Justice	SMALL	No environmental pathways or locations have been identified that would result in disproportionately high and adverse environmental impacts on minority and low-income populations. Impacts on minority and low-income communities should be similar to those experienced by the population as a whole. Any impacts would be tempered by proximity to the Chicago area.	SMALL to LARGE	Impacts vary depending on population distribution and characteristics at new site. Impacts on Dresden site would be identical to those in the no-action alternative.

If a natural-gas-fired facility were built at the Dresden site, there would be an additional land requirement to bring in enough gas to supply the combined-cycle facility. As stated previously, Exelon estimated that approximately 3 km (2 mi) of 41-cm (16-in.) gas pipeline would be required (Exelon 2003). Exelon further estimated that this pipeline would require approximately 15 to 16 ha (36 to 40 ac) for an easement (Exelon 2003). Exelon asserts that this would likely be of only minimal impact because Exelon would use best management practices during construction, such as minimizing soil loss and restoring vegetation immediately after the excavation is backfilled (Exelon 2003).

For construction at an alternate site, the full land requirement for a natural-gas-fired facility would be required because no existing infrastructure would be available. Additional land could be impacted for construction of a transmission line and natural gas and oil pipelines to serve the plant.

Regardless of whether the natural-gas facility is built at the Dresden site or at an alternate site, additional land could be required for natural gas wells and collection stations. In the GEIS, the staff estimated that approximately 1500 ha (3600 ac) would be needed for a 1000-MW(e) plant (NRC 1996). Proportionately more land would be needed for the 1650-MW(e) facility considered here. Partially offsetting these offsite land requirements would be the elimination of the need for uranium mining to supply fuel for Dresden Units 2 and 3. In the GEIS (NRC 1996), the staff estimated that approximately 400 ha (1000 ac) would be affected for mining the uranium and processing it during the operating life of a 1000-MW(e) nuclear power plant.

Overall, the land-use impacts of constructing the natural-gas-fired plant at the Dresden site are considered SMALL to MODERATE. Overall, the land-use impacts would depend on the chosen site but are characterized as SMALL to LARGE.

- **Ecology**

Locating a natural-gas-fired plant at the Dresden site would affect ecological resources because approximately 74 ha (183 ac) of currently unused land would be converted to industrial use. Impacts to terrestrial ecology would be somewhat reduced because some of the area to be developed would be land previously disturbed by site activities and thus of less ecological value. A new gas pipeline would require an easement of 15 to 16 ha (36 to 40 ac). Exelon asserts the new gas pipeline would likely be of only minimal impact because best management practices, such as minimizing soil loss and restoring vegetation immediately after the excavation is backfilled, would be used during construction (Exelon 2003). Impacts to ecological resources could include onsite habitat degradation, fragmentation, habitat loss, reduced ecosystem productivity, and a reduction in biological diversity. The use of a closed-cycle cooling system would reduce operational impacts on the aquatic ecosystem and would reduce the use of water below current levels. Overall, the ecological impacts of the natural-gas-fired alternative at the Dresden site are considered SMALL to MODERATE.

At an alternate site, the construction and operation of a natural-gas-fired plant would result in some ecological impacts. Impacts to ecological resources could include habitat degradation, fragmentation, habitat loss, reduced ecological productivity and a reduction in biological diversity. If needed, construction and maintenance of new transmission line(s) and gas-supply line would have similar ecological impacts. Use of make-up cooling water from a nearby surface-water body could have adverse aquatic resource impacts. Overall, the ecological impacts of the natural-gas-fired alternative at an alternate site are dependent on whether a site had been previously developed (SMALL to MODERATE) or is an undeveloped greenfield site (MODERATE to LARGE impact).

- **Water Use and Quality**

Each of the natural-gas-fired units would include a heat recovery boiler from which steam would turn an electric generator. Steam would be condensed and circulated back to the boiler for reuse. Overall, water requirements for combined-cycle generation are much less than for conventional, closed-cycle steam electric generators. The natural-gas-fired alternative at the existing site would use the existing modified, closed-cycle cooling system and would, therefore, have no incremental impacts on cooling-water needs. Some erosion and sedimentation probably would occur during construction (NRC 1996). The three groundwater wells that supply limited specific uses at the Dresden site would continue to be used. Overall, the impacts of the natural-gas-fired alternative at the Dresden site are considered SMALL.

At an alternate site, the cooling water would likely be drawn from a surface body of water. Plant discharges would consist mostly of cooling tower blowdown, characterized primarily by an increased temperature and increased concentration of dissolved solids relative to the receiving body of water and intermittent low concentrations of biocides (e.g., chlorine).

Treated process waste streams and sanitary wastewater may also be discharged. All discharges would likely be regulated through a NPDES permit. Use of groundwater for a natural-gas-fired plant at an alternate site is a possibility. There would be consumptive use of water due to evaporation from the cooling towers. Some erosion and sedimentation probably would occur during construction (NRC 1996). Overall, the impacts at an alternate site are considered SMALL to MODERATE.

Air Quality

Natural gas is a relatively clean-burning fuel. The natural-gas-fired alternative would release similar types of emissions but in lesser quantities than the coal-fired alternative. Hence, it would be subject to the same type of air quality regulations as a coal-fired plant, discussed in Section 8.2.1.1. The greatest concern from combined-cycle facilities are the emissions of ozone precursors, NO_x and VOCs.

Exelon projects the following emissions for the natural-gas-fired alternative (Exelon 2003):

Sulfur oxides: 21 MT/yr (133 tons/yr)
Nitrogen oxides: 386 MT/yr (426 tons/yr)
Carbon monoxide: 80 MT/yr (88 tons/yr)
PM_{10} particulates: 67 MT/yr (74 tons/yr)
Volatile organic compounds: 74 MT/yr (82 tons/yr).

A combined-cycle facility would also have unregulated carbon dioxide emissions that could contribute to global warming. While these emissions have not traditionally been an important environmental concern, they are becoming increasingly relevant at both a national and an international level.

In December 2000, EPA issued regulatory findings on emissions of hazardous air pollutants from electric utility steam-generating units (EPA 2000b). Natural-gas-fired power plants were found by EPA to emit arsenic, formaldehyde, and nickel (EPA 2000b). Unlike coal- and oil-fired plants, EPA did not determine that emissions of hazardous air pollutants from natural-gas-fired power plants should be regulated under Section 112 of the Clean Air Act.

Construction activities would result in temporary fugitive dust. Exhaust emissions would also come from vehicles and motorized equipment used during the construction process.

The preceding emissions would likely be largely the same at the Dresden site or at an alternate site. Impacts would be clearly noticeable but would not be sufficient to destabilize air resources as a whole. The overall air quality impact for a new natural-gas-fired generating facility sited at the Dresden site or an alternate site is considered MODERATE.

- **Waste**

Burning natural gas results in very few combustion by-products because of the clean nature of the fuel. There would be small amounts of solid waste products (i.e., ash) from burning natural-gas fuel. In the GEIS, the staff concluded that waste generation from gas-fired technology would be minimal (NRC 1996). Waste generation at an operating gas-fired plant would be largely limited to typical office wastes. Construction-related debris would be generated during construction activities. Overall, the waste impacts would be SMALL for a natural-gas-fired plant sited at the Dresden site or at an alternate site.

- **Human Health**

In the GEIS, the staff identifies cancer and emphysema as potential health risks from gas-fired plants (NRC 1996). The risk may be attributable to NO_x emissions that contribute to ozone formation, which in turn contribute to health risks. NO_x emissions from the plant would be regulated. As discussed in Section 8.2.1.1, NO_x emissions for a new combined-cycle plant at the Dresden site would be offset through the Emissions Reduction Trading Program because the Dresden site is in the Metropolitan Chicago Ozone Nonattainment Area. Human health effects are not expected to be detectable or would be sufficiently minor that they would neither destabilize nor noticeably alter any important attribute of the resource. Overall, the impacts on human health of the natural-gas-fired alternative are considered SMALL at the Dresden site or at an alternate site.

- **Socioeconomics**

Construction of a natural-gas combined-cycle facility would take approximately two to three years. The staff assumed that construction would take place while Dresden Units 2 and 3 continued operation and would be completed by the time they permanently ceased operations. In the GEIS (NRC 1996), the staff concluded that socioeconomic impacts from constructing a natural-gas-fired power plant would be low compared to other steam plants.

If the facility were constructed at the Dresden site, construction workers would be in addition to the 870 permanent employees and approximately 120 to 130 contract workers who currently work at the Dresden site. During construction, the communities immediately surrounding the Dresden site would experience demands on housing and public services that would have SMALL impacts. These impacts would be tempered because construction workers would commute to the site from a wider range of cities and towns comprising the Chicago metropolitan area. After construction, the nearby communities would be impacted by the loss of the construction jobs.

Exelon estimates that the new combined-cycle facility would have a workforce of approximately 25 to 40 (Exelon 2003), significantly fewer than the 150 assumed in the GEIS for a 1000-MW(e) natural-gas facility. If it is assumed that such a facility would require a workforce of approximately 50 workers, that the combined-cycle facility would be constructed at the Dresden site, and that Dresden Units 2 and 3 were decommissioned, there would be a loss of 820 permanent, high-paying jobs (from 870 jobs for Dresden Units 2 and 3, down to 50 for a natural-gas alternative) along with the loss of 120 to 130 contract workers with a commensurate reduction in demand on socioeconomic resources and contribution to the regional economy. These impacts would be tempered because the Dresden site is within the economically vital Chicago metropolitan area. The natural-gas alternative would provide a new tax base to offset the loss of the tax base associated with the decommissioning of Dresden Units 2 and 3. For all of these reasons, the appropriate characterization of nontransportation socioeconomic impacts for operating a natural-gas plant constructed at the Dresden site is considered SMALL.

If the alternative natural-gas-fired power plant were constructed at an alternate site, there would be impacts for areas around the Dresden site (from losing a facility) and around the alternate site (from gaining a facility). The impacts around the alternate site would depend on the socioeconomic characteristics of the new site. If the site were near a large urban center, as the Dresden site is, then the impacts would be small. On the other hand, socioeconomic impacts at a rural site would be larger than at an urban site because more of the peak construction workforce would need to move into the area to work (NRC 1996). Alternate sites would, therefore, need to be analyzed on a case-by-case basis. Socioeconomic impacts from construction of the new site could range from SMALL to MODERATE, depending on the characteristics of the surrounding regions. Impacts from operating the facility would likely be SMALL.

For transportation related to commuting of plant operating personnel, the impacts are considered small. The number of plant operating personnel would be small compared to the current workforce of 870 (Exelon 2003). Therefore, traffic impacts associated with plant personnel commuting to a natural-gas plant would be expect to be SMALL compared to the current impacts from Dresden Units 2 and 3. This would hold at both the Dresden site and at an alternate site.

During the construction period for the replacement natural-gas-fired units, a significant cadre of construction workers would be working at the site in addition to the 870 permanent and 130 contract workers currently at the Dresden site. The addition of these workers could place significant traffic loads on existing highways near the Dresden site. Such impacts would be SMALL to MODERATE. At an alternate site, such impacts are also considered SMALL to MODERATE.

- **Aesthetics**

The turbine buildings, the exhaust stacks (approximately 60 m [200 ft] tall), and the gas pipeline compressors would be visible off site during daylight hours. Buildings and structures would also be visible at night because of outside lighting. Visual impacts of buildings and structures could be mitigated by landscaping and by selecting an exterior color for the units that is consistent with the environment for the facility. Visual impact at night could be mitigated by reduced use of lighting and appropriate use of shielding. At the Dresden site, visual aesthetic impacts of a natural-gas combined-cycle facility are considered MODERATE. At an alternate site, cooling towers would be required; and these towers and their associated plumes would also be visible off site. The aesthetic impacts could be mitigated if the plant were located in an industrial area adjacent to other industrial plants. There would also be significant aesthetic impact from a new transmission line. Overall, the aesthetic impacts associated with a replacement natural-gas-fired power plant at an alternate site are considered MODERATE to LARGE and will depend on the exact location of the alternate site.

Natural-gas generation would introduce mechanical sources of noise that would be audible off site. Sources contributing to total noise produced by plant operation are classified as continuous or intermittent. Continuous sources include the mechanical equipment associated with normal plant operations. Intermittent sources include the use of outside loudspeakers and the commuting of plant employees. The incremental noise impacts of a natural-gas-fired plant compared to existing operations at the Dresden site are considered to be MODERATE. At an alternate site, these noise impacts would be SMALL to LARGE, depending on the site and location. Again, the aesthetic impacts at the plant site would be mitigated if the plant were located in an industrial area adjacent to other power plants or industrial facilities.

- **Historic and Archaeological Resources**

At the Dresden site or an alternate site, a cultural resource inventory would likely be needed for any onsite property that has not been previously surveyed. Other lands, if any, that are acquired to support the plant would also likely need an inventory of field cultural resources, identification and recording of existing historic and archaeological resources, and possible mitigation of adverse effects from subsequent ground-disturbing actions related to physical expansion of the plant site.

Before construction at the Dresden site or an alternate site, studies would likely be needed to identify, evaluate, and address mitigation of the potential impacts of new plant construction on cultural resources. The studies would likely be needed for all areas of potential disturbance at the proposed plant site and along associated corridors where new construction would occur (e.g., roads, transmission corridors, rail lines, or other rights-of-way). Historic and archaeological resource impacts need to be evaluated on a site-specific basis. The impacts can generally be effectively managed and, as such, impacts would vary between SMALL to MODERATE, depending on what historic and archaeologic resources are present, and whether mitigation is necessary.

- **Environmental Justice**

No environmental pathways or locations have been identified that would result in disproportionately high and adverse environmental impacts on minority and low-income populations if a replacement natural-gas-fired plant were built at the Dresden site. Other impacts, such as impacts on housing availability and prices during construction, might occur; and this could disproportionately affect minority and low-income populations. Closure of Dresden Units 2 and 3 would result in a decrease in employment of approximately 870 permanent operating employees and 120 to 130 contract employees (same as in the no-action case), offset by construction and operation of the replacement power plant. Resulting economic conditions could reduce employment prospects for minority or low-income populations. However, the Dresden site is located near an active urban area with many employment possibilities. Overall, impacts would be SMALL and would depend on the ability of minority or low-income populations to commute to other jobs outside the area. The impacts around the alternate site would depend upon the site chosen and the nearby population distribution. These impacts could vary between SMALL and LARGE.

8.2.2.2 Open-Cycle Cooling System

The environmental impacts of constructing a natural-gas-fired generation system at an alternate site using an open-cycle cooling system are largely the same as the impacts for a natural-gas-fired plant using a closed-cycle system. However, there are some environmental differences between the closed-cycle and once-through cooling systems. Table 8-5 summarizes the incremental differences.

Table 8-5. Incremental Impacts of Natural-Gas-Fired Generation at an Alternate Site with an Open-Cycle Cooling System Compared to Closed-Cycle Cooling

Impact Category	Change in Impacts from Closed-Cycle Cooling System
Land Use	10 to 12 ha (25 to 30 ac) less land required because cooling towers and associated infrastructure are not needed.
Ecology	Impacts would depend on ecology at the site. No impact to terrestrial ecology from cooling tower drift. Increased water withdrawal with possible greater impact on aquatic ecology.
Surface-water Use and Quality	No discharge of cooling tower blowdown. Increased water withdrawal and more thermal load on receiving body of water.
Groundwater Use and Quality	No change.
Air Quality	No change.
Waste	No change.
Human Health	No change.
Socioeconomic	No change.
Aesthetics	Reduced aesthetic impact because cooling towers would not be used.
Historic and Archaeological Resources	Impacts would depend on the cultural resources identified at the site.
Environmental Justice	No change.

8.2.3 Nuclear Power Generation

This section considers construction of a new nuclear power plant at the Dresden site and at an alternate site. The staff assumed that the new nuclear plant would have a 40-year lifetime.

The NRC summarized environmental data associated with the uranium fuel cycle in Table S-3 of 10 CFR 51.51. The impacts shown in Table S-3 are representative of the impacts that would be associated with a replacement nuclear power plant built to one of the certified designs and sited at Dresden or at an alternate site. The impacts shown in Table S-3 are for a 1000-MW(e) reactor and would need to be adjusted to reflect replacement of Dresden Units 2 and 3, which have a net capacity of 1824 MW(e). The environmental impacts associated with transporting fuel and waste to and from a light-water-cooled nuclear power reactor are summarized in Table S-4 of 10 CFR 51.52. The summary of the NRC's findings on NEPA issues for license renewal of nuclear power plants in Table B-1 of 10 CFR Part 51, Subpart A, Appendix B, is also relevant although not directly applicable, for consideration of environmental impacts associated with the operation of a replacement nuclear power plant. Additional environmental impact information for a replacement nuclear power plant using closed-cycle cooling is presented in Section 8.2.3.1 and using open-cycle cooling in Section 8.2.3.2.

8.2.3.1 Closed-Cycle Cooling System

For purposes of this SEIS, the staff assumed a nuclear plant would use the existing modified, closed-cycle cooling system at the Dresden site. The existing system is discussed above in Section 8.2.1.1.

The overall impacts of the nuclear generating system using the existing, modified closed-cycle system at the Dresden site and at an alternate site are discussed in the following sections and summarized in Table 8-6. For completeness, the staff also considered the impacts of a fully open-cycle cooling system with no cooling pond. An open-cycle system might be considered if the nuclear plant were built at an alternate site. Additional impacts from the use of an open-cycle cooling system are considered in Section 8.2.1.2. The magnitude of impacts from an alternate site would depend on the location.

Table 8-6. Summary of Environmental Impacts of New Nuclear Power Generation at the Dresden Site and Alternate Site Using Closed-Cycle Cooling System

	Dresden Site		Alternate Site	
Category	**Impact**	**Comments**	**Impact**	**Comments**
Land Use	MODERATE	Would use unused portion of Dresden site. Would require approximately 200 to 400 ha (500 to 1000 ac) for the plant. Plant would use any existing infrastructure (e.g., transmission lines).	MODERATE to LARGE	Same as Dresden site, plus land for transmission line and y existing infrastructure. Total impact would depend on whether the alternative site has been previously disturbed.
Ecology	MODERATE	Would use undeveloped areas at Dresden site. There would be potential for significant habitat loss and fragmentation and reduced productivity and biological diversity.	MODERATE to LARGE	Impact would depend on location and ecological conditions of site and transmission line route. There would be potential for habitat loss and fragmentation and reduced productivity and biological diversity.
Water Use and Quality	SMALL	Would use existing modified closed-cycle cooling system and continue current very limited groundwater use.	SMALL to MODERATE	Impact would depend on volume of water withdrawal, the constituents of the discharge water, and the characteristics of surface-water body or groundwater source.

Air Quality	SMALL	Fugitive emissions and emissions from vehicles and equipment during construction. Small amount of emissions from diesel generators and possibly other sources during operation. Emissions would be similar to current releases.	SMALL	Same impacts as at Dresden site.

Table 8-6. (Contd)

	Dresden Site		Alternate Site	
Category	**Impact**	**Comments**	**Impact**	**Comments**
Waste	SMALL	Waste impacts for an operating nuclear power plant are set out in 10 CFR Part 51, Appendix B, Table B-1. Debris would be generated and removed during construction.	SMALL	Same impacts as at Dresden site.
Human Health	SMALL	Human health impacts for an operating nuclear power plant are set out in 10 CFR Part 51, Appendix B, Table B-1.	SMALL	Same impacts as at Dresden site.
Socioeconomic	SMALL to MODERATE	During construction, impacts would be SMALL to MODERATE. Upwards of 2500 workers might be required at peak of the 5-year construction period.	SMALL to LARGE	Construction impacts at alternate site would be similar to those at Dresden site, but would depend on whether new site is located near a major metropolitan area.
		During operation, employment would be similar to current employment. Tax base would be preserved.		Grundy County would lose significant portion of tax base.
		Transportation impacts during operation would be SMALL due to the smaller workforce. Transportation impacts associated with construction workers would be SMALL to MODERATE.		Transportation impacts would be similar to those at Dresden site.
Aesthetics	MODERATE	Due to impact of nuclear plant buildings and structures along with noise impacts from plant operation. Visual impact would be similar to current impacts.	MODERATE to LARGE	Impacts would similar to those at Dresden site but would also include any aesthetic impacts from building new transmission line(s).

Table 8-6. (Contd)

	Dresden Site		Alternate Site	
Category	Impact	Comments	Impact	Comments
Historic and Archaeological Resources	SMALL to MODERATE	Studies would likely be needed to identify, evaluate, and address mitigation of the potential impacts of new plant construction on cultural resources at developed and undeveloped sites.	SMALL to MODERATE	Alternate location would necessitate cultural studies. Studies would likely be needed to identify, evaluate, and address mitigation of the potential impacts of new plant construction on cultural resources at developed and undeveloped sites.
Environmental Justice	SMALL	No environmental pathways or locations have been identified that would result in disproportionately high and adverse environmental impacts on minority and low-income populations. Impacts on minority and low-income communities would be similar to those experienced by the population as a whole.	SMALL to LARGE	Impacts vary depending on population distribution and characteristics at new site. Impacts on Dresden site would be identical to those in the no-action alternative.

- **Land Use**

According the GEIS, a light-water reactor requires approximately 200 to 400 ha (500 to 1000 ac) excluding transmission lines. The Dresden site is adequate to support a new nuclear facility. For siting a new facility, the existing infrastructure would be used to the extent practicable, thus limiting the amount of new construction that would be required. Specifically, the staff assumed that the new nuclear facility would use the existing cooling system, switchyard, offices, and transmission rights-of-way.

There would be no net change in land needed for uranium mining because land needed to supply the new nuclear plant would offset land needed to supply uranium for fueling the existing reactors at Dresden Units 2 and 3. Overall, the impact of a replacement nuclear generating plant on land use at the existing Dresden site is best characterized as MODERATE.

Land-use requirements at an alternate site would be approximately 200 to 400 ha (500 to 1000 ac) plus the possible need for a new transmission line (NRC 1996). In addition, it may be necessary to construct a rail spur or barge offloading facility to an alternate site to deliver equipment during construction. Depending on new transmission line routing, siting a new nuclear power plant at an alternate site could result in MODERATE to LARGE land-use impacts.

- **Ecology**

Locating a new nuclear power plant at the Dresden site would affect ecological resources because approximately 200 to 400 ha (500 to 1000 ac) of currently unused land would be converted to industrial use. Impacts to terrestrial ecology would be somewhat reduced because some of the area to be developed would be land previously disturbed by site activities and thus of less ecological value. Impacts to ecological resources could include habitat degradation, fragmentation, habitat loss, reduced ecosystem productivity, and a reduction in biological diversity. Use of a closed-cycle cooling system would reduce impacts to the aquatic ecosystem. Siting a new nuclear power plant at the Dresden site would have MODERATE ecological impact, primarily due to construction.

At an alternate site, the construction and operation of a new nuclear power plant would result in ecological impacts. Impacts to ecological resources could include habitat degradation, fragmentation, habitat loss, reduced ecological productivity and a reduction in biological diversity. If needed, construction and maintenance of a transmission line would have similar ecological impacts. Overall, the ecological impacts are dependent on whether a site had been previously developed (MODERATE) or is an undeveloped greenfield site (MODERATE to LARGE impact).

- **Water Use and Quality**

The nuclear alternative at the existing site would use the existing modified, closed-cycle cooling system and would, therefore, have no incremental impacts on cooling water needs. Some erosion and sedimentation probably would occur during construction (NRC 1996). The three groundwater wells that supply limited specific uses at the Dresden site could continue to be used. Overall, the impacts of the nuclear alternative at the Dresden site are considered SMALL, depending on the location.

At an alternate site, the cooling water would likely be drawn from a surface body of water. Plant discharges would consist mostly of cooling tower blowdown, characterized primarily by an increased temperature and concentration of dissolved solids relative to the receiving body of water and intermittent low concentrations of biocides (e.g., chlorine). Treated process waste streams and sanitary wastewater may also be discharged. All discharges would likely be regulated through a NPDES permit. Use of groundwater for a nuclear plant at an alternate site is a possibility. There would be consumptive use of water due to evaporation from the cooling towers. Some erosion and sedimentation probably would occur during construction (NRC 1996). Overall, the impacts at an alternate site are considered SMALL to MODERATE, depending on the location.

Air Quality

Construction of a new nuclear plant at the Dresden site or an alternate site would result in fugitive emissions during the construction process. Exhaust emissions would also come from vehicles and motorized equipment used during the construction process. An operating nuclear plant would have minor air emissions associated with emergency diesel generators. These emissions would be regulated. Overall, emissions and associated impacts at either the Dresden site or an alternate site are considered SMALL.

- **Waste**

The waste impacts associated with operation of a nuclear power plant are set out in Table B-1 of 10 CFR Part 51, Subpart A, Appendix B. In addition to the impacts shown in Table B-1, construction-related debris would be generated during construction activities and removed to an appropriate disposal site. Overall, waste impacts are considered SMALL at either the Dresden site or an alternate site.

- **Human Health**

Human health impacts for an operating nuclear power plant are set out in 10 CFR Part 51, Subpart A, Appendix B, Table B-1. Overall, human health impacts are considered SMALL at either the Dresden site or an alternate site.

- **Socioeconomics**

The construction period and the peak work force associated with construction of a new nuclear power plant are currently unquantified (NRC 1996). In the absence of quantified data, the staff assumed a construction period of five years and a peak work force of 2500. The staff assumed that construction would take place while Dresden Units 2 and 3 continued operation and would be completed by the time Dresden Units 2 and 3 permanently cease operations.

If the facility were constructed at the Dresden site, these workers would be in addition to the 870 permanent employees and the approximately 120 to 130 contract workers that currently work at the Dresden site. During construction of the new nuclear power plant, surrounding communities would experience demands on housing and public services that could have MODERATE impacts. These impacts would be tempered because the Dresden site is part of the economically vital Chicago metropolitan area. After construction, the nearby communities would be impacted by the loss of the construction jobs.

The replacement nuclear units are assumed to have an operating work force comparable to the approximately 1000 workers currently working at Dresden Units 2 and 3. The alternative new nuclear power plant would provide a new tax base to offset the loss of tax base associated with decommissioning of Dresden Units 2 and 3. For all of these reasons, the appropriate characterization of nontransportation, socioeconomic impacts for operating a new nuclear power plant constructed at the Dresden site is considered SMALL.

If the alternative new nuclear power plant were constructed at an alternate site, the impacts around the alternate site would depend on the socioeconomic characteristics of the new site. If the site were near a large urban center, as the Dresden site is, then the impacts would be small. On the other hand, in the GEIS, the staff stated that socioeconomic impacts at a rural site would be larger than at an urban site because more of the peak construction workforce would need to move into the area to work (NRC 1996). Alternate sites would, therefore, need to be analyzed on a case-by-case basis. Socioeconomic impacts from construction of the new site could range from SMALL to LARGE, depending on the characteristics of the surrounding regions. Impacts from operating the facility could range from SMALL to MODERATE, depending on the characteristics of the surrounding regions.

For transportation related to commuting of plant operating personnel, the impacts are considered small. The number of personnel would be similar to the number currently working at the Dresden site. Therefore, traffic impacts associated with plant personnel commuting to a new nuclear power plant would be expect to be SMALL compared to the current impacts from Dresden Units 2 and 3. This would hold for both the Dresden site and an alternate site.

During the five-year construction period for the replacement new nuclear power plant, however, a large number of construction workers would be working at the site in addition to the workers currently at the Dresden site. The addition of these workers could place significant traffic loads on existing highways near either the Dresden site or an alternate site. Such impacts would be MODERATE.

- **Aesthetics**

The containment buildings for a replacement nuclear power plant and other associated buildings would be visible off site during daylight hours. Buildings and structures would also be visible at night because of outside lighting. Visual impacts of buildings and structures could be mitigated by landscaping and by selecting an exterior color for the units that is consistent with the environment. Visual impact at night could be mitigated by reduced use of lighting and appropriate use of shielding. At the Dresden site, visual aesthetic impacts are considered MODERATE. At an alternate site, cooling towers would be required, and these towers and their associated plumes would also be visible off site. The aesthetic impacts could be mitigated if the plant were located in an industrial area adjacent to other power plants. There would also be significant aesthetic impact from a new transmission line. Overall, the aesthetic impacts associated with a replacement nuclear-fired power plant at an alternate site are considered MODERATE to LARGE and will depend on the exact location of the alternate site.

Nuclear generation would introduce mechanical sources of noise that would be audible off site. Sources contributing to total noise produced by plant operation are classified as continuous or intermittent. Continuous sources include the mechanical equipment associated with normal plant operations. Intermittent sources include the use of outside loudspeakers and the commuting of plant employees. The incremental noise impacts of a nuclear-fired plant compared to existing operations at the Dresden site are considered to be MODERATE. At an alternate site, these noise impacts would be SMALL to LARGE, depending on the site. Again, aesthetic impacts at the plant site would be mitigated if the plant were located in an industrial area adjacent to other power plants or industrial facilities.

- **Historic and Archaeological Resources**

At the Dresden site or an alternate site, a cultural resource inventory would likely be needed for any onsite property that has not been previously surveyed. Other lands, if any, that are acquired to support the plant would also likely need an inventory of field cultural resources, identification and recording of existing historic and archaeological resources, and possible mitigation of adverse effects from subsequent ground-disturbing actions related to physical expansion of the plant site.

Before construction at the Dresden site or an alternate site, studies would likely be needed to identify, evaluate, and address mitigation of the potential impacts of new plant construction on cultural resources. The studies would likely be needed for all areas of potential disturbance at the proposed plant site and along associated corridors where new construction would occur (e.g., roads, transmission corridors, rail lines, or other rights-of-way). Historic and archaeological resource impacts need to be evaluated on a site-specific basis. The impacts can generally be effectively managed; and, as such, impacts would vary between SMALL to MODERATE, depending on what historic and archaeologic resources are present, and whether mitigation is necessary.

- **Environmental Justice**

No environmental pathways or locations have been identified that would result in disproportionately high and adverse environmental impacts on minority and low-income populations if a new nuclear power plant were built at the Dresden site. Other impacts, such as impacts on housing availability and prices during construction, might occur during construction; and these impacts could disproportionately affect minority and low-income populations. Closure of Dresden Units 2 and 3 would result in a decrease in employment of approximately 870 permanent operating employees and 120 to 130 contract employees (same as in the no-action case), but this would be offset by construction and operation of the replacement power plant. Resulting economic conditions could reduce employment prospects for minority or low-income populations; however, the Dresden site is located near an active urban area with many employment possibilities. Overall, impacts would be SMALL and would depend on the ability of minority or low-income populations to commute to other jobs outside the area. The impacts around the alternate site would depend upon the site chosen and the nearby population distribution. These impacts could vary between SMALL and LARGE.

8.2.3.2 Open-Cycle Cooling System

The environmental impacts of constructing a nuclear generation system at an alternate site using an open-cycle cooling system are largely the same as the impacts for a nuclear generation system using a closed-cycle system. However, there are some environmental differences between the closed-cycle and once-through cooling systems. Table 8-7 summarizes the incremental differences.

8.2.4 Purchased Electrical Power

This section considers the option of Exelon decommissioning Dresden Units 2 and 3, not replacing the lost generation with a new power plant or other option, and then purchasing an equal amount of power and capacity to replace that generated by Dresden Units 2 and 3. There are two possibilities for the source of this power. On the one hand, this replacement power could come from facilities that are already built but not producing power. On the other hand, replacement power could come from new generation facilities. The likely outcome would be a combination of both sources. Initially, replacement power would come from existing sources. Under normal economic conditions, the use of replacement power will raise the price of capacity and energy because the supply will be lowered, but the demand will remain the same. Over time, this increase in price will spur new generation capacity to take advantage of the new opportunities for profit. In this case, the new generation could be attributed to a mix of sources, most likely natural-gas- and coal-fired generation, which were discussed above. If significant excess supply existed in the United States, then it might be the case that no new generation would be brought on line to replace the lower supply. However, no such excess supply condition exists in the Eastern Grid of which Illinois is a part. According to DOE/EIA, in 2001, the reserve margin[a] in the Eastern Grid was 13.9 percent in 2001, well below the traditional levels of 25 to 30 percent (DOE/EIA 2003b).

(a) The "reserve margin" is defined as excess available capacity as a fraction of total demand at a given time.

Table 8-7. Incremental Impacts of Nuclear Power Generation at an Alternate Site with Open-Cycle Cooling Compared to Closed-Cycle Cooling

Impact Category	Change in Impacts from Closed-Cycle Cooling System
Land Use	10 to 12 ha (25 to 30 ac) less land required because cooling towers and associated infrastructure are not needed.
Ecology	Impacts would depend on ecology at the site. No impact to terrestrial ecology from cooling tower drift. Increased water withdrawal with possible greater impact on aquatic ecology.
Surface-water Use and Quality	No discharge of cooling tower blowdown. Increased water withdrawal and more thermal load on receiving body of water.
Groundwater Use and Quality	No change.
Air Quality	No change.
Waste	No change.
Human Health	No change.
Socioeconomic	No change.
Aesthetics	Reduced aesthetic impact because cooling towers would not be used.
Historic and Archaeological Resources	Impacts would depend on the cultural resources identified at the site.
Environmental Justice	No change.

The regulatory system of Illinois complicates the notion of purchasing power. In a traditional, regulated utility environment, utilities managed all portions of the utility system from generation to transmission to distribution. In this environment, utilities would buy and sell power from other utilities to make up for any shortfalls in demand or excess generation capacity. However, Illinois, like many other states, has altered the regulation of its electric utilities so that generation is decoupled from transmission and distribution. Generators sell power and energy as commodities. While Exelon holds both generation and distribution companies, these companies are not linked in the traditional fashion—Exelon generation can sell to any distributor, and Exelon distribution can purchase from any generator. Exelon's distribution arm will purchase the electricity that it needs from whatever source provides the cheapest energy; it already purchases all the energy that it supplies. Exelon's generating arm could purchase and then sell the electricity, but this would not change supply or demand; it would simply add a middle man in the electricity market.

For these reasons, the staff does not believe that purchasing power to make up for the generation at Dresden Units 2 and 3 is a meaningful alternative that requires independent analysis. Any impacts from purchasing power on the open market will follow those of the generation sources that end up supplying the power; and these impacts are covered in other sections from this chapter.

8.2.5 Other Alternatives

Other generation technologies considered by the NRC are discussed in the following subsections. The staff felt that none of these options alone was sufficient to replace the capacity and energy of Dresden Units 2 and 3. However, such alternatives might be used in combination, as discussed in Section 8.2.6.

8.2.5.1 Oil-Fired Generation

EIA projects that oil-fired plants will account for very little of the new generation capacity in the United States through the year 2020 because of higher fuel costs and lower efficiencies (DOE/EIA 2001a). Oil-fired operation is more expensive than nuclear or coal-fired operation. Future increases in oil prices are expected to make oil-fired generation increasingly more expensive than coal-fired generation. The high cost of oil has prompted a steady decline in its use for electricity generation. Increasing domestic concerns over oil security will only exacerbate the move away for oil-fired electricity generation. Therefore, the staff does not consider oil-fired generation by itself a feasible alternative to Dresden Units 2 and 3.

8.2.5.2 Wind Power

According to the DOE (2003), Illinois has a capacity of approximately 3000 MW(e) of class 4 wind sites. In general, class 4 sites can be useful for generating power with large wind turbines. In addition, Illinois also has 6000 MW(e) of class 3+ sites. Class 3+ sites might prove economically viable for wind power generation with near-term technological advances. Wind power plants typically run at capacity factors of 30 to 35 percent (Northwest Power Planning Council [NWPPC] 2000). These capacity factors are much lower than those for a nuclear power plant, which commonly run above 90 percent. Therefore, approximately 4200 to 4900 MW(e) would have to be developed to make up for the approximately 13 billion kWh(e) generated by Dresden Units 2 and 3 in 2001 (DOE/EIA 2003c). Because the largest commercially available wind turbines are in the range of 1 MW to 1.5 MW, approximately 2800 to 4900 of these turbines would be required to replace the generation from Dresden Units 2 and 3.

Although the wind resource in Illinois, in theory, is sufficient to support replacement of the capacity and energy from Dresden Units 2 and 3, many difficulties render full replacement a problematic option. For one, the vast bulk of the wind resource would have to be developed; and this development would be an enormously extensive undertaking, especially when one considers that total wind power capacity in the United States at the end of 2002 was approximately 4500 MW(e). Although wind power production in the United States is expected to grow many times over the coming decades, installation of approximately 4200 MW(e) to 4900 MW(e) in the Midwest to replace the generation from Dresden Units 2 and 3 would require approximately a near-term doubling of current U.S. wind generation capacity. Further, access to many of the best wind power sites would require easements, extensive road building and, potentially, extensive clearing (for towers and blades). Construction of thousands of wind turbines in Illinois would also require extensive construction of transmission lines to bring the power and the energy to market. Wind energy is an intermittent resource, whereas Dresden Units 2 and 3 provide constant baseload power. When there is little wind, wind energy simply would not compensate for Dresden Units 2 and 3 energy generation. For all these reasons, the staff concludes that wind power alone is not a feasible substitute at this time for the baseload generation from Dresden Units 2 and 3.

8.2.5.3 Solar Power

Solar technologies use the sun's energy and light to provide heat and cooling, light, hot water, and electricity for homes, businesses, and industry. Solar power technologies (both photovoltaic and thermal) cannot currently compete with conventional fossil-fueled technologies in grid-connected applications due to higher capital costs per kilowatt of capacity. The average capacity factor of photovoltaic cells is about 25 percent (NRC 1996), and the capacity factor for solar thermal systems is about 25 percent to 40 percent (NRC 1996). These capacity factors are low because solar power is an intermittent resource, providing power when the sun is strong, whereas Dresden Units 2 and 3 provide constant baseload power. Solar technologies simply cannot make up for the capacity from Dresden Units 2 and 3 when the sun is not shining.

There can be substantial impacts to natural resources (wildlife habitat, land use, and aesthetic impacts) from construction of solar-generating facilities. As stated in the GEIS, land requirements are high—140 km^2 (55 mi^2) per 1000 MW(e) for photovoltaic and approximately 57 km^2 (22 mi^2) per 1000 MW(e) for solar thermal systems (NRC 1996). Neither type of solar electric system would fit at the Dresden site, and both would have large environmental impacts at a greenfield site.

Currently available photovoltaic (PV) cell conversion efficiencies range from approximately 7 to 17 percent. The average solar energy falling on a horizontal surface in the Illinois region in June, a peak month for sunlight, is approximately 6.0 to 6.5 kWh/m^2 per day. If an average solar energy throughout the year of approximately 3 kWh/m^2 per day (Exelon 2003) and a conversion efficiency of 10 percent are assumed, PV cells would yield an annual electricity production of approximately 110 kWh(e)/m^2 per year in Illinois. At this assumed rate of generation, replacing the 13 billion kWh generated in 2001 by Dresden Units 2 and 3 (DOE/EIA 2003c) would require approximately 120 million m^2 or 120 km^2 (46 mi^2) of PV arrays. Because of the area's low rate of solar radiation, the high technology costs, and the intermittent nature of the resource, solar power is limited to niche applications and is not a feasible baseload alternative to license renewal of Dresden Units 2 and 3.

8.2.5.4 Hydropower

Less than 0.1 percent of Illinois electricity generating capacity and its electricity generation come from hydroelectric power (DOE/EIA 2003a). As stated in Section 8.3.4 of the GEIS, hydropower's percentage of the country's generating capacity is expected to decline because hydroelectric facilities have become difficult to site as a result of public concern over flooding, destruction of natural habitat, and alteration of natural river courses. According to the *U.S. Hydropower Resource Assessment for Illinois* (Idaho National Engineering and Environmental Laboratory 1997), there is only 301 MW of undeveloped hydroelectric capacity in Illinois, far below that required to replace the 1824 MW(e) of Dresden Units 2 and 3.

In the GEIS, the staff estimated that land requirements for hydroelectric power are approximately 400,000 ha (1 million ac or about 1600 mi^2) per 1000 MW(e). This requirement would need to be adjusted proportionally upwards to meet the requirements of Dresden Units 2 and 3. This would result in a large impact on land use, most of which would be out-of-state because of Illinois' limited hydroelectric potential. Furthermore, operation of a hydroelectric facility would alter aquatic habitats above and below the dam, and the alteration would impact existing aquatic species. Due to the relatively low amount of undeveloped hydropower resource in Illinois and the large land-use and related environmental and ecological resource impacts associated with siting hydroelectric facilities large enough to replace Dresden Units 2 and 3, the staff concludes that local hydropower is not a feasible alternative to Dresden Units 2 and 3 OL renewal.

8.2.5.5 Geothermal Energy

Geothermal energy has an average capacity factor of 90 percent and can be used for baseload power where available. However, geothermal technology is not widely used as baseload generation due to the limited geographical availability of the resource and the immature status of the technology (NRC 1996). As illustrated by Figure 8.4 in the GEIS, geothermal plants are most likely to be sited in the western continental United States, Alaska, and Hawaii where hydrothermal reservoirs are prevalent. There is no feasible eastern location for geothermal capacity to serve as an alternative to Dresden Units 2 and 3. The staff concludes geothermal energy is not a feasible alternative to renewal of the Dresden Units 2 and 3 OLs.

8.2.5.6 Wood Waste

A wood-burning facility can provide baseload power and operate with an average annual capacity factor of around 70 to 80 percent and with 20 to 25 percent efficiency (NRC 1996). The fuels required are variable and site-specific. A significant barrier to the use of wood waste to generate electricity is the high delivered fuel cost and the high construction cost per megawatt of generating capacity. The larger wood waste power plants are only 40 to 50 MW(e) in size. Estimates in the GEIS suggest that the overall level of construction impact per megawatt of installed capacity should be approximately the same as that for a coal-fired plant although facilities using wood waste for fuel would be built at a smaller scale (NRC 1996). Like coal-fired plants, wood waste plants require large areas for fuel storage and processing and involve the same type of combustion equipment.

Due to uncertainties associated with obtaining sufficient wood and wood waste to fuel a baseload-generating facility, ecological impacts of large-scale timber cutting (e.g., soil erosion and loss of wildlife habitat), and high inefficiency, the staff has determined that the use of wood waste is not a feasible alternative to renewing the Dresden Units 2 and 3 OLs.

8.2.5.7 Municipal Solid Waste

Municipal waste combustors incinerate the waste and use the resultant heat to generate steam, hot water, or electricity. The combustion process can reduce the volume of waste by up to 90 percent and the weight of the waste by up to 75 percent (EPA 2001). Municipal waste combustors use three basic types of technologies: mass-burn, modular, and refuse-derived fuel (DOE/EIA 2001b). Mass-burning technologies are most commonly used in the United States. This group of technologies processes raw municipal solid waste "as is," with little or no sizing, shredding, or separation before combustion. Because of the need for specialized waste-separation and processing equipment for municipal solid waste, the initial capital costs for municipal solid-waste plants are greater than those for comparable steam turbine technology at wood waste facilities (NRC 1996).

Growth in the municipal waste combustion industry slowed dramatically during the 1990s after rapid growth during the 1980s. The slower growth was due to three primary factors: (1) the Tax Reform Act of 1986, which made capital intensive projects, such as municipal waste combustion facilities, more expensive relative to less capital intensive waste disposal alternatives, such as landfills; (2) the 1994 Supreme Court decision (*C&A Carbone, Inc. v. Town of Clarkstown*), which struck down local flow control ordinances that required waste to be delivered to specific municipal waste combustion facilities rather than landfills that may have had lower fees; and (3) increasingly stringent environmental regulations that increased the capital cost necessary to construct and maintain municipal waste combustion facilities (DOE/EIA 2001b).

Municipal solid-waste combustors generate an ash residue that is buried in landfills. The ash residue is composed of bottom ash and fly ash. (Bottom ash refers to that portion of the unburned waste that falls to the bottom of the grate or furnace. Fly ash represents the small particles that rise from the furnace during the combustion process. Fly ash is generally removed from flue gases using fabric filters and/or scrubbers [DOE/EIA 2001b]).

Currently, there are approximately 102 waste-to-energy plants operating in the United States. These plants generate approximately 2800 MW(e), or an average of approximately 28 MW(e) per plant (Integrated Waste Services Association 2001), much smaller than needed to replace the 1826-MW(e) baseload capacity of Dresden Units 2 and 3. Therefore, the staff concludes that municipal solid-waste combustion would not be a feasible alternative to renewal of the Dresden Units 2 and 3 OLs, particularly at the scale required.

8.2.5.8 Other Biomass-Derived Fuels

In addition to the use of wood waste and municipal solid-waste fuels, there are several other concepts for fueling electric generators, including burning crops, converting crops to a liquid fuel, such as ethanol, and gasifying crops (including wood waste). In the GEIS, the staff stated that none of these technologies has progressed to the point of being competitive on a large scale or of being reliable enough to replace a baseload plant such as Dresden Units 2 and 3 (NRC 1996). For these reasons, such fuels do not offer a feasible alternative to renewal of the Dresden Units 2 and 3 OLs.

8.2.5.9 Fuel Cells

Fuel cells work without combustion and its local environmental side effects. Power is produced electrochemically by passing a hydrogen-rich fuel over an anode and air over a cathode and separating the two with an electrolyte. The only by-products are heat, water, and carbon dioxide. Hydrogen fuel can come from a variety of hydrocarbon resources by subjecting them to steam under pressure. It can also be produced from electricity using electrolysis. Phosphoric acid fuel cells are the most mature fuel-cell technology, but they are only in the initial stages of commercialization. Phosphoric acid fuel cells are generally considered first-generation technology. These are commercially available today at a cost of approximately $4500 per kilowatt of installed capacity (DOE 2002). Higher-temperature, second-generation fuel cells achieve higher fuel-to-electricity and thermal efficiencies. The higher temperatures contribute to improved efficiencies and give the second-generation fuel cells the capability to generate steam for cogeneration and combined-cycle operations.

DOE has a performance target that in 2000 two second-generation fuel-cell technologies using molten carbonate and solid oxide technology, respectively, will be commercially available in sizes of approximately 3 MW at a cost of $1000 to $1500 per kilowatt of installed capacity (DOE 2002). For comparison, the installed capacity cost for a natural-gas-fired, combined-cycle plant is on the order of $500 to $600 per kilowatt (NWPPC 2000). As market acceptance and manufacturing capacity increase, natural-gas-fueled fuel-cell plants in the 50- to 100-MW range are projected to become available (DOE 2002); and natural gas, a potential feedstock for hydrogen, is less expensive than hydrogen. At the present time, however, the use of fuel cells is not economically or technologically competitive with other alternatives for baseload electricity generation. The use of fuels cells is, consequently, not a feasible alternative to renewal of the Dresden Units 2 and 3 OLs.

8.2.5.10 Delayed Retirement

Exelon has no plans for retiring any reactors in its fleet of nuclear plants and expects to need additional capacity in the near future (Exelon 2003). Further, Exelon indicates that any fossil plants slated for retirement tend to utilize less efficient generation and pollution control technologies. With more stringent environmental restrictions, the impact of delaying retirement of a fossil fuel plant to compensate for the loss of electricity from Dresden Units 2 and 3 would be bounded by the impacts for the natural-gas- and coal-fired alternatives, and the impact would potentially be more severe because of the less efficient pollution control equipment from older plants. The staff, therefore, concluded that delayed retirement of other Exelon generating units could not provide a replacement of the power supplied by Dresden Units 2 and 3 and could not be a feasible alternative to Dresden Units 2 and 3 license renewal.

8.2.5.11 Utility-Sponsored Conservation

The utility-sponsored conservation alternative refers to a situation with the following three conditions: (1) Dresden Units 2 and 3 cease to operate; (2) no new generation is brought on line to meet the lost generation; and, (3) the lost generation is instead replaced by more efficient use of electricity. More efficient use would arise from utility-sponsored conservation programs, potentially including energy audits, incentives to install energy-efficient equipment, and informational programs to inform electricity consumers of the benefits of, and possibilities for, electricity conservation. There are two reasons to believe that conservation is not an appropriate alternative to the full energy and the capacity provided by Dresden Units 2 and 3.

The first reason is that the supply of cost-effective energy conservation measures, above and beyond what is already planned, may not be large enough to replace the energy and the capacity of Dresden Units 2 and 3. While it is possible, for example with large incentives, to decrease usage of electricity to meet the lost generation, it is the cost of such measures that ultimately matters. If the costs are high, for example, significantly higher than the costs of coal-fired or natural-gas-fired generation or new nuclear generation, then it is infeasible to consider such measures as a replacement for Dresden Units 2 and 3. Hence, the feasibility of the utility-sponsored conservation alternative hinges largely on the costs of reducing demand, which will increase with the level of demand reduction. The cost of these measures has been under debate for many years. One estimate of utility demand-side management programs in 1992 gave an average cost of $0.040/kWh in 1992 dollars (Eto, et al. 1996), which is more than competitive with new generation. However, it has also been asserted that if such measures are this cost-effective, consumers would undertake them irrespective of utility programs. Therefore, such cost estimates must understate full consumer costs. Regardless, replacing the capacity and the energy from Dresden Units 2 and 3 would require a significant increase in the magnitude of energy conservation in the United States. According to the EIA (DOE/EIA 2001c), the sum of all large electric-utility energy conservation programs up through 2000 saved approximately 54,000 million kWh(e) in 2000. In 2001, Dresden Units 2 and 3 provided approximately 12,500 million kWh of electricity (DOE/EIA 2003c). Hence, to replace the lost generation at Dresden Units 2 and 3 would require an increase of over 25 percent in the total effect of large utility-sponsored conservation since the time that utilities have been reporting these numbers to the EIA. Such an increase would clearly increase the cost of energy conservation by moving beyond the more cost-effective measures.

The second reason that energy-conservation might not be an effective replacement for Dresden Units 2 and 3 involves the changing regulatory structure of the electric-utility industry. Even if it were cost-effective to replace the capacity from Dresden Units 2 and 3 using energy conservation, the regulatory structure in Illinois largely eliminates any incentive for Exelon to do so unilaterally. In a traditional, regulated utility environment, utilities managed all portions of the utility system from generation to transmission to distribution. In this environment, it was feasible for utilities to invest in energy-efficiency programs because they could, in many states, receive reimbursement through changes in their electricity rates. However, Illinois, like many other states, has altered the regulation of its electric utilities so that generation is decoupled from transmission and distribution. Generators sell power and energy as if they were commodities. While Exelon holds both generation and distribution companies, these companies are not linked in the traditional fashion. Exelon's generating organization can sell to any distributor, and Exelon distribution can purchase from any generator. Generation companies will not be reimbursed for energy-efficient investments, making such investments infeasible from the perspective of the stockholders. Exelon's generating organization will not be able to offer competitively priced power if it subsidizes demand reduction alternatives. Any energy-efficiency investments would, therefore, need to come from other sources unassociated with Exelon, for example, state-sponsored energy-efficiency programs.

For the two reasons stated above—that the costs of electricity reduction may be too high to be cost effective in replacing Dresden Units 2 and 3 and that it is out of the purview of Exelon to bring about these reductions—the staff does not consider energy efficiency by itself as a feasible alternative to license renewal.

8.2.6 Combination of Alternatives

Should the OLs not be renewed, the lost generating capacity would be replaced by a combination of more than one (possibly many) alternative, discussed thus far. As discussed in Section 8.2, Dresden Units 2 and 3 have a combined net summer rating of 1826 MW(e).

There are many possible combinations of alternatives. Table 8-8 contains a summary of the environmental impacts of an assumed combination of alternatives consisting of 1100 MW(e) of generation from a combined-cycle facility at the Dresden site, 300 MW(e) of energy conservation, and 429 MW(e) purchased from other generators. The impacts associated with the combined-cycle, natural-gas-fired units are based on the gas-fired-generation impact assumptions discussed in Section 8.2.2, adjusted for the reduced generation capacity. While the demand-side management (DSM) measures would have few environmental impacts, operation of the new natural-gas-fired plant would result in emissions and other environmental impacts. The environmental impacts associated with power purchased from other generators would still occur, but the impacts would be located elsewhere within the region, nation, or another country, as discussed in Section 8.2.4. The environmental impacts associated with purchased power are not shown in Table 8-8. The staff concludes that it is unlikely that the environmental impacts of any reasonable combination of generating and conservation options could be reduced to the level of impacts associated with the renewal of the OLs.

Table 8-8. Summary of Environmental Impacts for an Assumed Combination of Generation and Acquisition Alternatives

	Dresden Site		Alternate Site	
Impact Category	**Impact**	**Comments**	**Impact**	**Comments**
Land Use	SMALL to MODERATE	Almost 30 ha (75 ac) would be needed for power block, offices, roads, and parking areas. Additional impact would occur from construction of an underground gas pipeline.	SMALL to LARGE	Same as for Dresden site with addition of transmission lines.

Table 8-8. (Contd)

	Dresden Site		Alternate Site	
Impact Category	**Impact**	**Comments**	**Impact**	**Comments**
Ecology	SMALL to MODERATE	Would use undeveloped areas at Dresden site. There would be potential for significant habitat loss and fragmentation and reduced productivity and biological diversity.	SMALL to MODERATE	Impact would depend on whether site is previously developed. Factors to consider include location and ecology of site and transmission-line route. There would be potential for habitat loss and fragmentation and reduced productivity and biological diversity.
Water Use and Quality	SMALL	Would use closed-cycle cooling system with natural-gas combined-cycle units. This use would result in a significant reduction in cooling water requirements. Facility would continue very limited groundwater use.	SMALL to MODERATE	Impact would depend on volume of water withdrawal, the constituents of the discharge water, the characteristics of surface water or groundwater source, and the new intake structures required.
Air Quality	MODERATE	Sulfur oxides: 81 MT/yr (89 tons/yr) Nitrogen oxides: 257 MT/yr (284 tons/yr)—Actual impact would depend on emissions offsets Carbon monoxide: 53 MT/yr (59 tons/yr) Particulates: 49 MT/yr (54 tons/yr) PM_{10} Other: CO_2 emissions contribute to global warming	MODERATE	Same emissions as Dresden site although offsets for NO_x would depend on location.

1 **Table 8-8. (Contd)**

		Dresden Site		Alternate Site	
3	**Impact Category**	**Impact**	**Comments**	**Impact**	**Comments**
4	Waste	SMALL	Minimal waste product from fuel combination.	SMALL	Impacts identical to those for Dresden site.
5	Human Health	SMALL	Impacts considered minor.	SMALL	Impacts identical to those for Dresden site.
6	Socioeconomics	SMALL to MODERATE	During construction, impacts would be SMALL. Peak workforce during 2- to 3-year construction period would be significantly smaller than for other steam generation facilities.	SMALL to MODERATE	Construction impacts at alternate site would be similar to those at Dresden site but would depend on whether new site is located near a major metropolitan area.
7			During operation, employment would be decreased from approximately 1000 permanent and contract workers to fewer than 100. All employment impacts would be tempered by proximity to the Chicago metropolitan area. Tax base would be preserved.		Minimal impacts on local tax base.
8			Transportation impacts during operation would be SMALL due to the smaller workforce. Transportation impacts associated with construction workers would be SMALL to MODERATE.		Transportation impacts would be similar to those at Dresden site.

Table 8-8. (Contd)

	Dresden Site		Alternate Site	
Impact Category	**Impact**	**Comments**	**Impact**	**Comments**
Aesthetics	MODERATE	MODERATE aesthetic impact due to impact of plant buildings and structures along with noise from plant operation. Visual impact would be similar to current Dresden Units 2 and 3.	MODERATE to LARGE	Impact would depend on location. Greatest impact likely would be from the new transmission line(s) that would be needed.
Historic and Archaeological Resources	SMALL to MODERATE	Studies would likely be needed to identify, evaluate, and address mitigation of the potential impacts of new plant construction on cultural resources at developed and undeveloped sites.	SMALL to MODERATE	Alternate location would necessitate cultural studies. Studies would likely be needed to identify, evaluate, and address mitigation of the potential impacts of new plant construction on cultural resources at developed and undeveloped sites.
Environmental Justice	SMALL	No environmental pathways or locations were identified that would result in disproportionately high and adverse environmental impacts on minority and low-income populations. Impacts on minority and low-income communities would be similar to those experienced by the population as a whole. Any impacts would be tempered by proximity to the Chicago area.	SMALL to LARGE	Impacts would vary depending on population distribution and characteristics at new site. Impacts on Dresden site would be identical to those in the no-action alternative.

8.3 Summary of Alternatives Considered

The alternative actions, i.e., no-action alternative (discussed in Section 8.1), new generation alternatives (from coal, natural gas, and nuclear discussed in Sections 8.2.1 through 8.2.3, respectively), purchased electrical power (discussed in Section 8.2.4), alternative technologies (discussed in Section 8.2.5), and the combination of alternatives (discussed in Section 8.2.6) were considered in this chapter.

The no-action alternative would result in decommissioning Dresden Units 2 and 3 and would have SMALL environmental impacts for all impact categories with the exception of Socioeconomics. The no-action alternative is a conceptual alternative resulting in a net reduction in electricity generation; there will be no replacement power, and, therefore, no environmental impacts from replacement power. In actual practice, the power lost by not renewing the OLs for Dresden Units 2 and 3 would likely be replaced by (1) DSM and energy conservation, (2) electricity generated from other sources, either by Exelon or by another generator, or (3) some combination of these alternatives. Any replacement power would produce environmental impacts in addition to those discussed under the no-action alternative. Any replacement power would produce additional environmental impacts as discussed in Section 8.2.

For each of the new generation alternatives (coal, natural gas, and nuclear), the environmental impacts would not be less than the impacts of license renewal. For example, the air quality impacts from a coal-fired or natural-gas-fired facility would be greater than the impacts of the continued operation of Dresden Units 2 and 3. The impacts of purchased power would still occur but would occur elsewhere, and the notion of purchased power is confused by changes in the electricity regulatory structure in Illinois. Alternative technologies are not considered feasible at this time, and it is very unlikely that the environmental impacts of any reasonable combination of generation and conservation options could be reduced to the level of impacts associated with the renewal of the OLs for Dresden Units 2 and 3.

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

10 CFR Part 52. Code of Federal Regulations, Title 10, *Energy*, Part 52, "Early Site Permits; Standard Design Certifications; and Combined Licenses for Nuclear Power Plants."

40 CFR Part 50. Code of Federal Regulations, Title 40, *Protection of Environment*, Part 50, "National Primary and Secondary Ambient Air Quality Standards."

40 CFR Part 51. Code of Federal Regulations, Title 40, *Protection of Environment*, Part 51, "Requirements for Preparation, Adoption, and Submittal of Implementation Plans."

40 CFR Part 60. Code of Federal Regulations, Title 40, *Protection of Environment*, Part 60, "Standards of Performance for New Stationary Sources."

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

64 FR 35714. "Regional Haze Regulations, Final Rule." *Federal Register*. Vol. 64, No. 126, pp. 35714-3577. July 1, 1999.

C & A Carbone, Inc. v. Town of Clarkstown, 511 U.S. 383 (U.S. Supreme Court 1994).

Clean Air Act. 42 USC 7491 et seq.

Eto, J., E. Vine, L. Shown, R. Sonnenblick, and C. Payne. 1996. "The Total Cost and Measured Performance of Utility-Sponsored Energy-Efficiency Programs." *The Energy Journal*, Volume 17, Number 1.

Exelon Generation Company, LLC (Exelon). 2003. *Applicant's Environmental Report—Operating License Renewal Stage, Dresden Nuclear Power Station, Units 2 and 3*. Docket Nos. 50-237 and 50-259. Warrenville, Illinois. January.

Gabbard, Alex. 1993. "Coal Combustion: Nuclear Resource or Danger." *Oak Ridge National Laboratory Review*. Oak Ridge National Laboratory: Oak Ridge, Tennessee. Summer/Fall. Accessed at <http://www.ornl.gov/ORNLReview/rev26_34/text/colmain.html> on December 10, 2001.

Idaho National Engineering and Environmental Laboratory (INEEL). 1997. *U.S. Hydropower Resource Assessment for Illinois.* DOE/ID-10430(IL). Idaho Falls, Idaho. Accessed at <http://hydropower.inel.gov/state/il/il.pdf>.

Integrated Waste Services Association. 2001. "About Waste to Energy." Accessed at <http://www.wte.org/waste.html> on February 20, 2002.

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

National Historic Preservation Act (NHPA) of 1966. 16 USC 470, et seq.

Northwest Power Planning Council (NWPPC). 2000. "Northwest Power Supply Adequacy/Reliability Study Phase I Report." Accessed at <http://www.nwcouncil.org/library/2000/2000_4a.pdf> on January 3, 2002.

Resource Conservation and Recovery Act (RCRA) of 1976. 42 USC 6901 et seq.

Tax Reform Act of 1986. USC et seq.

U.S. Department of Energy/Energy Information Administration (DOE/EIA). 2001a. *Annual Energy Outlook 2002 With Projections to 2020.* DOE/EIA-0383(2002). Washington, D.C.

U.S. Department of Energy/Energy Information Administration (DOE/EIA). 2001b. "Renewable Energy 2000: Issues and Trends." DOE/EIA-0628(2000). Washington, D.C.

U.S. Department of Energy/Energy Information Administration (DOE/EIA). 2001c. *Electric Power Annual,* Volume II, DOE/EIA-0348(2000). Washington, D.C.

U.S. Department of Energy/Energy Information Administration (DOE/EIA). 2003a. *State Electricity Profile: Illinois.* Accessed at <http://www.eia.doe.gov/cneaf/electricity/st_profiles/illinois/il.html> on February 14, 2003.

U.S. Department of Energy/Energy Information Administration (DOE/EIA). 2003b. *Electricity Supply and Demand Fact Sheet.* Accessed at <http://www.eia.doe.gov/cneaf/electricity/page/fact_sheets/supply&demand.html>.

U.S. Department of Energy/Energy Information Administration (DOE/EIA). 2003c. *Nuclear Power Pants Operating in the U.S. in 2001.* Accessed at <http://www.eia.doe.gov/cneaf/nuclear/page/at_a_glance/reactors/states.html>.

U.S. Department of Energy (DOE). 2002. "Fuel Cell Technology." Accessed at <http://www.fe.doe.gov/coal_power/fuelcells/index.shtml> on March 25, 2002.

U.S. Department of Energy (DOE). 2003. "Illinois Wind Resource Maps." Accessed at <http://www.eere.energy.gov/windpoweringamerica/where_is_wind_illinois.html#1> on February 9, 2003.

U.S. Environmental Protection Agency (EPA). 1998. "Revision of Standards of Performance for Nitrogen Oxide Emissions from New Fossil-Fuel Fired Steam Generating Units; Revisions to Reporting Requirements for Standards of Performance for New Fossil-Fuel Fired Steam Generating Units, Final Rule." *Federal Register*. Vol. 63, No. 179, pp. 49442-49455. Washington, D.C. September 16.

U.S. Environmental Protection Agency (EPA). 2000a. "Notice of Regulatory Determination on Wastes From the Combustion of Fossil Fuels." *Federal Register*. Vol. 65, No. 99, pp. 32214-32237. Washington, D.C. May 22.

U.S. Environmental Protection Agency (EPA). 2000b. "Regulatory Finding on the Emissions of Hazardous Air Pollutants from Electric Utility Steam Generating Units." *Federal Register*. Vol. 65, No. 245, pp. 79825-79831. Washington, D.C. December 20.

U.S. Environmental Protection Agency (EPA). 2001. "Municipal Solid Waste Disposal." Accessed at <http://www.epa.gov/epaoswer/non_hw/muncpl/disposal.htm> on February 19, 2002. (No longer accessible.)

U.S. Federal Aviation Administration (FAA). 2000. "Obstruction marking and lighting." Advisory Circular AC 70/7460-1K.

U.S. Nuclear Regulatory Commission (NRC). 1988. *Final Generic Impact Statement on Decommissioning of Nuclear Facilities*. NUREG-0586, Washington, D.C.

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.

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). 2001. "NRC Organizes Future Licensing Project Organization." Press Release No. 01_035, March 30, 2001. Accessed at <http://www.nrc.gov/reading-rm/doc-collections/news/2001/01-035.htm>.

U.S. Nuclear Regulatory Commission (NRC). 2002. *Generic Environmental Impact Statement on Decommissioning Nuclear Facilities, Supplement 1 Regarding the Decommissioning of Nuclear Power Reactors*. NUREG-0586, Supplement 1. Washington, D.C.

9.0 Summary and Conclusions

By letter dated January 3, 2003, 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 (Exelon 2003a). If the OLs are renewed, state regulatory agencies and Exelon will ultimately decide whether the plant will continue to operate based on factors such 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 plant must be shut down at or before the expiration of the current OLs, which expire on 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) requires an environmental impact statement (EIS) for major Federal actions that significantly affect the quality of the human environment. 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) states that the EIS prepared at the OL renewal stage will be a supplement to the *Generic Environmental Impact Statement for License Renewal of Nuclear Plants* (GEIS), NUREG-1437, Volumes 1 and 2 (NRC 1996, 1999).[a]

Upon acceptance of the Exelon application, NRC began the environmental review process described in 10 CFR Part 51 by publishing a notice of intent to prepare an EIS and conduct scoping (68 FR 12386-12387 [NRC 2003a]) on March 14, 2003. The staff visited the Dresden site in March 2003 and held public scoping meetings on April 10, 2003, in Morris, Illinois (NRC 2003b). The staff reviewed the Exelon Environmental Report (ER) (Exelon 2003b), compared it to the GEIS, consulted with other agencies, and conducted an independent review of the issues following the guidance set forth in NUREG-1555, Supplement 1, *The Standard Review Plans for Environmental Reviews for Nuclear Power Plants, Supplement 1: Operating License Renewal* (NRC 2000). The staff also considered the public comments received during the scoping process for preparation of the supplemental environmental impact statement (SEIS) for Dresden Units 2 and 3. The public comments received during the scoping process that were considered to be within the scope of the environmental review are provided in Appendix A, Part I, of this SEIS.

(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.

The staff will hold two public meetings in Morris, Illinois in January 2004, to describe the preliminary results of the NRC environmental review and to answer questions to provide members of the public with information to assist them in formulating their comments. When the comment period ends, the staff will consider and disposition all of the comments received. These comments will be addressed in Appendix A, Part II, of the final SEIS.

This draft 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 available for reducing or avoiding adverse effects. It also includes the staff's preliminary recommendation regarding the proposed action.

The NRC 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) decisionmakers.

The goal of the staff's environmental review, as stated 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 decisionmakers 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) and in accordance with § 51.23(b).[a]

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. The staff evaluated 92 environmental issues in the GEIS 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 the 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 staff analysis in the GEIS shows the following:

(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 offsite radiological impacts from the fuel cycle and from high-level waste [HLW] 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.

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[a] The title of 10 CFR 51.23 is "Temporary Storage of Spent Fuel after Cessation of Reactor Operations—Generic Determination of No Significant Environmental Impact."

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 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 also 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. These alternatives were evaluated assuming that the replacement power generation plant is located at some other unspecified location in Illinois.

9.1 Environmental Impacts of the Proposed Action—License Renewal

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 the scoping process, Exelon, 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 Category 1 issues that are 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 and chronic effects from electromagnetic fields. The staff has reviewed the Exelon analysis for each issue and has conducted an independent review of each issue. One Category 2 issue is not applicable because it is related to plant design features or site characteristics not found at Dresden. Four Category 2 issues are not discussed in this draft SEIS because they are specifically related to refurbishment. Exelon (Exelon 2003b) 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 *Final Environmental Statement Related to the Operation of Dresden Nuclear Power Station, Units 2 and 3* (AEC 1973).

Sixteen 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 draft SEIS. For all 16 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, this issue has not been evaluated further. For severe accident mitigation alternatives (SAMAs), the staff concludes that a reasonable, comprehensive effort was made to identify and evaluate SAMAs. Based on its review of the SAMAs for Dresden Units 2 and 3, the staff concludes that none of the candidate SAMAs is cost-beneficial.

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.

The following sections discuss unavoidable adverse impacts, irreversible or irretrievable commitments of resources, and the relationship between local short-term use of the environment and long-term productivity.

9.1.1 Unavoidable Adverse Impacts

An environmental review conducted at the license renewal stage differs from the review conducted in support of a construction permit because the plant is in existence at the license renewal stage and has operated for a number of years. As a result, adverse impacts associated with the initial construction have been avoided, have been mitigated, or have already occurred. The environmental impacts to be evaluated for license renewal are those associated with refurbishment and continued operation during the renewal term.

The adverse impacts of continued operation identified are considered to be of SMALL significance, and none of them warrants implementation of additional mitigation measures. The adverse impacts of likely alternatives if Dresden Units 2 and 3 cease operation at or before the expiration of the current OLS would not be smaller than those associated with continued operation of these units, and they may be greater for some impact categories in some locations.

9.1.2 Irreversible or Irretrievable Resource Commitments

The commitment of resources related to construction and operation of Dresden Units 2 and 3 during the current license period was made when the plants were built. The resource commitments to be considered in this SEIS are associated with continued operation of the plants for an additional 20 years. These resources include materials and equipment required for plant maintenance and operation, the nuclear fuel used by the reactors, and ultimately, permanent offsite storage space for the spent fuel assemblies.

The most significant resource commitments related to operation during the renewal term are related to fuel fabrication and the disposal of low- and high-level radioactive wastes. Dresden Units 2 and 3 replace approximately one-third of the fuel assemblies in each of the two units during every refueling outage, which occurs on a 24-month cycle.

The likely power generation alternatives if Dresden Units 2 and 3 cease operation on or before the expiration of the current OLS would require a commitment of resources for construction of the replacement plants as well as for fuel to run the plants.

9.1.3 Short-Term Use Versus Long-Term Productivity

An initial balance between short-term use and long-term productivity of the environment at the Dresden site was set when the plants were approved and construction began. That balance is now well established. Renewal of the OLS for Dresden Units 2 and 3 and continued operation of the plant will not alter the existing balance but may postpone the availability of the site for other uses. Denial of the application to renew the OLS would lead to shutdown of the plant and would alter the balance in a manner that depends on subsequent uses of the site. For example, the environmental consequences of turning the Dresden site into a park or an industrial facility are quite different.

9.2 Relative Significance of the Environmental Impacts of License Renewal and Alternatives

The proposed action is renewal of the OLS for Dresden Units 2 and 3. Chapter 2 describes the site, the plant, and interactions of the plant with the environment. As noted in Chapter 3, no refurbishment and no refurbishment impacts are expected at Dresden Units 2 and 3. Chapters 4 through 7 discuss environmental issues associated with renewal of the OLS.

Environmental issues associated with the no-action alternative and alternatives involving power generation and use reduction are discussed in Chapter 8.

The significance of the environmental impacts from the proposed action (approval of the application for renewal of the OLS); the no-action alternative (denial of the application, no replacement generation, and decommissioning the two units); alternatives involving alternate power generation by nuclear, coal, or gas generation of power at an unspecified alternate site; and a combination of alternatives are compared in Table 9-1. Use of a closed-cycle cooling system with cooling towers for alternate power generation is assumed for Table 9-1. Once-through cooling impacts would be smaller in some instances, (e.g., land use and ecology) and larger in others (e.g., ecology) because additional land is not required to support cooling towers and associated infrastructure.

Table 9-1 shows that the significance of the environmental effects of the proposed action are SMALL for all impact categories (except for collective offsite radiological impacts from the fuel cycle and from HLW and spent fuel disposal, for which a single significance level was not assigned [see Chapter 6]). The alternative actions, including the no-action alternative, may have environmental effects in at least some impact categories that reach MODERATE or LARGE significance.

9.3 Staff Conclusions and Recommendation

Based on (1) the analysis and findings in the GEIS (NRC 1996, 1999); (2) the ER submitted by Exelon (Exelon 2003b); (3) consultation with Federal, state, and local agencies; (4) the staff's own independent review; and (5) the staff's consideration of public comments, the preliminary recommendation of the 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 decision makers would be unreasonable.

Table 9-1. Summary of Environmental Significance of License Renewal, the No-Action Alternative, and the Alternative Methods of Generation at an Unspecified Alternate Site Using a Closed-Cycle Cooling System

Impact Category	Proposed Action–License Renewal	No-Action Alternative–Denial of Renewal	Coal-Fired Generation	Natural-Gas-Fired Generation	New Nuclear Generation	Combination of Alternatives
Land Use	SMALL	SMALL	MODERATE to LARGE	SMALL to LARGE	MODERATE to LARGE	SMALL to LARGE
Ecology	SMALL	SMALL	MODERATE to LARGE	SMALL to LARGE	MODERATE to LARGE	SMALL to MODERATE
Water Use and Quality	SMALL	SMALL	SMALL to MODERATE	SMALL to MODERATE	SMALL to MODERATE	SMALL to MODERATE
Air Quality	SMALL	SMALL	MODERATE	MODERATE	SMALL	MODERATE
Waste	SMALL	SMALL	MODERATE	SMALL	SMALL	SMALL
Human Health[a]	SMALL	SMALL	SMALL	SMALL	SMALL	SMALL
Socioeconomics	SMALL	LARGE	SMALL to LARGE	SMALL to MODERATE	SMALL to LARGE	SMALL to MODERATE
Aesthetics	SMALL	SMALL	MODERATE to LARGE	MODERATE to LARGE	MODERATE to LARGE	MODERATE to LARGE
Historic and Archaeological Resources	SMALL	SMALL	SMALL to MODERATE	SMALL to MODERATE	SMALL to MODERATE	SMALL to MODERATE
Environmental Justice	SMALL	SMALL	SMALL to LARGE	SMALL to LARGE	SMALL to LARGE	SMALL to LARGE

(a) Excludes collective offsite radiological impacts from the fuel cycle and from HLW and spent fuel disposal, for which single significance levels were not assigned. *See Chapter 6 for details.*

9.4 References

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

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

Exelon Generation Company (Exelon). 2003a. *Application for Renewed Operating Licenses, Dresden Units 2 and 3.* Warrenville, Illinois.

Exelon Generation Company (Exelon). 2003b. Applicant's Environmental Report – Operating License Renewal Stage, Dresden Units 2 and 3, Docket Nos. 50-237 and 50-249. Warrenville, Illinois.

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

U.S. Atomic Energy Commission (AEC). 1973. *Final Environmental Statement Related to the Operation of Dresden Nuclear Power Station, Units 2 and 3, Commonwealth Edison Company.* Docket No. 50-237 and 50-249, Washington, D.C.

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.

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 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). 2003b. *Environmental Impact Statement Scoping Process: Summary Report – Dresden Units 2 and 3, Morris, Illinois.* Washington, D.C.

Appendix A

Comments Received on the Environmental Review

Appendix A

Comments Received on the Environmental Review

Part I - Comments Received during Scoping

On March 14, 2003, the U.S. Nuclear Regulatory Commission (NRC) published a Notice of Intent in the Federal Register (68 FR 12386–12387) to notify the public of the staff's intent to prepare a plant-specific supplement to the *Generic Environmental Impact Statement for License Renewal of Nuclear Plants* (GEIS), NUREG-1437, Volumes 1 and 2, to support the renewal application for the Dresden operating licenses and to conduct scoping. The plant-specific supplement to the GEIS has been prepared in accordance with the National Environmental Policy Act (NEPA), Council on Environmental Quality guidelines, and 10 CFR Part 51. As outlined by NEPA, the NRC initiated the scoping process with the issuance of the Federal Register Notice. The NRC invited the applicant; Federal, state, and local government agencies; local organizations; and individuals to participate in the scoping process by providing oral comments at the scheduled public meetings and/or submitting written suggestions and comments no later than May 12, 2003.

The scoping process included two public scoping meetings, which were held at Jennifer's Garden Banquet & Convention Center in Morris, Illinois, on April 10, 2003. To publicize the meetings, NRC staff issued a press release and posted flyers in nearby areas commonly visited by local residents. Approximately 90 members of the public attended the meetings. Both sessions began with NRC staff members providing a brief overview of the license renewal process and the NEPA process. After the NRC's prepared statements, the meetings were open for public comments. Twenty-one attendees provided either oral or written statements that were recorded and transcribed by a certified court reporter. The meeting transcripts are an attachment to the June 12, 2003, Scoping Meeting Summary. In addition to the comments provided during the public meetings, one e-mail message was received by the NRC in response to the Notice of Intent.

The scoping process provides an opportunity for public participation to identify issues to be addressed in the plant-specific supplement to the GEIS and highlight public concerns and issues. The Notice of Intent to prepare an EIS identified the following objectives of the scoping process:

- Define the proposed action

- Determine the scope of the supplement to the GEIS and identify significant issues to be analyzed in depth

- Identify and eliminate peripheral issues

- Identify any environmental assessments and other environmental impact statements being prepared that are related to the supplement to the GEIS

- Identify other environmental review and consultation requirements

- Indicate the schedule for preparation of the supplement to the GEIS

- Identify any cooperating agencies

- Describe how the supplement t the GEIS will be prepared.

At the conclusion of the scoping period, the NRC staff and its contractors reviewed the transcripts and all written material to identify individual comments. All comments and suggestions received orally during the scoping meetings or in writing were considered. Each set of comments from a given commenter was given a unique identifier (Commenter ID number), so that each set of comments from a commenter could be traced back to the transcript or letter by which the comments were submitted. Several commenters submitted comments through multiple sources (e.g., afternoon and evening scoping meetings).

Table A.1 identifies the individuals who provided comments and the Commenter ID number associated with each person's set(s) of comments. The individuals are listed in the order in which they spoke at the public meeting, and in alphabetical order for the comments received by letter or e-mail.

Specific comments were categorized and consolidated by topic. Comments with similar specific objectives were combined to capture the common essential issues raised by the commenters. The comments fall into one of several general groups. These groups include:

- Specific comments that address environmental issues within the purview of the NRC environmental regulations related to license renewal. These comments address Category 1 or Category 2 issues or issues that were not addressed in the GEIS. They also address alternatives and related federal actions.

- General comments (1) in support of or opposed to nuclear power or license renewal or (2) on the renewal process, the NRC's regulations, and the regulatory process. These comments may or may not be specifically related to the Dresden license renewal application.

- Questions that do not reveal new information.

- Specific comments that address issues that do not fall within or are specifically excluded from the purview of NRC environmental regulations. These comments typically address such issues as the need for power, emergency preparedness, current operational safety issues, and safety issues related to operation during the renewal period.

Table A-1. Individuals Providing Comments during Scoping Comment Period

Commenters ID	Commenter	Affiliation (If Stated)	Comment Source and ADAMS Accession Number[a]
DS-A	Mitch Bailey		Afternoon Scoping Meeting
DS-B	Paul Nelson	Grundy County Board	Afternoon Scoping Meeting
DS-C	John Almer	Grundy County Board	Afternoon Scoping Meeting
DS-D	Danny Bost	Dresden Nuclear Power Station	Afternoon Scoping Meeting
DS-E	Fred Polaski	Exelon	Afternoon Scoping Meeting
DS-F	Tom Osmonson		Afternoon Scoping Meeting
DS-G	Ben Kosiek	International Brotherhood of Boilermakers	Afternoon Scoping Meeting
DS-H	David Balog	Local 1 Boilermakers	Afternoon Scoping Meeting
DS-I	Tom Connor	Local 1 Boilermakers	Afternoon Scoping Meeting
DS J	Cecil Pinder	Local 1 Boilermakers	Afternoon Scoping Meeting
DS-K	Robert Schwartz	Troy Fire Protection District	Afternoon Scoping Meeting
DS-L	Patrick O'Connor	Newberg-Perini/Stone and Webster	Afternoon Scoping Meeting
DS-M	Fred Bourdelais	Grundy County	Afternoon Scoping Meeting
DS-N	Jennifer Shaw		Afternoon Scoping Meeting
DS-O	Frank Schmidt	Grundy County Sheriff's Department	Afternoon Scoping Meeting
DS-P	John Riley		Afternoon Scoping Meeting
DS-Q	Bob Hovey	Dresden Nuclear Power Station	Evening Scoping Meeting
DS-R	Fred Polaski	Exelon	Evening Scoping Meeting
DS-S	Alfie Rodriguez		Evening Scoping Meeting
DS-T	Millie Dyer	Grundy County Board	Evening Scoping Meeting
DS-U	Lee Fatan		Evening Scoping Meeting
DS-V	George Kirn		Evening Scoping Meeting
DS-W	Fred Bevington		Email - Letter (ML03140095)

[a] The afternoon transcripts can be found under accession number ML031500539 and the evening transcripts can be found under accession number ML031500547.

Each comment applicable to this environmental review is summarized in this section. This information, which was extracted from the Dresden Scoping Summary Report dated July 21, 2003, is provided for the convenience of those interested in the scoping comments applicable to this environmental review. The comments that are general or outside the scope of the environmental review for Dresden are not included here. More detail regarding the disposition of general or inapplicable comments can be found in the summary report. The ADAMS accession number for the summary report is ML032030608. This accession number is provided to facilitate access to the document through the Public Electronic Reading Room (ADAMS) <http://www.nrc.gov/reading-rm.html>.

The following pages summarize the comments and suggestions received as part of the scoping process that are applicable to this environmental review and discuss the disposition of the comments and suggestions. The parenthetical identifier after each comment refers to the comment set (Commenter ID) and the comment number for that commenter.

Comments in this section are grouped in the following categories:

1. Socioeconomics
2. Alternatives to License Renewal
3. Environmental Justice

Part I. *Comments Received during Scoping*

1. Socioeconomics

As stated in 10 CFR Part 51, Table B-1, Category 2 socioeconomic issues are:

- Housing
- Public services: public utilities
- Public services, education (refurbishment)
- Offsite land use (refurbishment)
- Offsite land use (license-renewal term)
- Public services, transportation
- Historic and archaeological resources.

Comment: They employ good employees, they make good neighbors, they provide good jobs. The tax dollars provided from the plant, we have a very nice school system, fire district, library district, we're very fortunate (DS-A-1).

Comment: And license renewal is a very important issue for us not only to the people at Dresden Station but also to the people in the communities that surround us. We believe Dresden is a key element of the local economy (DS-D-1).

Comment: I hope that you realize the positive impact that Dresden has as a power generator and as a business in our local communities (DS-D-4).

Comment: Okay, I really think that we need to allow this extension; otherwise by not allowing it, we're going to place an undo hardship on the community (DS-G-2).

Comment: The schools are excellent, the fire and police are all excellent here. I don't live in this area anymore. I used to live in Morris. I live in New Lenox now, but I know in the local area that at least twice a year both the nuclear plants give us a lot of work being a member of Boiler makers Local 1 (DS-J-2).

Comment: There's a whole base of people from around the country that come here and do the outage here. They go to Quad Cities, they come back for Braidwood. So basically this extension would affect not only Illinois but several other states as well (DS-J-3).

Comment: Our lives are supported in NRC granting an extension to the operating license for Dresden Nuclear Station (DS-K-1).

Comment: Now we did most of our work in the narrow band of time to support the refueling outages. But if you look at that in terms of its impact on the local economy, you can see that it's significant. Our employees earn more than twenty-five million dollars working at Dresden Station last year. Most of that money was returned to the local economies of Will and Grundy County (DS-L-2).

Comment: Last year we did an outage in October. We brought in people from twenty-two, pardon me twenty-six different states, most of the people were local but it gives you an idea about the impact that the work that we do here has across the nation (DS-L-4).

Comment: I think that they provide a tremendous economic impact for the county of Grundy (DS-M-4).

Comment: Safe, good fire district, good police district, good library and now I'm sending my kids to that school and I hope they can receive the same benefits that I did. Mostly I'm thankful to the tax dollars that were created at that point, ComEd and today Exelon (DS-P-1).

Comment: License renewal is very important. It's important, not only to the people at Dresden Station, but to the people in the communities that surround us. Dresden is the key element in the local community (DS-Q-1).

Comment: And I hope that you realize the positive impact that Dresden has had as a generator of electricity and as a good neighbor for our local communities (DS-Q-6).

Comment: During all that time, I've noticed it's been nothing but a great, a big asset to the community. Not only to the community but to the county and to the State. Dresden itself fulfills the need for employment (DS-S-2).

Comment: I was out of the county for a while, but I know how great of an impact it does have on the county (DS-T-2).

Response: The comments are noted. Socioeconomic issues specific to the plant are Category 2 issues and will be addressed in Chapter 4 of the SEIS.

2. Alternatives to License Renewal

Comment: And we also had to take a look in our review at what would happen if the license for Dresden is not renewed and that generation, at 1800 megawatts, was replaced with other types of electricity generation, and concluded that any other means would have more of an impact on the environment than continuing to operate Dresden for another twenty years (DS-E-2).

Response: The comment is noted. Impacts from reasonable alternatives for the Dresden Nuclear Power Station license renewal will be evaluated in Section 8 of the SEIS.

3. Environmental Justice

Comment: As a resident born in Morris and one that has lived my whole life within a ten mile radius of the plant, I feel that I've been witness to what I believe is environmental injustice. I believe that part of the reason that this community has so many plants, nuclear plants, chemical plants, coal plants, is because of the economic class of the community (DS-N-2).

Response: The comment is noted. Environmental justice is an issue specific to the plant and will be addressed in Chapter 4 of the SEIS.

Appendix B

Contributors to the Supplement

Appendix B

Contributors to the Supplement

The overall responsibility for the preparation of this supplement was assigned to the Office of Nuclear Reactor Regulation, U.S. Nuclear Regulatory Commission (NRC). The statement was prepared by members of the Office of Nuclear Reactor Regulation with assistance from other NRC organizations, and the Lawrence Livermore National Laboratory. Representatives from Argonne National Laboratory, Los Alamos National Laboratory, Pacific Northwest National Laboratory, Energy Research Incorporated, and the Information Systems Laboratory also participated in this review.

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	NUCLEAR REGULATORY COMMISSION	
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John Tappert	Nuclear Reactor Regulation	Section Chief
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Jack Cushing	Nuclear Reactor Regulation	Land Use, Historic and Archaeological Impacts
Cristina Guerrero	Nuclear Reactor Regulation	General Scientist
Robert Palla	Nuclear Reactor Regulation	Severe Accident Mitigation Alternatives
Richard Emch	Nuclear Reactor Regulation	Project Management, Severe Accident Mitigation Alternatives, Radiation Protection
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Bruce Mrowca	Severe Accident Mitigation Alternatives

[a] Lawrence Livermore National Laboratory is operated for the U.S. Department of Energy by the University of California.

[b] Argonne National Laboratory is operated for the U.S. Department of Energy by the University of Chicago.

[c] Pacific Northwest National Laboratory is operated for the U.S. Department of Energy by Battelle Memorial Institute.

[d] Los Alamos National Laboratory is operated for the U.S. Department of Energy by the University of California.

Appendix C

Chronology of NRC Staff Environmental Review Correspondence Related to Exelon Generation Company, LLC's Application for License Renewal of Dresden Nuclear Power Station, Units 2 and 3

Appendix C

Chronology of NRC Staff Environmental Review Correspondence Related to Exelon Generation, LLC's Application for License Renewal of Dresden Nuclear Power Station, Units 2 and 3

This appendix contains a chronological listing of correspondence between the Nuclear Regulatory Commission (NRC) and the Exelon Generation Company, LLC (Exelon) and other correspondence related to the NRC staff's environmental review, under 10 CFR Part 51, of Exelon's application for renewal of the Dresden Nuclear Power Station, Units 2 and 3, operating licenses. All documents, with the exception of those containing proprietary information, have been placed in the Commission's Public Document Room, at One White Flint North, 11555 Rockville Pike (first floor), Rockville, MD, and are available electronically from the Public Electronic Reading Room found on the Internet at the following web address: http://www.nrc.gov/NRC/ADAMS/index.html. From this site, the public can gain access to the NRC's Agencywide Document Access and Management Systems (ADAMS), which provides text and image files of NRC's public documents in the Publicly Available Records (PARS) component of ADAMS. The ADAMS accession numbers for each document are included below.

January 3, 2003	Letter from Mr. Jeffrey A. Benjamin, Exelon, to NRC submitting the application for the renewal of the operating license for Dresden Nuclear Power Station, Units 2 and 3 (Accession No. ML030090203)
January 6, 2003	Comment letter from Dick Kopczick, Mayor, City of Morris, Illinois, to NRC regarding the license renewal of Dresden Nuclear Power Station, Units 2 and 3 (Accession No. ML030210119)
January 10, 2003	NRC Press Release No. 03-007, "NRC Announces The Availability of License Renewal Application for Dresden, Quad Cities Nuclear Power Plants" (Accession No. ML030100360)
January 24, 2003	Letter from NRC staff to Mr. John L. Skolds, Exelon, regarding the receipt and availability of the Dresden and Quad Cities license renewal applications (Accession N2o. ML030240603)

February 24, 2003	Letter from NRC staff to Ms. Jolene Franciskovich, Coal City Public Library District, Coal City, IL, concerning the maintenance of reference material for public access related to the Dresden Nuclear Power Station, Units 2 and 3 license renewal environmental review (Accession No. ML030630385)
February 24, 2003	NRC staff letter to Ms. Deborah Steffes, Morris Area Public Library, Morris, IL, regarding the maintenance of reference material for public access related to the Dresden Nuclear Power Station, Units 2 and 3 license renewal environmental review (Accession No. ML030630416)
February 26, 2003	Letter from NRC staff to Mr. John L. Skolds, Exelon Generation Company, LLC, forwarding determination of acceptability and sufficiency of docketing, proposed review schedule, and opportunity for a hearing regarding an application for license renewal of Dresden Nuclear Power Station, Units 2 and 3 (Accession No. ML030570654)
March 6, 2003	Letter from NRC staff to Mr. John L. Skolds, Exelon Generation Company, LLC, Notice of Intent to prepare an environmental impact statement and conduct scoping process for license renewal of Dresden Nuclear Station, Units 2 and 3 (Accession No. ML030660306)
March 11, 2003	NRC staff letter to the Honorable Kenneth Meshigaud, Chairperson, Hannahville Indian Community, inviting participation in the environmental review scoping process (Accession No. ML030710302)
March 11, 2003	Letter from NRC staff to Mr. Richard Nelson, United States Fish and Wildlife Service, requesting information relevant to the NRC environmental review (Accession No. ML030710635)
March 11, 2003	NRC staff letter to the Honorable Juan Garcan Jr., Chairperson, Kickapoo Traditional Tribe of Texas, inviting participation in the environmental review scoping process (Accession No. ML030710348)
March 12, 2003	NRC staff letter to the Honorable Harold Frank, Chairperson, Forest County Potawatomi Community, Wisconsin, inviting participation in the environmental review scoping process (Accession No. ML030730705)

March 12, 2003	NRC staff letter to the Honorable Gil Holliday, Chairperson, Huron Potawatomi, Inc., Michigan, inviting participation in the environmental review scoping process (Accession No. ML030730061)
March 12, 2003	NRC staff letter to the Honorable David K. Sprague, Chairperson, Match-E-Be-Nash-She-Wish Band of Potawatomi Indians of Michigan, inviting participation in the environmental review scoping process (Accession No. ML030730768)
March 12, 2003	NRC staff letter to the Honorable John Miller, Chairperson, Match-E-Be-Nash-She-Wish Band of Potawatomi Indians of Michigan, inviting participation in the environmental review scoping process (Accession No. ML030730773)
March 12, 2003	NRC staff letter to the Honorable John A. Barrett, Chairperson, Citizen Potawatomi Nation, Oklahoma, inviting participation in the environmental review scoping process (Accession No. ML030730343)
March 12, 2003	NRC staff letter to the Honorable Zachariah Pahmahmie, Chairperson, Prairie Band of Potawatomi Nation, Kansas, inviting participation in the environmental review scoping process (Accession No. ML030720625)
March 12, 2003	NRC staff letter to the Honorable Lisa Waukau, Chairperson, Menominee Indian Tribe of Wisconsin, inviting participation in the environmental review scoping process (Accession No. ML030730444)
March 12, 2003	NRC staff letter to the Honorable Danny Kaskaske, Chairperson, Kickapoo Tribe of Oklahoma, inviting participation in the environmental review scoping process (Accession No. ML030730249)
March 12, 2003	NRC staff letter to the Honorable Steve Cadue, Chairperson, Kickapoo Tribe of Indians of the Kickapoo Reservation in Kansas, inviting participation in the environmental review scoping process (Accession No. ML030730381)
March 12, 2003	NRC staff letter to the Honorable John Blackhawk, Chairperson, Winnebago Tribe of Nebraska, inviting participation in the environmental review scoping process (Accession No. ML030730744)

March 12, 2003	NRC staff letter to the Honorable Troy Swallow, President, Ho-Chunk Nation of Wisconsin, inviting participation in the environmental review scoping process (Accession No. ML030720621)
March 21, 2003	Notice of public meeting for April 10, 2003, public meetings in Morris, IL to discuss environmental scoping process for the Dresden Nuclear Power Station, Units 2 and 3 (Accession No. ML030790593)
April 17, 2003	Letter from NRC staff to Mr. John L. Skolds, Exelon Generation Company, LLC, Request for Additional Information - environmental review of license renewal applications for Dresden Nuclear Power Station, Units 2 and 3 (Accession No. ML031070572)
May 1, 2003	E-mail to DresdenEIS@nrc.gov from Fred Bevington requesting information regarding the environmental review scoping process meeting (Accession No. ML031400095)
May 2, 2003	Letter from NRC staff to Mr. John L. Skolds, Exelon Generation Company, LLC, Revised Request for Additional Information - environmental review of license renewal applications for Dresden Nuclear Power Station, Units 2 and 3 (Accession No. ML031220535)
May 8, 2003	Letter from Mr. Stephen K. Davis, Illinois Department of Natural Resources, providing comments for the environmental scoping process (Accession No. ML031420027)
May 14, 2003	E-mail from Mr. William D. Maher, Exelon Generation Company, LLC, providing information requested regarding land use classifications (Accession No. ML031970776)
May 21, 2003	Letter from Mr. David N. Given, United States Department of the Interior, National Park Service, providing comments for the environmental scoping process (Accession No. ML031600183)
May 28, 2003	Letter from Mr. Patrick R. Simpson, Exelon Generation Company, LLC, responding to NRC Request for Additional Information dated May 2, 2003, related to the environmental review of license renewal applications of Dresden Nuclear Power Station, Units 2 and 3 (Accession No. ML031540677)

May 30, 2003	Letter from NRC staff to Mr. John L. Skolds, Exelon Generation Company, LLC, Request for Additional Information related to the staff's review of the license renewal environmental report for the Dresden Nuclear Power Station, Units 2 and 3 (Accession No. ML031530067)
June 12, 2003	Summary of public meetings held on April 10, 2003, in Morris, IL to discuss environmental scoping process for the Dresden Nuclear Power Station, Units 2 and 3 (Accession No. ML030790593)
June 19, 2003	E-mail from Mr. William D. Maher, Exelon Generation Company, LLC, providing revised pages to the environmental report, concerning the scope of transmission lines reviewed for shock (Accession No. ML032030221)
June 24, 2003	Letter to the NRC staff from Mr. John Skermont and Mr. Robert Schwartz, providing statements in support of license renewal from union members (ML031820438)
July 1, 2003	NRC staff letter to Mr. Maynard Crossland, Director, Illinois Historic Preservation Agency, providing information regarding the environmental review being conducted for the Dresden license renewal application and requesting comment (ML031820776)
July 3, 2003	NRC staff letter to Mr. John Skermont, International Brotherhood of Boilermakers, Iron Ship Builders, Blacksmiths, Forgers and Helpers responding to the June 24, 2003, letter (ML031890768)
July 8, 2003	E-mail from Mr. William D. Maher, Exelon Generation Company, LLC, forwarding environmental data requested by NRC and Exelon from the Illinois Department of Natural Resources (Accession No. ML032030211)
July 16, 2003	E-mail from Mr. Donald E. Vancover, Exelon Generation Company, LLC, providing draft Severe Accident Mitigation Alternatives Request for Additional Information responses (Accession No. ML032030227)
July 21, 2003	Letter from NRC staff to Mr. Jeffery A. Benjamin, Exelon Generation Company, LLC, providing a copy of the Scoping Summary Report associated with the license renewal environmental review (Accession No. ML032030608)

July 23, 2003	Letter from Mr. Patrick R. Simpson, Exelon Generation Company, LLC, responding to the NRC Request for Additional Information dated May 30, 2003, related to the environmental review of license renewal applications of Dresden Nuclear Power Station, Units 2 and 3 (Accession No. ML032060390)
August 11, 2003	Letter to Mr. Richard Nelson, United States Fish and Wildlife Service, requesting comments regarding the expanded scope of the Dresden Nuclear Power Station, Units 2 and 3 environmental scoping process (Accession No. ML032250248)
September 15, 2003	Letter form Mr. Richard Nelson, United States Fish and Wildlife Service, providing a response to the March 11 and August 11, 2003, NRC staff letters requesting information on threatened or endangered species in the vicinity of the Dresden site (ML032730720)
October 27, 2003	Email from Mr. William Maher, Exelon Generation Company, LLC, providing confirmation of completion of an Exelon procedure modification regarding the identification of potential historic or archaeological sites (ML033090462)

Appendix D

Organizations Contacted

Appendix D

Organizations Contacted

During the course of the staff's independent review of environmental impacts from operations during the renewal term, the following Federal, state, regional, and local agencies were contacted:

City of Morris, IL

Grungy County Economic Development Council, Morris, IL

Grungy County Planning and Zoning, Morris, IL

Grungy County Tax Assessor, Morris, IL

Illinois and Michigan Canal National Heritage Corridor Commission

Illinois Environmental Protection Agency

Illinois Historic Preservation Agency

Illinois Department of Natural Resources

Hannahville Indian Community

Kickapoo Tribe

- Kickapoo Tribe of Oklahoma
- Kickapoo Tribe of Indians of the Kickapoo Reservation in Kansas
- Kickapoo Traditional Tribe of Texas

Menominee Tribe

- Menominee Indian Tribe of Wisconsin

National Park Service, U.S. Department of the Interior

Potawatomi Tribe

- Forest County Potawatomi Community, WI
- Huron Potawatomi, Inc., Michigan
- Match-E-Be-Nash-She-Wish Band, Potawatomi Indians of Michigan
- Potawatomi Tribe, Oklahoma
- Prairie Band, Potawatomi Nation, Kansas

State Historical Society of Iowa

The Salvation Army, Will County, Joliet, IL

The United Way, Grungy County, Morris, IL
U.S. Fish and Wildlife Service
U.S. Forest Service, Midewin National Tall Grass Prairie
Will County Center for Economic Development, Joliet, IL
Will County Executive Officer, Joliet, IL
Will County Planning Division, Joliet, IL
Winnebago Tribe
- Winnebago Tribe of Nebraska
- Ho-Chunk Nation of Wisconsin

Appendix E

Exelon Generation Company, LLC's Compliance Status and Consultation Correspondence

Appendix E

Exelon Generation Company, LLC's Compliance Status and Consultation Correspondence

Correspondence issued and received during the evaluation process of the application for renewal of the operating license for Dresden Nuclear Power Station, Units 2 and 3 (Dresden) is identified in Table E-1. Copies of the correspondence are included at the end of this appendix.

The licenses, permits, consultations, and other approvals obtained from Federal, State, regional, and local authorities for Dresden are listed in Table E-2.

Table E-1. Consultation Correspondence

Source	Recipient	Date of Letter
U.S. Nuclear Regulatory Commission (P. T. Kuo)	U.S. Fish and Wildlife Service (R. C. Nelson)	March 11, 2003
Illinois Department of Natural Resources (S. K. Davis)	U.S. Nuclear Regulatory Commission	May 8, 2003
National Park Service (D. N. Givin)	U.S. Nuclear Regulatory Commission	May 21, 2003
U.S. Nuclear Regulatory Commission (P. T. Kuo)	Illinois Historic Preservation Agency (M. Crossland)	July 1, 2003
U.S. Nuclear Regulatory Commission (P. T. Kuo)	U.S. Fish and Wildlife Service (R. Nelson)	August 11, 2003
U.S. Fish and Wildlife Service (R. C. Nelson)	U.S. Nuclear Regulatory Commission (L.L. Wheeler)	September 15, 2003

Table E-2. Federal, State, Local, and Regional Licenses, Permits, Consultations, and Other Approvals for Current Dresden Nuclear Power Station, Units 2 and 3 Operation

Agency	Authority	Description	Number	Issue Date	Expiration Date	Remarks
NRC						
10 CFR Part 50	Operating license, Dresden Unit 2	DPR -19	December 22, 1969	December 22, 2009	Authorizes operation of Unit 2	
NRC	10 CFR Part 50	Operating license, Dresden Unit 3	DPR - 25	January 12, 1971	January 12, 2011	Authorizes operation of Unit 3
FWS	Section 7 of the Endangered Species Act (16 USC 1536)	Consultation	NA		NA	Requires a Federal agency to consult with FWS regarding whether a proposed action will affect endangered or threatened species
Illinois Historic Preservation Agency	National Historic Preservation Act, Section 106	Consultation	NA		NA	The National Historic Preservation Act requires Federal agencies to take into account the effect of any undertaking on any district, site, building, structure, or object that is included in or eligible for inclusion in the National Register of Historic Places.
IEPA	Illinois Environmental Protection Act (Title 35 IAC, Subtitle C, Ch.1)	National Pollution Discharge Elimination System Permit	IL0002224	October 6, 2000	October 31, 2005	Permit for discharge of wastewater and once-through cooling water to the Mississippi. Section 1.E.15 of the permit states that the permit constitutes certification of compliance with §401 of the Federal Water Pollution Control Act (Clean Water Act).

Table E-2 (Contd)

Agency	Authority	Description	Number	Issue Date	Expiration Date	Remarks
IEPA	Rivers, Lakes, and Streams Act (615 ILCS)	Class 1 Dam Permit	DS 2000233	December 19, 2000	December 19, 2002	The permit authorizes operation and maintenance of the cooling pond and appurtenances.
IEPA	IRS Ch. 111-1/2 Sec. 1039	Federally-enforceable Air Operating Permit	063806AAC	April 19, 2001	April 19, 2006	The permit authorizes emissions from diesel emergency generators, boilers, and miscellaneous emissions units and activities.
IEPA	IRS Ch. 111-1/2, Section 1039	Open Burning permit	ID# 04030 Location ID# 161807AAB	February 16, 2002	February 16, 2003	Open burning for emergency response fire fighter training

CFR = Code of Federal Regulations
FWS= U.S. Fish and Wildlife Service
NRC= U.S. Nuclear Regulatory Commission
EPA = U.S. Environmental Protection Agency
IEPA = Illinois Environmental Protection Agency
NMFS = National Marine Fisheries Service
USC = United States Code

Appendix E

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

March 11, 2003

Mr. Rick Nelson
Field Supervisor
U.S. Fish and Wildlife Service
4469 48th Avenue Court
Rock Island, IL 61201

SUBJECT: REQUEST FOR COMMENTS CONCERNING DRESDEN NUCLEAR POWER STATION APPLICATION FOR OPERATING LICENSE RENEWAL

Dear Mr. Nelson:

The U.S. Nuclear Regulatory Commission (NRC) is reviewing an application for the renewal of the operating license for the Dresden Nuclear Power Station, Units 2 and 3 (DNPS), located on the south shoreline of the Illinois River, at the confluence of the Des Plaines and Kankakee Rivers at river mile 272.4. As part of the review of the license renewal application, the NRC is preparing a Supplemental Environmental Impact Statement (SEIS) under the provision of the National Environmental Policy Act (NEPA), which includes analyses of pertinent environmental issues, including endangered or threatened species and impacts to fish and wildlife. This letter is being submitted under the provisions of the Endangered Species Act and the Fish and Wildlife Coordination Act.

The proposed action would include the use and continued maintenance of existing facilities and transmission lines and would not result in any new construction or disturbance. DNPS is located in Grundy County, Illinois. In total, for the specific purpose of connecting DNPS to the regional transmission system, there are approximately 200 miles of corridor that occupy approximately 5,500 acres of land. As shown in the enclosed transmission line maps, two 1.1-mile lines, located on Station property, connect DNPS to an existing line between the Pontiac and Electric Junction substations. The Electric Junction lines runs east and then turns north, crossing the Illinois River. The lines run for 31.1-miles. The two Goodings Grove lines cross the Kankakee River south of DNPS and then run northeast and terminate at the Elwood Substation. The Goodings Grove corridor is 12.4-miles long. Pontiac Mid-Point is a 43.3-mile line that runs in a southwesterly direction and terminates south of Pontiac, Illinois. Powerton is a 104.5-mile line that crosses the Kankakee River twice before heading southwest and terminating near the Illinois River. The last line connecting DNPS to the regional system is the Collins Station line that extends 11.8-miles with a 150-foot right-of-way. This line crosses the Illinois River along the Electric Junction corridor and then runs west for approximately 4-miles before crossing back over the Illinois River to the Collins Station.

DNPS operates in the indirect open-cycle mode from June 15 through September 30. After circulating through the condensers, water is discharged into a 2-mile-long cooling canal to remove waste heat from the facility. As water travels through the hot canal, it may be withdrawn and circulated through a series of 36 mechanical draft cooling towers as needed to maintain water temperatures, and is returned to the canal at a cooler temperature. The water is then discharged to the Illinois River. The Illinois River in the vicinity of the plant is considered part of the aquatic environment of interest.

R. Nelson -2-

The other mode of plant operation is closed-cycle. DNPS can operate in closed-cycle at any time, but normally operates in this mode from October 1 through June 14, when the mechanical draft towers are typically not utilized. In this mode, water is circulated through the condensers for Units 2 and 3, passed through the hot canal, and then routed back to the intake structure via the flow regulating station gates. As cooling water system schematic diagram is enclosed.

To support the environmental impact statement preparation process and to ensure compliance with Section 7 of the Endangered Species Act, the NRC requests a list of species and information on protected, proposed, and candidate species and critical habitat that may be in the vicinity of DNPS and its associated transmission lines. In addition, please provide any information you consider appropriate under the provisions of the Fish and Wildlife Coordination Act.

We plan to hold a public NEPA scoping meeting on April 10, 2003, at the Jennifer's Garden Banquet and Convention Center, 555 West Gore Road, Morris, Illinois. You and your staff are invited to attend. Your office will receive a copy of the draft SEIS along with a request for comments. The anticipated publication date for the draft SEIS is December 2003.

If you have any questions concerning the NRC staff review of the license renewal application, please contact Mr. Louis Wheeler, Senior Project Manager, at (301) 415-1444 or by email at DXW@nrc.gov.

Sincerely,
/RA/
Pao-Tsin Kuo, Program Director
License Renewal and Environmental Impacts
Division of Regulatory Improvement Programs
Office of Nuclear Reactor Regulation

Docket Nos.: 50-237 and 50-249

Enclosures: DNPS Transmission Line Maps (2)
DNPS Cooling Water System Schematic Diagram

cc w/encls.: See next page

Dresden Nuclear Power Units 2 and 3

cc:

Site Vice President - Dresden Nuclear Power Station
Exelon Generation Company, LLC
6500 N. Dresden Road
Morris, IL 60450-9765

Dresden Nuclear Power Station Plant Manager
Exelon Generation Company, LLC
6500 N. Dresden Road
Morris, IL 60450-9765

Regulatory Assurance Manager - Dresden
Exelon Generation Company, LLC
6500 N. Dresden Road
Morris, IL 60450-9765

U.S. Nuclear Regulatory Commission
Dresden Resident Inspectors Office
6500 N. Dresden Road
Morris, IL 60450-9766

Chairman
Grundy County Board
Administration Building
1320 Union Street
Morris, IL 60450

Regional Administrator
U.S. NRC, Region III
801 Warrenville Road
Lisle, IL 60532-4351

Illinois Department of Nuclear Safety
Office of Nuclear Facility Safety
1035 Outer Park Drive
Springfield, IL 62704

Document Control Desk-Licensing
Exelon Generation Company, LLC
4300 Winfield Road
Warrenville, IL 60555

Senior Vice President, Nuclear Services
Exelon Generation Company, LLC
4300 Winfield Road
Warrenville, IL 60555

Vice President
Mid-West Regional Operating Group
Exelon Generation Company, LLC
4300 Winfield Road
Warrenville, IL 60555

Senior Vice President
Mid-West Regional Operating Group
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Director - Licensing
Mid-West Regional Operating Group
Exelon Generation Company, LLC
4300 Winfield Road
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Senior Counsel, Nuclear
Mid-West Regional Operating Group
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Manager Licensing - Dresden and Quad Cities
Exelon Generation Company, LLC
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Mr. John L. Skolds, President
Exelon Nuclear
Exelon Generation Company, LLC
4300 Winfield Road
Warrenville, IL 60555

Manager Licensing - Dresden and Quad Cities
Exelon Generation Company, LLC
4300 Winfield Road
Warrenville, IL 60555

Ms. Jolene Franciskovich
Director
Coal City Public Library District
85 North Garfield Street
Coal City, IL 60416

Ms. Deborah Steffes
Reference Manager
Morris Area Public Library
604 West Liberty Street
Morris, IL 60450

William D. Maher
License Renewal Environmental Lead
Exelon Nuclear
200 Exelon Way
Kennett Square, PA 19348

Frederick W. Polaski
License Renewal Manager
Exelon Nuclear
200 Exelon Way
Kennett Square, PA 19348

Albert A. Fulvio
Exelon Nuclear
200 Exelon Way
Kennett Square, PA 19348

Appendix E – Environmental Report
Section 3 Figures

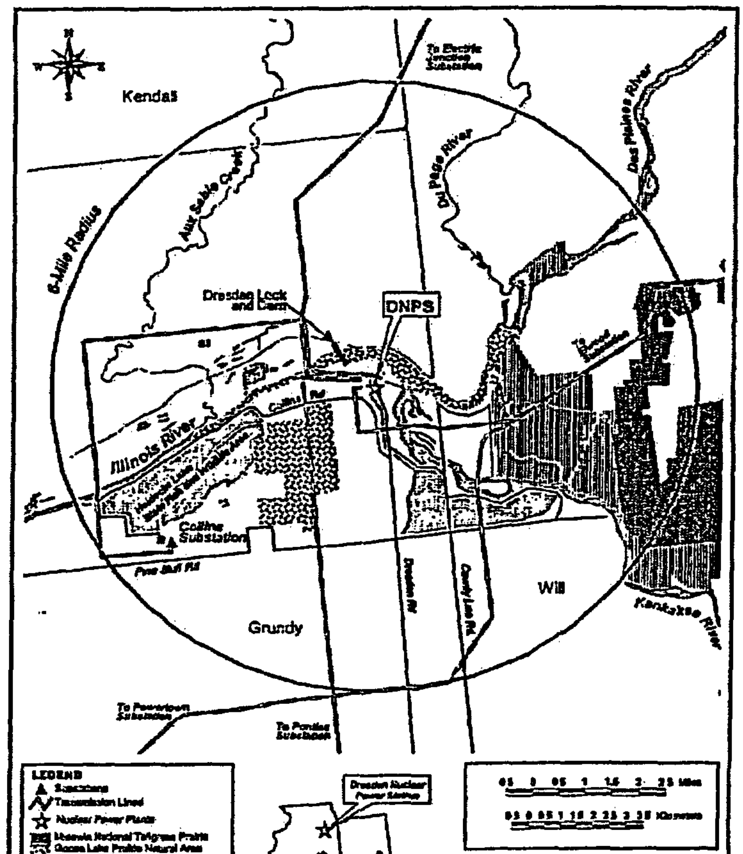

FIGURE 3-4
Detailed Transmission Line Map

Page E.3-16 *Dresden License Renewal Application*

Illinois
Department of
Natural Resources

http://dnr.state.il.us

One Natural Resources Way • Springfield, Illinois 62702-1271

Rod R. Blagojevich, Governor

May 8, 2003

3/14/03
68FR12385
(4)

NRC Docket Nos. 50-254 and 50-265
50-238 and 50-249

RECEIVED
2003 MAY 23 AM 9:19
Rules and Directives Branch
USNRC

Chief of Rules and Directives Branch
Division of Administrative Services
Mailstop T-6D59
United States Nuclear Regulatory Commission
Washington, DC 20555

RE: **Dresden Nuclear Power Station, Units 2 & 3 License Renewal**
Grundy County - License Nos. DPR-19 and DPR-25
Quad Cities Nuclear Power Station, Units 1 & 2 License Renewal
Rock Island County - License Nos. DPR-29 and DPR-30

Endangered Species Consultation Program
Natural Heritage Database Review #'s: 0201014 & 0201015

To Whom This Concerns:

Thank you for submitting the January 3, 2003 operating license renewal applications regarding the Quad Cities Nuclear Power Station, Units 1 & 2 and Dresden Nuclear Power Station, Units 2 & 3 for consultation in accordance with the *Illinois Endangered Species Protection Act* [520 ILCS 10/11], the *Illinois Natural Areas Preservation Act* [525 ILCS 30/17], and Title 17 *Illinois Administrative Code* Part 1075. The Natural Heritage Database identified the presence of State protected resources within the vicinity of portions of the existing transmission lines associated with each power station. Adverse impacts to State protected resources do not appear likely. Exelon has been advised to inform the Department if new transmission lines are proposed in the future.

The Department thoroughly discussed and evaluated the operating license renewal applications for each of the subject power stations. It is the Department's biological opinion that continued operation of the power stations, as described and detailed in the operating license applications, will not adversely affect State protected resources or existing environmental conditions in the immediate vicinity of the Dresden and Quad Cities nuclear power stations.

Consultation is limited to State-listed threatened or endangered species, Illinois Natural Areas and dedicated Land & Water Reserves and Nature Preserves; it does not entail a comprehensive environmental impact assessment. The Department may raise concerns through other venues regarding potential impacts to other natural resources as it deems appropriate.

E-RIDS=ADM-03
Add: D.K. Wills (DXW)
Template=ADM-013

NRC Docket Nos. 50-254 and 50-265
50-236 and 50-249

Thank you for the opportunity to comment on these nuclear power station operating license renewal applications. Should you have any questions, please do not hesitate to contact me.

Sincerely,

Stephen K. Davis, P.G.
Chief
Division of Natural Resource Review and Coordination
Office of Realty and Environmental Planning

cc: Division File
M. Conlin
T. Hickman
R. Pietruszka
D. Wheeler, NRC
K. Jury, Exelon

United States Department of the Interior

NATIONAL PARK SERVICE

MIDWEST REGION
1709 JACKSON STREET
OMAHA, NEBRASKA 68102-2571

IN REPLY REFER TO:

MAY 21 2003

3/14/03
68FR12386
(3)

ER-03/0276

Chief, Rules and Directives Branch
Division of Administrative Services
Office of Administration
Mail Stop T-6 D 59
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555-0001

Ref: Docket 50-237 and 50-249

Dear Chief:

Our office recently sent you comments concerning the review of the notice of intent to prepare an environmental impact statement for the Exelon Generation Company, LLC, Quad Cities nuclear power station, units 1 and 2, Rock Island County, Illinois, published in the *Federal Register*, on March 14, (page 12385). However, we intended those comments to be directed to the Exelon Generation Company, LLC, Dresden Nuclear Power Station, units 2 and 3, in Grundy County, Illinois, with the docket numbers listed above. We apologize for this confusion but we would like to offer again our comments that concern specifically the Dresden facilities.

This project is located within the Illinois and Michigan Canal National Heritage Corridor (ILMI), an affiliated area of the National Park Service. Please include ILMI in all related project correspondences. If you have any questions, please contact Phyllis Ellin, Executive Director of ILMI, at 201 W. 10th St., #1-SE, Lockport, Illinois, 60441, telephone 815-588-6040.

We again apologize for the confusion and appreciate the opportunity to provide these late comments.

Sincerely,

David N. Given

David N. Given
Acting Regional Director

E-RFDS=ADM-03
Call = L. Wheeler (DXW)

Template=ADM-013

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

July 1, 2003

Mr. Maynard Crossland
Director
Illinois Historic Preservation Agency
Preservation Services Division
One Old State Capitol Plaza
Springfield, IL 62701

SUBJECT: DRESDEN NUCLEAR POWER STATION LICENSE RENEWAL REVIEW AND (IHPA LOG NO. 0201160019WGR)

Dear Mr. Crossland:

The U.S. Nuclear Regulatory Commission (NRC) staff is reviewing an application to renew the operating licenses for Dresden Nuclear Power Station, Units 2 and 3 (DNPS), which is located in Goose Lake Township, Grundy County, Illinois. DNPS is owned and operated by Exelon Generation Company, LLC (Exelon). The application for renewal was submitted by Exelon on January 3, 2003, pursuant to NRC requirements at Title 10 of the *Code of Federal Regulations* Part 54 (10 CFR Part 54). The NRC has established that, as part of the staff review of any nuclear power plant license renewal action, a site-specific Supplemental Environmental Impact Statement (SEIS) to its "Generic Environmental Impact Statement for License Renewal of Nuclear Plants" (GEIS), NUREG-1437, will be prepared under the provisions of 10 CFR Part 51, the NRC rules that implement the National Environmental Policy Act (NEPA). In accordance with 36 CFR 800.8, the SEIS will include analyses of potential impacts to historic and cultural resources. A draft SEIS is scheduled for publication in December of 2003, and will be provided to you for review and comment.

In the context of the National Historic Preservation Act, the Agency official (the Director, Office of Nuclear Reactor Regulation, NRC) has determined that the area of potential effect (APE) for a license renewal action is the area at the power plant site and its immediate environs which may be impacted by post-license renewal land disturbing operation or projected refurbishment activities associated with the proposed action. The APE may extend beyond the immediate environs in those instances where post-license renewal land disturbing operations or projected refurbishment activities, specifically related to license renewal, potentially have an effect on known or proposed historic sites. This determination is made irrespective of ownership or control of the lands of interest.

While preparing its application, Exelon contacted your office by letter dated January 11, 2002, and your office responded on January 30, 2002. In its letter, Exelon stated that the operation of DNPS, including the maintenance of identified transmission lines, through the license renewal term is not expected to affect cultural or historic resources in the area. Exelon further stated that no new construction was planned, and maintenance activities would be limited to previously disturbed areas. It was also noted that the American Nuclear Society designated DNPS Unit 1 as a Nuclear Historic Landmark. The January 30, 2002, response letter stated that based on

M. Crossland 2

the information provided, no historic properties would be affected, and IHPA had no objection to the undertaking proceeding as planned.

We request that you respond to this letter and indicate whether there are any changes to the determination in your January 30, 2002, letter to Exelon. For your information, enclosed is one example of a letter sent from the NRC staff to 13 Native American Tribes identified by the Bureau of Indian Affairs as having potential interest in the proposed undertaking affording them the opportunity to participate in this process and identify issues of concern to them. No issues have been identified to date. If you have any questions or require additional information, please contact the Environmental Project Manager, Duke Wheeler at 301-415-1444 or DXW@nrc.gov.

Sincerely,
/RA/

Pao-Tsin Kuo, Program Director
License Renewal and Environmental Impacts
Division of Regulatory Improvement Programs
Office of Nuclear Reactor Regulation

Docket Nos.: 50-237 and 50-249

Enclosure: As stated

cc w/o encl.: See next page

Dresden Nuclear Power Units 2 and 3

cc:

Site Vice President - Dresden Nuclear Power Station
Exelon Generation Company, LLC
6500 N. Dresden Road
Morris, IL 60450-9765

Dresden Nuclear Power Station Plant Manager
Exelon Generation Company, LLC
6500 N. Dresden Road
Morris, IL 60450-9765

Regulatory Assurance Manager - Dresden
Exelon Generation Company, LLC
6500 N. Dresden Road
Morris, IL 60450-9765

U.S. Nuclear Regulatory Commission
Dresden Resident Inspectors Office
6500 N. Dresden Road
Morris, IL 60450-9766

Chairman
Grundy County Board
Administration Building
1320 Union Street
Morris, IL 60450

Regional Administrator
U.S. NRC, Region III
801 Warrenville Road
Lisle, IL 60532-4351

Illinois Department of Nuclear Safety
Office of Nuclear Facility Safety
1035 Outer Park Drive
Springfield, IL 62704

Document Control Desk-Licensing
Exelon Generation Company, LLC
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Senior Vice President, Nuclear Services
Exelon Generation Company, LLC
4300 Winfield Road
Warrenville, IL 60555

Vice President
Mid-West Regional Operating Group
Exelon Generation Company, LLC
4300 Winfield Road
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Senior Vice President
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ENCLOSURE

LETTER TO: THE HONORABLE LISA WAUKAU, CHAIRPERSON

MENOMINEE INDIAN TRIBE OF WISCONSIN

(NATIVE AMERICAN TRIBE IDENTIFIED BY THE BUREAU OF INDIAN AFFAIRS)

MARCH 12, 2003

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

March 12, 2003

The Honorable Lisa Waukau, Chairperson
Menominee Indian Tribe of Wisconsin
P.O. Box 910
Keshena, WI 54135-0910

SUBJECT: U.S. NUCLEAR REGULATORY COMMISSION REVIEW OF THE DRESDEN NUCLEAR POWER STATION LICENSE RENEWAL APPLICATION

Dear Ms. Waukau:

The U.S. Nuclear Regulatory Commission (NRC) is seeking input for its environmental review of an application from Exelon Generation Company, LLC (Exelon) to renew its operating license for the Dresden Nuclear Power Station, Units 2 and 3 (DNPS), located in Grundy County, Illinois. DNPS is in close proximity to lands that may be of interest to the Menominee Tribe. As described below, the NRC process includes an opportunity for public participation in the environmental review. We want to ensure that you are aware of our efforts and, pursuant to 10 CFR 51.28(b), the NRC invites the Menominee Indian Community to provide input to the scoping process relating to the NRC's environmental review of the application.

The NRC will hold public scoping meetings for the DNPS license renewal supplement to the NRC's "Generic Environmental Impact Statement for License Renewal of Nuclear Plants" (GEIS) (NUREG-1437). These scoping meetings will be held at Jennifer's Garden Banquet and Convention Center, 555 West Gore Road, Morris, Illinois, on April 10, 2003. There will be two sessions to accommodate interested parties. The first session will convene at 1:30 p.m. and will continue until 4:30 p.m., as necessary. The second session will convene at 7:00 p.m., with a repeat of the overview portions of the meeting, and will continue until 10:00 p.m., as necessary. Additionally, the NRC staff will host informal discussions one hour before the start of each session. No formal comments on the proposed scope of the supplement to the GEIS will be accepted during the informal discussions. To be considered, comments must be provided either at the transcribed public meetings or in writing. The application and the environmental review process are described below.

Under NRC regulations, the original operating license for a nuclear power plant is issued for up to 40 years. The license may be renewed for up to an additional 20 years if NRC requirements are met. The current operating licenses for DNPS will expire in 2011. Exelon submitted an environmental report as part of its application for renewal of the DNPS operating license on January 3, 2003. The application is electronically available for inspection from the Publicly Available Records component of NRC's Agencywide Documents Access and Management System (ADAMS). ADAMS is accessible at http://www.nrc.gov/reading-rm/adams.html, which provides access through the NRC's Public Electronic Reading Room (PERR) link. If you do not have access to ADAMS or if there are problems in accessing the documents located in ADAMS, contact the NRC's Public Document Room (PDR) Reference staff at 1-800-397-4209, 301-415-4737, or by e-mail to pdr@nrc.gov. In addition, the application can be viewed on the Internet http://www.nrc.gov/reactors/operating/licensing/renewal/applications/dresden-quad.html.

L. Waukau 2

A paper copy of the document can be viewed at the NRC's PDR, located at One White Flint North, 11555 Rockville Pike (first floor), Rockville, Maryland; at the Morris Area Public Library, 604 West Liberty Street, Morris, Illinois; and the Coal City Public Library District, 85 North Garfield Street, Coal City, Illinois. Also, the GEIS assesses the scope and impact of environmental effects that would be associated with license renewal at any nuclear power plant site. A copy of this document can also be found on the NRC's website or at the NRC's PDR.

The NRC is gathering information for the document that will be a DNPS-specific supplement to the GEIS. The supplement will contain the results of the review of the environmental impacts on the area surrounding the DNPS site that are related to terrestrial ecology, aquatic ecology, hydrology, cultural resources, and socioeconomic issues (among others) and will contain a recommendation regarding the environmental acceptability of the license renewal action.

Please submit any written comments the Menominee Indian Community may have to offer on the scope of the environmental review by May 12, 2003. Comments should be submitted either by mail to the Chief, Rules and Directives Branch, Division of Administrative Services, Mail Stop T-6 D59, U.S. Nuclear Regulatory Commission, Washington, D.C. 20555-0001, or by e-mail to DresdenEIS@nrc.gov.

At the conclusion of the scoping process, the NRC staff will prepare a summary of the significant issues identified, the conclusions reached, and will mail a copy to you.

The NRC will prepare a draft supplemental environmental impact statement (SEIS) for public comment, and will hold another set of public meetings in the site vicinity to solicit comments on the draft. A copy of the draft SEIS will be sent to you for your review and comment. After consideration of public comments received on the draft, the NRC will prepare a final SEIS. The issuance of a final environmental statement for DNPS is planned for July 2004. If you need additional information regarding the environmental review process, please contact Louis L. Wheeler, Project Manager, at (301) 415-1444.

Sincerely,
/RA/
Pao-Tsin Kuo, Program Director
License Renewal and Environmental Impacts Program
Division of Regulatory Improvement Programs
Office of Nuclear Reactor Regulation

Docket Nos. 50-237, 50-249

cc: See next page

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

August 11, 2003

Mr. Rick Nelson
Field Supervisor
U.S. Fish and Wildlife Service
4469 48th Avenue Court
Rock Island, IL 61201

SUBJECT: EXPANDED SCOPE OF DRESDEN NUCLEAR POWER STATION APPLICATION FOR OPERATING LICENSE RENEWAL

Dear Mr. Nelson:

This letter requests comments regarding the expanded scope of the environmental review associated with the proposed operating license renewals for Dresden Nuclear Power Station, Units 2 and 3 (DNPS).

On March 11, 2003, the U.S. Nuclear Regulatory Commission (NRC) staff requested your comments on the operating license renewal application for DNPS, located in Grundy County, Illinois. To support our preparation of an environmental impact statement and to ensure compliance with Section 7 of the Endangered Species Act (ESA), we requested a list of species and information on protected, proposed, and candidate species and critical habitats which may be in the vicinity of DNPS and its associated transmission lines. In addition, we requested any information you considered appropriate under the provisions of the Fish and Wildlife Coordination Act (FWCA).

We are writing now to inform you that since our March 11, 2003, letter, the scope of the transmission lines included in this environmental review has been expanded. Specifically, the length of the Goodings Grove transmission line corridor was stated in our letter as being 12.4 miles long and terminating at the Elwood substation in Will County. Based on additional information provided by the licensee, Exelon Generation Company, LLC, the length of the Goodings Grove corridor pertinent to our review extends 29.8 miles to the Goodings Grove substation in Will County, and occupies 903 acres (see attached map).

As provided for by the ESA and FWCA, we request that you consider the effects the expanded scope of the project may have on endangered and threatened species of fish and wildlife. Please notify us of any issues that we should consider during the preparation of the environmental impact statement for the proposed DNPS license renewal.

If you have any questions concerning the process for the NRC staff review of the license renewal application, please contact Mr. Louis Wheeler, Senior Project Manager, at (301) 415-1444 or via e-mail at DXW@nrc.gov.

Sincerely,

/RA/
Pao-Tsin Kuo, Program Director
License Renewal and Environmental Impacts
Division of Regulatory Improvement Programs
Office of Nuclear Reactor Regulation

Docket Nos.: 50-237 and 50-249

Enclosure: DNPS Transmission Line Map

cc w/encl.: See next page

Dresden Nuclear Power Units 2 and 3

cc:

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U.S. Nuclear Regulatory Commission
Dresden Resident Inspectors Office
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Morris, IL 60450-9766

Chairman
Grundy County Board
Administration Building
1320 Union Street
Morris, IL 60450

Regional Administrator
U.S. NRC, Region III
801 Warrenville Road
Lisle, IL 60532-4351

Illinois Department of Nuclear Safety
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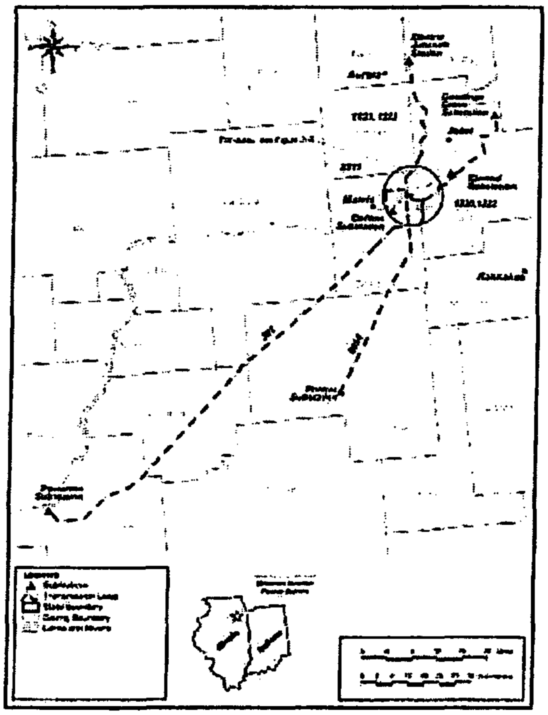

Transmission Line Corridors Associated with Dresden Nuclear Power Station.

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Rock Island Field Office
4469 48th Avenue Court
Rock Island, Illinois 61201
Phone: (309) 793-5800 Fax: (309) 793-5804

IN REPLY REFER TO:
FWS/RIFO

September 15, 2003

United States Nuclear Regulatory Commission
Attn: Mr. Louis Wheeler, Senior Project Manager
License Renewal and Environmental Impacts
Division of Regulatory Improvement Programs
Office of Nuclear Reactor Regulation
Washington, D.C. 20555-0001

Dear Mr. Wheeler:

This is in response to your letters of March 11, 2003, and August 11, 2003, requesting our comments regarding renewal of the operating license for the Dresden Nuclear Power Station, Units 2 and 3 and the expanded scope of the environmental review associated with the proposed license renewals for Dresden Nuclear Power Station, Units 2 and 3 in Tazewell, Woodford, La Salle, Livingston, Grundy, Will, Kendall and Du Page Counties in Illinois. The expanded scope consists of expanding transmission lines into other counties.

The following federally listed species are known to occur in the aforementioned counties in Illinois.

Classification	Common Name (Scientific Name)	Habitat
Tazewell County		
Threatened	Bald eagle *Haliaeetus leucocephalus*	wintering
Threatened	Lakeside daisy *Hymenoxis herbacea*	dry rocky prairies (introduced)
Threatened	Decurrent false aster *Boltonia decurrens*	Illinois River floodplain
Woodford County		
Threatened	Bald eagle *Haliaeetus leucocephalus*	wintering

Mr. Louis Wheeler 2

Threatened	Decurrent false aster *Boltonia decurrens*	Illinois River floodplain
La Salle County		
Threatened	Bald eagle *Haliaeetus leucocephalus*	wintering
Threatened	Decurrent false aster *Boltonia decurrens*	Illinois River floodplain
Endangered	Indiana bat *Myotis sodalis*	caves, mines; small stream corridors with well-developed riparian woods; upland and bottomland forests
	Critical habitat	Blackball Mine
Livingston County		
See statewide distribution below.		
Grundy County		
Threatened	Bald eagle *Haliaeetus leucocephalus*	wintering
Threatened	Eastern prairie fringed orchid *Platanthera leucophaea*	wet grassland habitats
Will County		
Threatened	Bald eagle *Haliaeetus leucocephalus*	wintering
Threatened	Lakeside daisy *Hymenoxis herbacea*	dry rocky prairies (introduced)
Threatened	Mead's milkweed *Asclepias meadii*	dry/mesic prairies (introduced)
Endangered	Hine's emerald dragonfly *Somatochlora hineana*	spring-fed wetlands
Endangered	Leafy prairie clover *Dalea foliosa*	Des Plaines River floodplain
Candidate	Eastern massasauga *Sistrurus catenatus catenatus*	shrubby wetlands

Kendall County
See statewide distribution below.

Du Page County		
Threatened	Prairie bush-clover *Lespedeza leptostachya*	dry to mesic prairies
Threatened	Eastern prairie fringed orchid *Platanthera leucophaea*	wet grassland habitats
Endangered	Hine's emerald dragonfly *Somatochlora hineana*	spring-fed wetlands
Statewide		
Threatened	Prairie bush-clover *Lespedeza leptostachya*	dry to mesic prairies
Threatened	Eastern prairie fringed orchid *Platanthera leucophaea*	wet grassland habitats
Endangered	Indiana bat *Myotis sodalis*	caves, mines; small stream corridors with well-developed riparian woods; upland and bottomland forests

The threatened bald eagle is listed as wintering and possibly breeding in Tazewell, Woodford, La Salle, Grundy and Will Counties in Illinois. Bald eagles build their nests in large trees near rivers or lakes. A typical nest is around 5 feet in diameter. Eagles often use the same nest year after year.

During the winter, this species feeds on fish in the open water areas created by dam tailwaters, the warm water effluents of power plants and municipal and industrial discharges, or in power plant cooling ponds. The more severe the winter, the greater the ice coverage and the more concentrated the eagles become. They roost at night in groups in large trees adjacent to the river in areas that are protected from the harsh winter elements. They perch in large shoreline trees to rest or feed on fish. There is no critical habitat designated for this species. The eagle may not be harassed, harmed, or disturbed when present nor may nest trees be cleared. Please refer to the enclosed "Management Guidelines for Breeding Areas."

The federally endangered lakeside daisy is known to occur in Will and Tazewell Counties, Illinois. Historically, it has grown in outcrops of dolomite or limestone bedrock, dry, gravelly prairies, on terraces or hills associated with major river systems. It is now restricted to dry, thin-soiled, degraded prairie remnants. There is no critical habitat listed for this species in Illinois. Federal regulations prohibit any commercial activity involving this species or the malicious damage or removal of this species from Federal land or any other lands in knowing violation of

Mr. Louis Wheeler 4

State law or regulation, including State criminal trespass law. If any of the aforementioned habitat criteria are found in the project area, we request that searches for this species be conducted between late April through early June, when the daisy typically blooms and is more easily identified.

The threatened decurrent false aster is known to occur in Tazewell, Woodford, and La Salle Counties, Illinois (Illinois River floodplain). It is also considered to potentially occur in any county bordering the Illinois River and the counties bordering the Mississippi River between the mouths of the Missouri River and the Ohio River. It occupies disturbed alluvial soils in the floodplains of these rivers. There is no critical habitat listed for this species in Illinois.

The Indiana bat is known to occur in La Salle County, Illinois and potentially occurs statewide in Illinois. The Blackball Mine in La Salle County is listed as Critical habitat.

During the summer, the Indiana bat frequents the corridors of small streams with well-developed riparian woods as well as mature upland forests. It forages for insects along the stream corridor, within the canopy of floodplain and upland forests, over clearings with early successional vegetation (old fields), along the borders of croplands, along wooded fencerows, and over farm ponds and in pastures. It has been shown that the foraging range for the bats varies by season, age, and sex and ranges up to 81 acres (33ha). It roosts and rears its young in cavities and beneath the loose bark some live species of trees and those of large dead or dying trees. It winters in caves and abandoned mines.

An Indiana bat maternity colony typically consists of a primary roost tree and several alternate roost trees. The use of a particular tree appears to be influenced by weather conditions (temperature and precipitation). For example, dead trees found in more open situations were used more often during cooler or drier days while interior live and dead trees were selected during periods of high temperature and/or precipitation. Indiana bats tend to return to the same roosting area year after year. Please refer to the attached "Indiana bat guidelines for Illinois."

The threatened Mead's milkweed is known to occur in Will County, Illinois where it has been introduced. There is no critical habitat designated for this species. Federal regulations prohibit any commercial activity involving this species or the destruction, malicious damage or removal of this species from Federal land or any other lands in knowing violation of State law or regulation, including State criminal trespass law. This species should be searched for whenever prairie remnants are encountered.

The endangered Hine's emerald dragonfly is known to occur in Will and Du Page Counties in Illinois. It occupies marshes and sedge meadows fed by calcareous groundwater seepage and underlain by dolomite bedrock. In general, these areas are characterized by the presence of slowly flowing water and nearby or adjacent forest edges. If suitable habitat for this species occurs in a project area, we ask that surveys be conducted. If a Hine's emerald dragonfly is found, this office should be notified immediately. Water quality is an important element of this species habitat. Environmental studies should address how the project would affect water quality and quantity, including any effects associated with future developments made possible by the proposed project.

Mr. Louis Wheeler 5

The endangered **leafy prairie clover** is known to occur in Will County, Illinois, and may potentially occur in LaSalle County. It occupies prairie remnants on thin soil over limestone bedrock. There is no critical habitat designated for this species. Federal regulations prohibit any commercial activity involving this species or the destruction, malicious damage or removal of this species from Federal land or any other lands in knowing violation of State law or regulation, including State criminal trespass law. If any prairie remnants are found within the project area, we request that searches for this species be conducted from late July through August, as this is when the clover typically flowers and is more easily identified.

The **prairie bush clover** is known to occur in Lee County, Illinois and potentially occurs throughout Iowa and Illinois. Prairie bush clover occupies dry to mesic prairies with gravelly soil. Federal regulations prohibit any commercial activity involving this species or the destruction, malicious damage or removal of this species from Federal land or any other lands in knowing violation of State law or regulation, including State criminal trespass law. This species should be searched for whenever prairie remnants are encountered.

The **eastern prairie fringed orchid** occupies wet grassland habitats and potentially occurs throughout Illinois. Possible habitat includes, but is not restricted to, mesic prairie, sedge meadows, marsh edges and bogs. If any of these aforementioned habitat remnants are found within any of the project areas, we request that searches for this species be conducted between June 28 and July 11, when the orchid typically flowers and is most identifiable. Federal regulations prohibit any commercial activity involving this species or the destruction, malicious damage or removal of this species from Federal land or any other lands in knowing violation of State law or regulation, including State criminal trespass law.

The endangered **Iowa Pleistocene snail** is known to occur on north-facing slopes of the driftless area in Clinton County, Iowa. It occupies algific (cold-producing) talus slopes at the outlet of underground ice caves along limestone bluffs within a narrow regime of soil moisture and temperature. There is no critical habitat designated. It must not be harmed, harassed or disturbed.

The project lies within the range of the **eastern massasauga**, a docile rattlesnake that is declining throughout its national range and is currently a Federal Candidate species. The snake is currently listed as endangered by the State of Illinois and is believed to occur in Will County. Your proactive efforts to conserve this species now may help avoid the need to list the species under the Endangered Species Act in the future. Due to their reclusive nature, we encourage early project coordination to avoid potential impacts to massasaugas and their habitat.

The massasauga is often found in or near wet areas, including wetlands, wet prairie, or nearby woodland or shrub edge habitat. This often includes dry goldenrod meadows with a mosaic of early successional woody species such as dogwood or multiflora rose. Wet habitat and nearby dry edges are utilized by the snakes, especially during the spring and fall. Dry upland areas up to 1.5 miles away are utilized during the summer, if available. Some project management ideas include the following:

1) At a minimum, project evaluations should contain delineations of whether or not massasauga habitat occurs within project boundaries. Descriptions should indicate the quality and quantity of

Mr. Louis Wheeler 6

massasauga habitat (holes, crayfish burrows, foraging area, or basking sites) that may be affected by the project.

2) In cases where massasaugas are known to occur or potential habitat is rated moderate to high, massasauga surveys may be necessary. If surveys are conducted, it may be helpful to inquire with local resource agency personnel, or reliable local residents, who may know of massasauga sightings. For more detailed information, please contact us.

Migratory birds
In addition to trying to ensure that electrical transmission lines and structures do not adversely affect threatened and endangered species, the U. S. Fish and Wildlife Service is also interested in minimizing potential impacts to other wildlife resources, particularly migratory birds. The Migratory Bird Treaty Act (16 U.S.C. 703-712) prohibits the taking, killing, possession, sale, transportation and importation of migratory birds, their eggs, parts and nests, except when specifically authorized by the Secretary of the Interior. The Bald and Golden Eagle Protection Act (16 U.S.C. 668) prohibits the taking of any bald or golden eagle except when specifically authorized by the Secretary of the Interior. These laws do not allow the killing of migratory birds, including eagles without a permit. To avoid killing migratory birds, many companies employ raptor and migratory bird deterents and line configurations, which minimizes electrocution. These and other methods are described in *Avian Power Line Interaction Committee (APLIC), 1994; Mitigating Bird Collisions with Power Lines: The State of the Art in 1994, Edison Electric Institute, Washington D.C., 78 pp.; Avian Power Line Interaction Committee (APLIC), 1996; Suggested Practices for Raptor Protection on Power Lines, Edison Electric Institute/Raptor Research Foundation, Washington, D. C., 128 pp.* Copies can be obtained via the internet at http://www.eei.org/productsandservices/descriptionandaccess/ or by calling 1-800-334-5453.

We encourage you to work with us to eliminate loss of migratory birds attributable to power lines and other power transmission facilities. If you would like additional information, please contact us as indicated below.

In addition, The Corps of Engineers is the Federal agency responsible for wetland regulation. We recommend that you contact them for assistance in delineating any wetland types and acreage within the expanded scope of the project. Priority consideration should be given to avoid impacts to these wetland areas. Any activities that would alter these wetlands may require a Section 404 permit. Unavoidable impacts will require a mitigation plan to compensate for any losses of wetland functions and values. The U.S. Army Corps of Engineers, Clock Tower Building, P.O. Box 2004, Rock Island, Illinois 61201, should be contacted for information about the permit process.

These comments provide technical assistance only and do not constitute a report of the Secretary of the Interior on a project within the meaning of Section 2(b) of the Fish and Wildlife Coordination Act, do not fulfill the requirements under Section 7 of the Endangered Species Act, nor do they represent the review comments of the U.S. Department of the Interior on any forthcoming environmental statement.

Mr. Louis Wheeler 7

If you have any questions concerning our comments, please contact Ginger Molitor of my staff at (309) 793-5800 ext. 212.

Sincerely,

Richard C. Nelson
Supervisor

Cc: Jessie Coty, Kris Lah
Enclosures

G:\Word Documents\Ginger\completed\Illinois\DresdenNuclear Regulatory Commission

Guidelines for Protection of Indiana Bat Summer Habitat in Illinois

The endangered Indiana bat (*Myotis sodalis*) is known to occur in Adams, *Alexander, Bond, Ford, *Hardin, Henderson, *Jackson, *Jersey, Johnson, *La Salle, Madison, Macoupin, McDonough, *Monroe, Perry, Pike, *Pope, Pulaski, Saline, Schuyler, Scott, *Union, and Vermilion Counties in Illinois. (*Counties with hibernacula) **The Blackball Mine in La Salle County has been listed as Critical Habitat. Potential habitat for this species occurs statewide, therefore, Indiana bats are considered to potentially occur in any area with forested habitat.**

Indiana bats migrate seasonally between winter hibernacula and summer roosting habitats. Winter hibernacula include caves and abandoned mines. Females emerge from hibernation in late March or early April to migrate to summer roosts. Females form nursery colonies under the loose bark of trees (dead or alive) and/or cavities, where each female gives birth to a single young in June or early July. A maternity colony may include from one to 100 individuals. A single colony may utilize a number of roost trees during the summer, typically a primary roost tree and several alternates. Some males remain in the area near the winter hibernacula during the summer months, but others disperse throughout the range of the species and roost individually or in small numbers in the same types of trees as females. The species or size of tree does not appear to influence whether Indiana bats utilize a tree for roosting provided the appropriate bark structure is present. However, the use of a particular tree does appear to be influenced by weather conditions, such as temperature and precipitation.

During the summer, the Indiana bat frequents the corridors of small streams with riparian woods as well as mature upland forests. It forages for insects along stream corridors, within the canopy of floodplain and upland forests, over clearings with early successional vegetation (old fields), along the borders of croplands, along wooded fencerows, over farm ponds and in pastures. To **avoid impacting this species, tree clearing activities should not occur during the period of April 15 to September 15. If a proposed action occurs within a 5-mile radius of a winter hibernacula, tree clearing should be prohibited from April 1 to November 15.** If it is necessary to clear trees during this time frame, mist net surveys may be necessary to determine if Indiana bats are present. "Mist Netting Guidelines" can be obtained from our office. A search for this species should be made prior to any cave-impacting activities.

Suitable summer habitat in Illinois is considered to have the following characteristics within a ½ mile radius of a project site:

1) forest cover of 15% or greater;
2) permanent water;
3) one or more of the following tree species: shagbark and shellbark hickory that may be dead or alive, and dead bitternut hickory, American elm, slippery elm, eastern cottonwood, silver maple, white oak, red oak, post oak, and shingle oak with slabs or plates of loose bark;
4) potential roost trees with 10% or more peeling or loose bark

If the project site contains any habitat that fits the above description, it may be necessary to conduct a survey to determine whether the bat is present. If Indiana bats are known to be present, they must not be harmed, harassed or disturbed when present. **Large-scale habitat alterations within known or potential Indiana bat habitat should not be permitted without a bat survey and/or consultation with this office.**

Minor tree clearing (i.e. timber stand improvement or clearing of small stands) should conserve trees which are dead or have loose bark and should be limited to non-maternity periods between the dates of September 16 and April 14.

If you have any comments or questions, please contact the Rock Island Field Office at (309) 793-5800.

From:
Northern States Recovery Plan
1983

Appendix E

MANAGEMENT GUIDELINES FOR BREEDING AREAS

The purpose of these guidelines is to provide minimum criteria for protecting bald eagles at their breeding areas from human disturbance and to preserve and enhance important habitat features of these areas. The criteria are based on a synthesis of existing guidelines in present use by the U.S. Forest Service (Eastern Region), U. S. Fish and Wildlife Service, and the views of eagle researchers.

Although eagles often use particular nests for many years, they frequently move to different sites. Turnover of existing nests, from losses to wind, changes by the eagles, and other natural factors may be as much as 12% of the sites per year. Eagle "real estate" is much less fixed than for humans. Thus, the conservation and management of nesting habitat is far more important than the identification and preservation of specific nest sites or even breeding areas.

Eagle tolerance of human presence is highly variable, both seasonally and among different individuals or pairs of eagles. Some bald eagles nest and accept people, boaters, hikers, cabins, roads, and other human presence in very close proximity, possibly as a result of habituation. On the other hand, some may be extremely intolerant and be disturbed readily. This variability must be recognized in both research and management. Management should be conservative and assume that intolerant birds may be present now or in the future. We should be especially conservative in areas with low populations.

All nesting eagles are disturbed more easily at some times of the nesting season than at others. Four periods of sensitivity to disturbance can be identified for nesting areas. These are as follows.

1. Most critical period. Prior to egg laying bald eagles engage in courtship activities and nest building. During this and the incubation periods they are most intolerant of external disturbances and may readily abandon the area. The most critical period for disturbances therefore extends from approximately one month prior to egg laying through the incubation period.

2. Moderately critical period. This includes approximately one month prior to the above period and about four weeks after hatching. Prior to the nesting season individual pairs of eagles vary considerably in time of return to the nest site or, if permanent residents, the time they begin to come into physiological condition for breeding and become sensitive to

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disturbance. After hatching the chicks are quite vulnerable to inclement weather and need frequent brooding and feeding. Disturbance can keep adults from nests and, depending on the weather and length of time involved, may cause weakening or death of chicks. The adults are quite protective of the nest site as long as one or more healthy chicks are present. Thus, disturbance at this time is less critical, although still potentially detrimental, than during the pre-laying and incubation period.

3. Low critical period. This period extends from the time chicks are about one month of age until approximately six weeks after fledging. During this time adults are still quite attached to nesting areas but tolerate moderate amounts of human presence. Restriction should be decided on a case by case basis.

4. Not critical period. The existence of this period depends on whether adults are permanent residents in their nesting areas. In most regions adults leave the vicinity for a few weeks or months each year. During the time they are gone one need be concerned only with activities that alter the habitat in ways that would make it unsuitable for future nesting.

The timing of these periods depends on geographic location. Eagles tend to breed earlier farther south or in coastal locations. Establishment of critical periods in managment planning will therefore depend on the timing of nesting in each area.

Management of nesting areas will depend on the amount of suitable habitat, numbers of pairs present, extent of the areas used by nesting eagles, and present land uses. Plans should be prepared for each breeding area and planning should encompass larger units when habitat is suitable and many nesting pairs are present. In planning for a large region, particularly if major changes in land use or development are anticipated, the following major items should be addressed:

1. Distribution of habitat modification. Large contiguous areas of habitat should remain suitable, not just small, specific sites where nests currently are located.

2. Upper limit to habitat modification. Limits on habitat modification should be clearly established in advance, and unplanned development should be discouraged or prohibited. Limits set in advance are generally more acceptable to persons desiring further development; the process permits reasonable negotiation and compromise and limits are easier to enforce.

3. Rate of development. Development should only be allowed to approach the upper limit slowly, over a period of years. Sudden, large-scale development should be prevented if possible.

4. Seasonal timing of human activity. Construction and related activities should be confined to the low or non-critical periods of the year described above.

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5. Human attitudes toward eagles in the area. Much human-eagle interaction depends on the predominant attitude of human residents of each area. Residents and visitors of some areas are very favorably disposed toward the birds, if not proud and quite protective. They may be careful not to disturb the birds and may help prevent disturbance or destruction by other persons. Such attitudes should be encouraged through education and law enforcement. Illegal shooting of eagles, especially young birds of the year still in the vicinity of nests during the fall hunting season, should be severely penalized.

The above guidelines pertain to larger geographic units where several eagles may be nesting. The following pertain to specific breeding areas.

SITE-SPECIFIC MANAGEMENT PLANS

A. Basic information and essential habitat. Site-specific management plans should be tailored to the size and configuration of essential habitats, and should address such factors as the prey base, habitat used for foraging, and any other features necessary for maintaining habitat suitability. In addition, management plans should clearly specify restrictions on human activities and habitat alterations in establishing buffer zones around nests (see next point in outline). For basic information forms, see end of this appendix.

B. Disturbance Buffer Zones for Nest Trees. Each nest within a breeding area will be protected by three zones that become less restrictive to human activity as the distance from the nest increases. Some activities need to be restricted only during the nesting season, or critical periods. Guidelines for zones, based on those developed by the U. S. Forest Service in the Eastern Region and used in several parts of the United States, are described below. If buffer zones are used they should be established around all nest sites within a breeding area regardless of their activity status, since alternate nests often are used as feeding platforms and roosting sites.

1. Primary Zone

   a) Size: The boundary of this zone should be 330 feet (5 chains) from the nest.

   b) Restrictions: All land use except actions necessary to protect or improve the nest site should be prohibited in this zone. Human entry and low-level aircraft operations should be prohibited during the most critical and moderately critical periods, unless performed in connection with eagle research or management by qualified individuals. Motorized access into this zone should be prohibited. Restrictions on human entry

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at other times should be addressed in the breeding area management plan, considering the types, extents, and durations of proposed or likely activities.

2. Secondary zone

a) Size: This zone should extend 660 feet (10 chains) from the nest.

b) Restrictions: Land-use activities that result in significant changes in the landscape, such as clearcutting, land clearing, or major construction, should be prohibited. Actions such as thinning tree stands or maintenance of existing improvements can be permitted, but not during the most critical and moderately critical periods. Human entry and low-level aircraft operations should be prohibited during the most critical period unless performed in connection with necessary eagle research and management by qualified individuals. Roads and trails in this zone should be obliterated, or at least closed during the most and moderately critical periods. Restrictions on human entry at other times should be addressed in the breeding area management plan, considering the types, extents, and durations of proposed or likely activities.

3. Tertiary Zone

a) Size: This is the least restrictive zone. It should extend one-quarter mile (20 chains) from the nest, but may extend up to one-half mile (40 chains) if topography and vegetation permit a direct line of sight from the nest to potential activities at that distance. The configuration of this zone, therefore, may be variable.

b) Restrictions: Some activities are permissible in this zone except during the most critical period. Each breeding area management plan may identify specific hazards that require additional constraints.

C. Other Management Guidelines.

1. Abandoned Nest Trees

a) When a tree containing an eagle nest has blown down or has been damaged so it can no longer support a nest, remove all buffer zones. The breeding area management plan itself, however, should remain in effect or be revised, such as by removing buffer zones until a new nest is established.

b) When a nest structure disappears but the nest tree remains the buffer zones should remain in effect through at least the following three breeding seasons. If the nest is not rebuilt, remove the zoning but still consider the area as essential habitat and protect it accordingly.

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c) When a nest is classified as a remnant, that is, one that has been unoccupied for five consecutive years, and is not being maintained by eagles, retain only the primary zone.

Roosting and Potential Nest Trees.

a) Three or more super-canopy trees (preferably dead or with dead tops) should be identified and preserved within one-quarter mile of each nest as roosting and perching sites.

b) In areas identified as potential nesting habitat, there should be at least four to six over-mature trees of species favored by bald eagles for every 320 acres within 1320 feet of a river or lake larger than 40 acres. These trees should be taller than surrounding trees or at the edge of the forest stand, and there should be clear flight paths to them.

c) Artificial nest structures may be provided where suitable nest sites are unavailable in occupied or potential habitat. Structures may be placed in trees containing dilapidated nests; in trees without existing nests, but which otherwise appear suitable; or in man-made structures such as powerlines or tripods. Nest platforms should be approximately five to six feet in length and width (25-36 square feet) and be made to last for several years. Roosting structures may be erected using powerpoles with several horizontal perches near the upper end.

3. Prey Base Management

a) Fisheries management should strive to maintain a prey base consistent with eagle food habits.

b) In some breeding areas, particularly in the west, mammals form a portion of the diet of bald eagles. Land management in these areas should maintain an adequate prey base in terrestrial habitats.

c) Feeding of eagles may be considered a valid management tool in areas where natural prey are highly contaminated or temporarily unavailable for some reason. This management option rarely will be used.

d) In some regions, commercial and sport fishermen may be providing an important but unrecognized (by people) food source for eagles by dumping rough fish. Many commercial fishermen are also suffering from reduced catches of game fish and quotas imposed for the purpose of managing fisheries. Subsidization perhaps in the form of monetary or tax incentives might benefit eagles, fishermen, and possibly the fisheries.

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SITE-SPECIFIC MANAGEMENT PLANS

Outline for data file and breeding area management plans

Breeding Area No. and Name: ____________________

Nest No.(s): ____________________

Location: ____________________

Date: ____________________

By: ____________________

I. Breeding Area Characteristics
   A. General Description
      Nest Site Relationships
      Overview of Habitat and Land Uses
   B. Feeding Areas (Known and/or Assumed)
   C. Known or Potential Perch/Roost Trees
   D. Potential Nest Sites Available
   E. Land Ownership within Breeding Area
      Identify Acquisition Needs
   F. Post-nesting Use of Habitat

II. Nest Site Characteristics (Each nest in territory)
   A. Tree Measurements (height, DBH, size); Nest Measurements
   B. Condition of Nest Tree
   C. Date Constructed
   D. Timber Type, Size and Density
   E. Distance to Water
   F. Distance to Roads and Other Development
   G. Accessibility
   H. Relation of Nest Height to Surrounding Canopy
   I. Precise Directions for Reaching Nest

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Appendix F

GEIS Environmental Issues Not Applicable to Dresden Units 2 and 3

Appendix F

GEIS Environmental Issues Not Applicable to Dresden Units 2 and 3

The following table lists those environmental issues listed in the *Generic Environmental Impact Statement for License Renewal of Nuclear Plants* (GEIS) (NRC 1996; 1999)[a] and 10 CFR Part 51, Subpart A, Appendix B, Table B-1, that are not applicable to Dresden Units 2 and 3 because of plant or site characteristics.

Table F-1. GEIS Environmental Issues Not Applicable to Dresden Units 2 and 3

ISSUE—10 CFR Part 51, Subpart A, Appendix B, Table B-1	Category	GEIS Sections	Comment
SURFACE WATER QUALITY, HYDROLOGY, AND USE (FOR ALL PLANTS)			
Altered salinity gradients	1	4.2.1.2.2 4.4.2	The Illinois River is an inland freshwater river with no salinity gradient.
Altered thermal stratification of lakes	1	4.2.1.2.3; 4.4.2.2	The discharge is to the Illinois River
GROUNDWATER USE AND QUALITY			
Groundwater-use conflicts (Ranney wells)	2	4.8.1.4	Dresden Units 2 and 3 do not have or use Ranney wells.
Groundwater quality degradation (Ranney wells)	1	4.8.2.2	Dresden Units 2 and 3 do not have or use Ranney wells.
Groundwater-use conflicts (potable and service water, and dewatering; plants that use >100 gpm)	2	4.8.1.1 4.8.1.2	Dresden Units 2 and 3 use <100 gpm of groundwater.

[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 F-1. (Contd)

ISSUE—10 CFR Part 51, Subpart A, Appendix B, Table B-1	Category	GEIS Sections	Comment
GROUNDWATER USE AND QUALITY			
Groundwater quality degradation (saltwater intrusion)	1	4.8.2.1	The cooling pond at Dresden is not near a saltwater body.
Groundwater quality degradation (cooling ponds in salt marshes)	1	4.8.3	The cooling pond at Dresden is not near a saltwater body or a marsh.
TERRESTRIAL RESOURCES			
Bird collisions with cooling towers	1	4.3.5.2	This issue is related to a heat-dissipation system that is not installed at Dresden Units 2 and 3.

F.1 References

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

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.

Appendix G

NRC Staff Evaluation of Severe Accident Mitigation Alternatives (SAMAs) for Dresden Nuclear Power Station, Units 2 & 3, in Support of the License Renewal Application Review

Appendix G

NRC Staff Evaluation of Severe Accident Mitigation Alternatives (SAMAs) for Dresden Nuclear Power Station, Units 2 & 3, in Support of the License Renewal Application Review

G.1 Introduction

Exelon Generation Company, LLC (Exelon) submitted an assessment of SAMAs for Dresden as part of the ER (Exelon 2003a). This assessment was based on the most recent Dresden Probabilistic Risk Assessment (PRA) available at that time, a plant-specific offsite consequence analysis performed using the MELCOR Accident Consequence Code System 2 (MACCS2), and insights from the Dresden Individual Plant Examination (IPE) (ComEd 1996) and Individual Plant Examination of External Events (IPEEE) (ComEd 1997). In identifying and evaluating potential SAMAs, Exelon considered SAMA analyses performed for other operating plants which have submitted license renewal applications, as well as industry and NRC documents that discuss potential plant improvements, such as NUREG-1560 (NRC 1997a). Exelon identified 265 potential SAMA candidates. This list was reduced to 10 unique SAMA candidates by eliminating SAMAs that were not applicable to Dresden due to design differences, had already been implemented, or had high implementation costs. Exelon assessed the costs and benefits associated with each of the potential SAMAs and concluded that none of the candidate SAMAs evaluated would be cost-beneficial for Dresden.

Based on a review of the SAMA assessment, the NRC issued a request for additional information (RAI) to Exelon by letter dated May 30, 2003 (NRC 2003). Key questions concerned: dominant risk contributors at Dresden and the SAMAs that address these contributors, the potential impact of external event initiators and uncertainties on the assessment results, and detailed information on some specific candidate SAMAs. Exelon submitted additional information by letter dated July 23, 2003 (Exelon 2003b). In the response, Exelon provided: tables containing importance measures for various events and their relationship to evaluated SAMAs; rationale for why the core damage frequency (CDF) for fire events would be substantially lower than reported in the IPEEE; results of a revised screening based on consideration of the potential impact of external events and uncertainties; more realistic estimates of the benefits and implementation costs for several SAMAs that appeared to be cost-beneficial based on the revised screening; and the costs and benefits associated with several lower cost alternatives. Exelon's responses addressed most of the staff's concerns and reaffirmed that none of the SAMAs would be cost-beneficial.

Based on its review, the staff concluded that the contribution to risk from fire events would be higher than assumed in Exelon's SAMA analysis. The staff adjusted Exelon's risk reduction estimates to account for the contribution to risk (and risk reduction) from fire events, and found that none of the candidate SAMAs would be cost-beneficial, but that two SAMAs are close to being cost-beneficial, and could be cost-beneficial given a more detailed assessment of their benefits in external events or when uncertainties are taken into account. However, these SAMAs do not relate to adequately managing the effects of aging during the period of extended operation, and therefore need not be implemented as part of license renewal pursuant to 10 CFR Part 54.

An assessment of SAMAs for Dresden is presented below.

G.2 Estimate of Risk for Dresden

Exelon's estimates of offsite risk at Dresden are summarized in Section G.2.1. The summary is followed by the staff's review of Exelon's risk estimates in Section G.2.2.

G.2.1 Exelon's Risk Estimates

Two distinct analyses are combined to form the basis for the risk estimates used in the SAMA analysis: (1) the Dresden Level 1 and 2 PRA model, which is an updated version of the Modified Individual Plant Examination (IPE) (ComEd 1996), and (2) a supplemental analysis of offsite consequences and economic impacts (essentially a Level 3 PRA model) developed specifically for the SAMA analysis. The SAMA analysis is based on the most recent Level 1 and 2 PRA model available at the time of the ER, referred to as the 2002 Update model. The scope of the Dresden PRA does not include external events.

The baseline CDF for the purpose of the SAMA evaluation is approximately 1.9×10^{-6} per year, and the baseline large early release frequency (LERF) is approximately 3×10^{-7} per year. The CDF and LERF are based on the risk assessment for internally-initiated events. Exelon did not include the contribution to risk from external events within the Dresden risk estimates, nor did it account for the potential risk reduction benefits associated with external events in the SAMA screening process described in the ER. It is Exelon's position that the existing fire and IPEEE programs have already addressed potential plant improvements related to these areas (Exelon 2003a). In response to an RAI, Exelon performed a separate assessment of the impact on the results if the SAMA benefits (for internal events) were increased to account for additional benefits in external events. This is discussed further in Sections G.4 and G.6.2.

The breakdown of CDF by initiating event/accident type is provided in Table G-1. As shown in this table, loss of offsite power and transients (such as a transient with feedwater unavailable and main condenser available, and loss of turbine building closed cooling water) are dominant contributors to the CDF. Bypass events (i.e., interfacing systems LOCA) contribute less than one percent to the total internal events CDF.

Table G-1. Dresden Core Damage Frequency

Initiating Event/Accident Class	CDF (Per Year)	% Contribution to CDF
Loss of Offsite Power (LOOP)[1] (dual-unit and single-unit)	7.8×10^{-7}	41
Transients	6.3×10^{-7}	34
Loss of Multiple DC Buses	1.5×10^{-7}	8
Loss-of-Coolant Accident (LOCA)	1.1×10^{-7}	6
Internal Flooding	5.7×10^{-8}	3
Manual Shutdown	5.7×10^{-8}	3
Others	5.7×10^{-8}	3
Loss of Service Water	3.8×10^{-8}	2
Interfacing Systems LOCA (ISLOCA)	1.9×10^{-9}	0.1
Total CDF (from internal events)	**1.9×10^{-6}**	**100**

[1]Includes station blackout (SBO)

The Level 2 PRA model has been updated since the IPE. During 1999, Exelon revised the PRA to include a simplified LERF methodology as described in NUREG/CR-6595 (NRC 1999). In 2002, Exelon replaced the simplified LERF model with a full Level 2 PRA. The source terms were also updated to account for the extended power uprate which was approved by the NRC in 2001 (NRC 2001b). The conditional probabilities, fission product release fractions, and release characteristics associated with each release category were provided in response to an RAI (Exelon 2003b).

The offsite consequences and economic impact analyses use the MACCS2 code to determine the offsite risk impacts on the surrounding environment and public. Inputs for this analysis include plant-specific and site-specific input values for core radionuclide inventory, source term and release characteristics, site meteorological data, projected population distribution (within a 80 km [50-mi] radius) for the year 2031, emergency response evacuation modeling, and economic data.

In the ER, Exelon estimated the dose to the population within 80 km (50 mi) of the Dresden site to be approximately 0.1023 person-Sv (10.23 person-rem) per year. The breakdown of the total population dose by containment release mode is summarized in Table G-2.

Table G-2. Breakdown of Population Dose by Containment Release Mode

Containment Release Mode	Population Dose (Person-Rem[1] Per Year)	% Contribution
Early containment failure	8.04	79
Late containment failure	2.14	21
Containment Bypass	0.05	<1
No Containment Failure	~0	~0
Total Population Dose	**10.23**	**100**

[1]One person-Rem = 0.01 person-Sv

G.2.2 Review of Exelon's Risk Estimates

Exelon's determination of offsite risk at Dresden is based on the following three major elements of analysis:

- the Level 1 and 2 risk models that form the bases for the 1996 "Modified" IPE submittal (ComEd 1996) and the 1997 IPEEE submittal (ComEd 1997),

- the major modifications to the IPE model that have been incorporated in the Dresden PRA, and

- the MACCS2 analyses performed to translate fission product release frequencies from the Level 2 PRA model into offsite consequence measures.

Each of these analyses was reviewed to determine the acceptability of Exelon's risk estimates for the SAMA analysis, as summarized below.

The staff's review of the Dresden IPE is described in an NRC report dated November 9, 1995 (NRC 1995). Based on a review of the original IPE submittal, the staff could not reach the conclusion that Commonwealth Edison had met the intent of Generic Letter 88-20 (NRC 1988). By letter dated June 28, 1996, Commonwealth Edison submitted a "Modified" IPE (ComEd 1996). The staff's review of the Modified IPE is documented in a letter dated October 2, 1997 (NRC 1997b). In that review, the staff focused on whether the licensee addressed the concerns documented in the November 9, 1995, staff evaluation. The staff concluded that Modified IPE submittal met the intent of Generic Letter 88-20; that is, the Modified IPE was of adequate quality to be used to look for design or operational vulnerabilities.

The Modified IPE CDF, which included internal floods, was reported to be $3x10^{-6}$ per year for Unit 2 and $5x10^{-6}$ per year for Unit 3. The PRA used in the SAMA analysis, i.e., the 2002 Update model, indicates a decrease in the total CDF to $1.9x10^{-6}$ per year for both units. The reduction is attributed to plant and modeling improvements that have been implemented at Dresden since the Modified IPE was submitted, including changes related to the extended power uprate (EPU). A summary listing of those changes that resulted in the greatest impact on the total core damage frequency was provided in the ER and in response to an RAI (Exelon 2003b), and include:

- installed SBO diesel generators and the Division 1 4-kV cross-tie which reduced the LOOP contribution,

- revised LOOP/dual-unit LOOP analysis for initiating event frequencies and non-recovery probabilities,

- increased the medium break LOCA (MBLOCA) frequency using the latest Electric Power Research Institute (EPRI) methodology, added credit for feedwater in MBLOCA event tree, and added a higher human error probability (HEP) for operators to depressurize with a MBLOCA,

- reduced general transient frequency, and updated initiating event frequencies based on operating experience,

- revised human reliability analysis based on most recent operator interviews, and

- revised treatment of anticipated transient without scram (ATWS) sequences, including revised failure probabilities based on NUREG/CR-5500 (NRC 1999), added a failure to inhibit automatic depressurization system to several ATWS sequences, and added a manual scram following an inadvertent open relief valve to the ATWS event tree logic.

The CDF value for Dresden is at the lower end of the range of the CDF values reported in the IPEs for other boiling water reactor (BWR) 3/4 plants. Figure 11.2 of NUREG-1560 shows that the IPE-based total internal events CDF for BWR 3/4 plants ranges from $1x10^{-6}$ to $8x10^{-5}$ per year (NRC 1997a). It is recognized that other plants have reduced the values for CDF subsequent to the IPE submittals due to modeling and hardware changes. The current internal events CDF results for Dresden remain comparable to other plants of similar vintage and characteristics.

The staff considered the peer reviews performed for the Dresden PRA, and the potential impact of the review findings on the SAMA evaluation. In response to an RAI, Exelon described the previous peer reviews, the most significant of which was the Nuclear Energy Institute/Boiling Water Reactor Owners Group (BWROG) Peer Review of the 1999 PRA model conducted in

January 2000 (Exelon 2003b). The BWROG review concluded that the Dresden PRA is consistent with other industry PRAs in scope, methods, data usage, and results, and does not have unique PRA features. Exelon stated that there were no "A" level facts and observations, and that all "B" level, and a number of the "C" level facts and observations were resolved in the 2002 Update. The most significant recommendations identified weaknesses in the area of Level 2 analysis, internal flooding, and thermal hydraulic analysis. Exelon stated that efforts to enhance the PRA in these areas have been completed and include incorporation of a new internal flooding study and a full Level 2 model into the 2002 PRA Update. Exelon concluded that improvements made since the Peer Review and the independent review have corrected any significant weaknesses identified and that the 2002 PRA Update model fully supports the SAMA identification and evaluation process.

One recommendation that was not addressed was that a capability to model uncertainties be added to the model and uncertainty analyses be performed. In an RAI, the staff requested that Exelon provide an estimate of the uncertainties associated with the internal events CDF, and an assessment of the impact on the Phase 1 screening and Phase 2 evaluation if the risk reduction estimates are increased to account for uncertainties (NRC 2003). In response to this request, Exelon estimated the uncertainties based on a review of other plants' CDF uncertainty distributions (Exelon 2003b). Exelon's evaluation and results are discussed in further detail in Section G.4 and G.6.2.

Given that the Dresden PRA has been peer reviewed and the peer review findings were either addressed or judged to have no impact on the SAMA evaluation, and that Exelon satisfactorily addressed staff questions regarding the PRA, the staff concludes that the Level 1 PRA model is of sufficient quality to support the SAMA evaluation.

Exelon submitted an IPEEE in December 1997 (ComEd 1997), in response to Supplement 4 of Generic Letter 88-20. Exelon did not identify any fundamental weaknesses or vulnerabilities to severe accident risk in regard to the external events related to seismic, fire, or other external events. However, a number of areas were identified for improvement in both the seismic and fire areas. In response to a staff RAI, Exelon replaced the seismic and fire sections with revised sections including additional and updated information (ComEd 2000). In a letter dated September 28, 2001, (NRC 2001a), the staff concluded that the submittal met the intent of Supplement 4 to Generic Letter 88-20, and that the licensee's IPEEE process is capable of identifying the most likely severe accidents and severe accident vulnerabilities.

The IPEEE uses a focused scope EPRI seismic margins analysis. This method is qualitative and does not provide the means to determine the numerical estimates of the CDF contributions from seismic initiators. All equipment in the seismic IPEEE scope was reviewed in accordance with Unresolved Safety Issue (USI) A-46 program procedures. Exelon found that, based on the EPRI assessment methodology, some of the plant's high confidence low probability of failure

(HCLPF) values were less than the 0.3g review level earthquake used in the IPEEE. The most limiting (or lowest) HCLPF values were:

electrical buses	0.17g
electrical distribution panels	0.17g
condensate storage tank	0.20g
diesel fuel oil storage day tank	0.26g

Other components, mostly electrical, had HCLPF values ranging from 0.27g to 0.29g. In response to an RAI regarding the IPEEE, Exelon stated that a number of improvements were made in the seismic area, primarily in equipment anchorages, during the resolution of the USI A-46 program (NRC 2000). As a result of either plant modifications or more rigorous evaluation, only the condensate storage tanks and diesel fuel oil storage day tank now have capacities at or less than 0.26g (Exelon 2003b).

During the review of the IPEEE, the staff questioned the availability of an ultimate heat sink in the event of a failure of the Dresden Lock and Dam which has a HCLPF value of 0.1g. In response to the RAI, Commonwealth Edison (now Exelon) stated that the success path identified for decay heat removal was the low pressure coolant injection (LPCI) system in the torus cooling mode with the containment cooling service water (CCSW) providing cooling to the LPCI heat exchangers. However, for a dam failure, the isolation condenser for each unit will be used as the means of decay heat removal in lieu of CCSW and LPCI mode of torus cooling. Exelon noted that a modification to develop a seismically-qualified or verified makeup path to supply water from the ultimate heat sink to the shell of the isolation condenser was being developed, and would be completed in conjunction with the approved schedule for resolution of USI A-46 outliers. According to the USI A-46 safety evaluation report (NRC 2000), the outliers will be resolved within two refueling outages per unit following receipt of the NRC safety evaluation report on the USI A-46 submittal.

In addition to the seismically-qualified/verified makeup path to the isolation condenser modification, Exelon stated that a study would be performed to ensure that a small break LOCA, with no torus cooling but with the isolation condenser in operation, does not result in unacceptable torus temperatures. During review of Exelon's EPU amendment application, the staff noted that Exelon had not yet implemented the modification to the isolation condenser makeup path, nor performed the small break LOCA (SBLOCA) confirmatory study. Therefore, the staff requested that Exelon augment its IPEEE seismic margins analysis by performing some simplified seismic risk evaluations of the current and EPU plant configurations for these two seismic outliers (e.g., seismically-qualified isolation condenser makeup path, and seismically-induced SBLOCA effects).

As described in the EPU SER, the SBLOCA confirmatory study demonstrated that the isolation condenser and available emergency core cooling systems (ECCS) are sufficient to mitigate a seismically-induced SBLOCA for a 24-hour period, but showed that additional equipment, specifically a cooling water supply to the CCSW heat exchangers, will be required shortly after 24 hours to supply suppression pool cooling. In a letter dated September 26, 2001, Exelon stated that it plans to use large portable pumps to restore the required CCSW cooling flow via suction from the intake canal (Exelon 2001). These pumps would be stored in an area that could withstand the postulated seismic event and would be staged with hose connections to the CCSW piping. The necessary fittings will be installed on the existing CCSW piping. Power for the portable pumps will be supplied either by portable diesel engines or by temporary power connections to the available existing electrical buses. Procedures will be developed to ensure that the necessary actions will be taken within the 24 hour period to establish suppression pool cooling flow. These actions will provide the capability to mitigate the seismically induced SBLOCA for the 72-hour time frame given in EPRI NP-6041-SL (EPRI 1991). In response to an RAI, Exelon stated that the CCSW fitting modification and development of associated procedures are scheduled to be completed on the same schedule as the isolation condenser makeup seismic upgrade. This modification essentially constitutes implementation of Phase 2 SAMA 2.

In the ER, Exelon evaluated increases to the seismic ruggedness of plant components as Phase 2 SAMA 5, and in dispositioning this SAMA indicated that "this SAMA remains under investigation for resolution as part of the Dresden close out of the IPEEE commitments." In an RAI, the staff asked for a description of the improvements under investigation, their status, and expected implementation schedule (NRC 2003a). In response to the RAI, Exelon stated that, as indicated in NUREG-1742 (NRC 2002a), an extensive number of plant improvements or other actions were planned to resolve USI A-46 outliers, and that all outliers have either been resolved or will be completed no later than the end of the Unit 2 refueling outage scheduled for October 2003, except for a Unit 3 modification to some motor control centers, which is currently scheduled for the fall of 2004 (Exelon 2003b). No further seismic upgrades are planned.

The staff inquired about systems, structures, and components that limit the plant HCLPF and asked Exelon to explain why modifications to increase seismic capacity would not be cost-beneficial when evaluated consistent with the regulatory analysis guidelines (NRC 2003). In its response, Exelon provided a listing of systems, structures, and components with HCLPF values less than 0.3g. As discussed previously, either plant modifications or more rigorous evaluation, only the condensate storage tanks and diesel fuel oil storage day tank now have capacities at or less than 0.26g. Exelon stated that modifications to increase the condensate storage tank (CST) seismic capacities would be expected to cost more than several hundred thousand dollars, and that only minimal benefit is expected from increasing the remaining outliers to values greater than 0.3g (Exelon 2003b). The staff evaluated the benefit from increasing the seismic capacity of the CST to 0.3g. The staff estimates that this would result in a reduction in the CDF of about 5×10^{-8} per year. The associated benefit would be on the order of $100,000. Although Exelon stated that the cost of such a modification would be more than several hundred thousand dollars, it is likely that it would cost $1M or more. Therefore, increasing the seismic capacity of the CSTs is not cost-beneficial.

Based on the licensee's efforts to identify and address seismic outliers, the staff concludes that the opportunity for seismic-related SAMAs has been adequately explored and that there are no cost-beneficial, seismic-related SAMA candidates.

The Dresden fire analysis employed the Fire Induced Vulnerability Evaluation methodology for screening of compartments and EPRI's Fire PRA Implementation Guide (EPRI 1995) for detailed evaluation of the unscreened compartments. The licensee's overall approach in the IPEEE fire analysis is similar to other fire analysis techniques, employing a graduated focus on the most important fire zones using qualitative and quantitative screening criteria. The fire zones or compartments were subjected to at least two screening stages. In the first stage, a compartment was screened out if it was found to not contain any safe shutdown circuits and equipment, equipment important to plant safety, or plant trip initiators. In the second stage, a CDF criterion of $1x10^{-6}$ per year was applied. The licensee used the IPE model of internal events to quantify the CDF resulting from a fire initiating event. The conditional core damage probability was based on the equipment and systems unaffected by the fire. Initially, all fire event sequences were quantified assuming all equipment/cables in the area would fail by the fire. The CDF for each zone was obtained by multiplying the frequency of a fire in a given fire zone by the conditional core damage probability associated with that fire zone. The screening methodology applied by the licensee makes less and less conservative assumptions (e.g., equipment that may survive the fires in the area) until a fire zone is screened out, the results do not indicate a vulnerability, or a vulnerability is identified and addressed. After the screening, three compartments remained for Unit 2 that contributed more than the screening value of $1.0x10^{-6}$, and six remained for Unit 3. These compartments are:

Compartment Description (fire area)	CDF
Unit 2	
Control Room	$7.15x10^{-6}$
Trackway/Switchgear Area	$5.38x10^{-6}$
Reactor Building Mezzanine	$1.65x10^{-6}$
Unit 3	
Control Room	$7.11x10^{-6}$
West Corridor and Trackway	$6.85x10^{-6}$
Reactor Building Mezzanine	$3.54x10^{-6}$
Mezzanine Floor	$3.44x10^{-6}$
Auxiliary Electric Equipment Room	$2.53x10^{-6}$
Cable Tunnel	$2.12x10^{-6}$

The fire CDFs for Unit 2 and Unit 3 are 1.7×10^{-5} and 3.1×10^{-5} per year, respectively, which are about factors of 9 and 16 higher than the internal events CDF of 1.9×10^{-6} per year. In light of these values, the staff inquired why Exelon neither considered fire explicitly in the SAMA study nor considered the impact of fire CDF in its uncertainty assessment. In an RAI (NRC 2003), the staff asked Exelon to explain, for each fire area, what measures were taken to further reduce risk, and explain why these CDFs can not be further reduced in a cost-effective manner. While not explicitly addressing the fire areas, Exelon cited a list of nine insights from the fire IPEEE results, and provided a disposition of the insights with respect to the SAMA analysis (Exelon 2003b). Exelon also performed a review of the Dresden Fire PRA model cut sets to determine the dominant sequence types. Excluding the control room severe fire, Exelon identified three dominant sequence types–loss of decay heat removal, loss of injection at high pressure, and loss of injection at low pressure. These sequence types are also dominant contributors to the internal events CDF. For each of the dominant sequence types, Exelon provided a list of potential improvements evaluated during the SAMA analysis, and showed that each of the dominant sequence types were addressed by numerous SAMAs (that were previously identified based on internal events). Exelon did make modifications to seismically mount a hydrogen seal oil control panel at Unit 2 and hydrogen monitors at both units. Hydrogen lines are routed through the cabinets in question, so the potential for hydrogen gas release in this area existed. These concerns have been resolved by design change packages 9900205 (Unit 2) and 9900204 (Unit 3). With regard to the SAMA evaluation, Exelon judged that the best approach to address additional fire-related improvements was to rely on SAMAs identified for external events, and to apply extra margin to account for internal events, and to apply extra margin to account for potential benefits from external events.

Exelon also described three areas in which it believes significant conservatism exists in the fire CDF estimates -- initiating event frequencies, system response/fire modeling, and human reliability modeling. Removal of or reduction in the conservatism in these areas would result in a reduction of the fire CDF to about 5.2×10^{-6} per year which is a factor of three greater than the internal events CDF (Exelon 2003b). Exelon accounted for the contribution from external events, as well as uncertainty, by applying a multiplier of five to the averted cost estimates reported in the ER. Exelon characterized the result as an "upper bound averted cost estimate" (Exelon 2003b). The staff's review is described in Section G.6.2.

The Dresden IPEEE evaluated high winds, floods and other events using the progressive screening approach recommended in NUREG-1407 (NRC 1991). Based on this evaluation, the licensee determined that the risk from high winds, floods and other events was negligible. Additionally, the Dresden IPEEE demonstrated that transportation and nearby facility accidents were not considered to be significant vulnerabilities at the plant.

The staff reviewed the process used by Exelon to extend the containment performance (Level 2) portion of the PRA to an assessment of offsite consequences (essentially a Level 3 PRA). This included consideration of the source terms used to characterize fission product releases for the applicable containment release category and the major input assumptions used in the offsite consequence analyses. The MACCS2 code was utilized to estimate offsite consequences. Plant-specific input to the code includes the Dresden reactor core radionuclide inventory, source terms for each release category, emergency evacuation modeling, site-specific meteorological data, and projected population distribution within a 80 km (50 mile) radius for the year 2031. This information is provided in Appendix E of the ER (Exelon 2003a).

Exelon characterized the releases for the spectrum of possible radionuclide release scenarios using a set of 10 release categories, defined based on the timing and magnitude of the release. Two of the categories were combined with other release categories resulting in the use of only eight release categories. Each end state from the Level 2 analysis is assigned to one of the release categories. The process for assigning accident sequences to the various release categories and selecting a representative accident sequence for each release category is described in response to RAIs (Exelon 2003b). The release categories and their frequencies are presented in Table 4-4 of the ER (Exelon 2003). Table 3-4 of the response to an RAI provides a break out of the source term by release category (Exelon 2003b). The source terms used for the SAMA evaluation have been updated since the Modified IPE to account for the EPU and are based on the MAAP 4.0.4 code. The staff concludes that the assignment of release categories and source terms is consistent with typical PRA practice and acceptable for use in the SAMA analysis.

The core inventory input used in the MACCS2 was obtained from the MACCS2 User's Guide, and corresponds to the end-of-cycle values for a 3,578 MWth BWR plant. A scaling factor of 0.8264 was applied to provide a representative core inventory of 2,957 MWth for Dresden (the uprated power level). All releases were modeled as occurring at ground level. The staff questioned the non-conservatism of this assumption and requested an assessment of the impact of alternative assumptions (e.g., releases at a higher elevation). In response to the RAI, Exelon reassessed the doses for all eight release categories assuming that all plumes originated from the top of the reactor building. The results showed that the 50-mile population dose could increase by up to about eight percent (Exelon 2003b), which equates to about a six-percent increase in the maximum attainable benefit. This small increase has a negligible impact on the analysis and its results.

Exelon used site-specific meteorological data, obtained from the plant meteorological tower, processed from hourly measurements for the 2000 calendar year as input to the MACCS2 code. Data from this year was selected because it contained the fewest data voids. Data voids were filled with data from other tower measurements for smaller gaps, and from the Joliet Municipal Airport tower for larger gaps. The staff notes that previous SAMA analyses results have shown little sensitivity to year-to-year differences in meteorological data and considers use of the 2000 data in the base case to be reasonable.

The population distribution the applicant used as input to the MACCS2 analysis was estimated for the year 2031, based on the NRC geographic information system for 1990 (NRC 1997c), and the population growth rates were based on 2000 County-level census data (USBC 2001). The staff considers the methods and assumptions for estimating population reasonable and acceptable for purposes of the SAMA evaluation.

The emergency evacuation model was modeled as a single evacuation zone extending out 16 km (10 mi) from the plant. It was assumed that 95 percent of the population would move at an average speed of approximately 1.19 meters per second (2.7 miles/hour) with a delayed start time of 15 minutes (Exelon 2003a). This assumption is conservative relative to the NUREG-1150 study (NRC 1990), which assumed evacuation of 99.5 percent of the population within the emergency planning zone. The evacuation assumptions and analysis are deemed reasonable and acceptable for the purposes of the SAMA evaluation.

Much of the site-specific economic data were provided from SECPOP90 (NRC 1997c) by specifying the data for each of the 21 counties surrounding the plant, to a distance of 50 miles. In addition, generic economic data that are applied to the region as a whole were revised from the MACCS2 sample problem input when better information was available. The agricultural economic data were updated using available data from the 1997 Census of Agriculture (USDA 1998). These included per diem living expenses, relocation costs, value of farm and non-farm wealth, and fraction of farm wealth from improvements (e.g., buildings).

Exelon did not perform sensitivity analyses for the MACCS2 parameters, such as evacuation and population assumptions. However, sensitivity analyses performed as part of previous SAMA evaluations for other plants have shown that the total benefit of the candidate SAMAs would increase by less than a factor of 1.2 (typically about 20 percent) due to variations in these parameters. This change is small and would not alter the outcome of the SAMA analysis. Therefore, the staff concludes that the methodology used by Exelon to estimate the offsite consequences for Dresden provides an acceptable basis from which to proceed with an assessment of risk reduction potential for candidate SAMAs. Accordingly, the staff based its assessment of offsite risk on the CDF and offsite doses reported by Exelon.

G.3 Potential Plant Improvements

The process for identifying potential plant improvements, an evaluation of that process, and the improvements evaluated in detail by Exelon are discussed in this section.

G.3.1 Process for Identifying Potential Plant Improvements

Exelon's process for identifying potential plant improvements (SAMAs) consisted of the following elements:

- review of plant-specific improvements identified in the Dresden IPE and IPEEE and subsequent PRA revisions

- review of SAMA analyses submitted in support of original licensing and license renewal activities for other operating nuclear power plants

- review of other NRC and industry documentation discussing potential plant improvements, e.g., NUREG-1560.

Based on this process, an initial set of 265 candidate SAMAs was identified, as reported in Table F-1 in Appendix E to the ER. In Phase 1 of the evaluation, Exelon performed a qualitative screening of the initial list of SAMAs and eliminated SAMAs from further consideration using the following criteria:

- the SAMA is not applicable at Dresden due to design differences,

- the SAMA is sufficiently similar to other SAMAs, and as such is combined with another SAMA,

- the SAMA has already been implemented at Dresden,

- the SAMA has no significant safety benefit, or has implementation costs greater than any possible risk benefit.

Based on this screening, 215 SAMAs were eliminated leaving 50 for further evaluation. Of the 215 SAMAs eliminated, 47 were eliminated because they were not applicable to Dresden, 46 were similar and combined with other SAMAs, 83 were eliminated because they already had been implemented at Dresden, and 39 were eliminated because they either had no significant safety benefit or had implementation costs greater than any risk benefit. A preliminary cost estimate was prepared for each of the 50 remaining candidates to focus on those that had a possibility of having a net positive benefit. A screening cutoff of approximately $456K, the maximum attainable benefit (MAB), which corresponds to eliminating all severe accident risk, was then applied to the remaining candidates (see discussion in Section G.6.1 for a derivation of the MAB). Forty of the 50 SAMAs were eliminated because their estimated cost exceeded this MAB, leaving 10 candidate SAMAs for further evaluation in Phase 2.

In response to an RAI concerning the impact of external events and uncertainties on the SAMA identification process, Exelon re-evaluated the Phase 1 SAMAs using a screening value of $2M rather than $456K. As a result, 87 Phase 1 SAMAs were identified for further consideration (rather than the 50 SAMAs originally identified). These SAMAs were subsequently reassessed using the same criteria as described in the ER. Table 7-2 of the response to the RAI contains the 87 SAMAs and their subsequent disposition. Twelve of the 87 SAMAs were retained for further evaluation in Phase 2 as discussed in Section G.6.2 (the 10 SAMAs identified through the original screening plus two additional SAMAs) (Exelon 2003b).

The 12 remaining SAMAs were further evaluated and subsequently eliminated in the Phase 2 evaluation, as described in Sections G.4 and G.6.1 below.

G.3.2 Review of Exelon's Process

Exelon's efforts to identify potential SAMAs focused primarily on areas associated with internal initiating events. The initial list of SAMAs generally addressed the accident categories that are dominant CDF and containment failure contributors or issues that tend to have a large impact on a number of accident sequences at Dresden.

The preliminary review of Exelon's SAMA identification process raised some concerns regarding the completeness of the set of SAMAs identified and the inclusion of plant-specific risk contributors. The staff requested clarification regarding the portion of risk represented by the dominant risk contributors (NRC 2003). Because a review of the importance ranking of basic events in the PRA could identify SAMAs that may not be apparent from a review of the top cut sets, the staff also questioned whether an importance analysis was used to confirm the adequacy of the SAMA identification process. In response to the RAI, Exelon provided a tabular listing of the contributors with the greatest potential for reducing risk as demonstrated by the risk reduction worth assigned to the event (Exelon 2003b). Exelon used a cutoff of 1.01, and stated that events below this point would influence the CDF by less than one-percent. This equates to an averted cost-risk (benefit) of approximately $4,000. Exelon also reviewed the LERF-based risk worth reduction events to determine if there were additional equipment failures or operator actions that should be included in the provided table. Similarly, Exelon correlated the top risk worth reduction events with the SAMAs evaluated in the ER (Exelon 2003b). Based on these additional assessments, Exelon concluded that the set of 265 SAMAs evaluated in the ER addresses the major contributors to CDF and LERF, and that the review of the top risk contributors does not reveal any new SAMAs.

The staff questioned Exelon about lower cost alternatives to the SAMAs evaluated, including the use of a portable generator to power the battery chargers, and backup nitrogen bottles or portable air compressors as backup to instrument air (NRC 2003). In response, Exelon provided estimated benefits and implementation costs for several lower cost alternatives, including those in the form of potential procedural changes (Phase 2 SAMAs 1, 3b, 4, and 11) (Exelon 2003b). These are discussed further in Section G.6.2.

Exelon considered potential improvements to further reduce external events risk. Exelon is planning to implement a seismic enhancement to a makeup path to the isolation condenser and to some motor control centers, and a modification to permit the use of portable pumps to restore the required CCSW cooling flow via suction from the intake canal following a SBLOCA. The latter modification essentially constitutes implementation of Phase 2 SAMA 2. Although Exelon did not evaluate specific fire modifications as part of the SAMA analysis, several of the SAMAs identified based on the internal events risk profile would also be effective in fire events, e.g., procedure and hardware modifications to aid in decay heat removal. Based on the revised fire analyses, the staff has not identified any fire-related vulnerabilities and thus, no additional SAMAs have been identified besides those identified by the licensee that would specifically address fire-related risks.

The staff notes that the set of SAMAs submitted is not all inclusive, since additional, possibly even less expensive, design alternatives can always be postulated. However, the staff concludes that the benefits of any additional modifications are unlikely to exceed the benefits of the modifications evaluated and that the alternative improvements would not likely cost less than the least expensive alternatives evaluated, when the subsidiary costs associated with maintenance, procedures, and training are considered.

The staff concludes that Exelon used a systematic and comprehensive process for identifying potential plant improvements for Dresden, and that the set of potential plant improvements identified by Exelon is reasonably comprehensive and therefore acceptable. This search included reviewing insights from the IPE and IPEEE and other plant-specific studies, reviewing plant improvements considered in previous SAMA analyses, and using the knowledge and experience of its PRA personnel. While explicit treatment of external events in the SAMA identification process was limited, it is recognized that the prior/pending implementation of plant modifications for fire and seismic events and the absence of external event vulnerabilities reasonably justifies examining primarily the internal events risk results for this purpose.

G.4 Risk Reduction Potential of Plant Improvements

Exelon evaluated the risk-reduction potential of the 12 Phase 2 SAMAs that were applicable to Dresden. A majority of the SAMA evaluations were performed in a bounding fashion in that the SAMA was assumed to completely eliminate the risk associated with the proposed enhancement. Such bounding calculations overestimate the benefit and are conservative.

Exelon used model re-quantification to determine the potential benefits. The CDF and population dose reductions were estimated using the 2002 Update of the Dresden PRA. The changes made to the model to quantify the impact of SAMAs are detailed in Section F.6 of

Appendix E to the ER (Exelon 2003a) and in the response to the RAI (Exelon 2003b). Table G-3 lists the assumptions considered to estimate the risk reduction for each of the 12 Phase 2 SAMAs, the estimated risk reduction in terms of percent reduction in CDF and population dose, and the estimated total benefit (present value) of the averted risk as used in the staff's assessment. The determination of the benefits for the various SAMAs is further discussed in Section G.6.

The staff has reviewed Exelon's bases for calculating the risk reduction for the various plant improvements and concludes that the rationale and assumptions for estimating risk reduction are reasonable and generally conservative (i.e., the estimated risk reduction is higher than what would actually be realized). Accordingly, the staff based its estimates of averted risk for the various SAMAs on Exelon's risk reduction estimates reported in the ER, but applied a multiplier of five to these values to account for benefits in external events as discussed in Section G.6.2.

G.5 Cost Impacts of Candidate Plant Improvements

Exelon estimated the costs of implementing the 12 candidate SAMAs through the application of engineering judgment and review of other plants' estimates for similar improvements. The cost estimates conservatively did not include the cost of replacement power during extended outages required to implement the modifications, nor did they include recurring maintenance and surveillance costs or contingency costs associated with unforeseen implementation obstacles. Cost estimates typically included procedures, engineering analysis, training, and documentation, in addition to any hardware.

The staff reviewed the bases for the applicant's cost estimates. For certain improvements, the staff also compared the cost estimates (presented in Table 7-3 of the response to the RAI) to estimates developed elsewhere for similar improvements, including estimates developed as part of other licensees' analyses of SAMAs for operating reactors and advanced light-water reactors. The cost estimates provided in the response to the RAI were typically in the form of ranges. The staff reviewed these ranges and found them to be consistent with estimates provided in support of other plants' analyses. In response to an RAI, Exelon provided more specific values, typically at the upper end of the previously provided ranges. For purposes of evaluating specific SAMAs, the staff selected values from the range to represent a reasonable or typical cost.

The staff concludes that the cost estimates provided by Exelon, as adapted by the staff (see Section G.6.2), are sufficient and appropriate for use in the SAMA evaluation.

Table G-3. SAMA Cost/Benefit Screening Analysis

Phase 2 SAMA	Assumptions	% Risk Reduction		Total Benefit ($)		Cost ($)
		CDF	Population Dose	Baseline [1]	Best Estimate	
1 - Enhance procedures to direct reactor pressure vessel (RPV) depressurization given the loss of recirculation pump seal cooling or damage to the seals	Eliminate all seal failures	2	2	41,500		50,000
2 - Provide an alternate means of cooling the low pressure coolant injection (LPCI) heat exchangers, e.g., diesel-driven fire pump	CCSW is completely reliable	2	2	38,500		>100,000
3 - Develop an enhanced drywell spray system a) install hardware modification and develop procedures to use the fire protection system (FPS) for injection to the RPV or the containment spray b) develop procedures to use LPCI cross-tie from other unit as an alternate containment spray source	Assign complete success to the drywell spray effectiveness in Level 2 for all sequences except Class II, IV, and V	<1	18	345,000	38,000	a) >265,000 b) 50,000
4 - Provide procedural enhancements to re-open main steam isolation valves (MSIV)	Reduce human error probability (HEP) for failure to restore condenser from 0.5 to 3.7E-3	0	0	negligible		25,000
5 - Increase the seismic capacity of components on the safe shutdown paths with capacities less than 0.3g to 0.3g	Extend the safety shutdown path seismic capacity to at least 0.3g			100,000		>200,000 for CST (largest outlier)
6 - Add a rupture disk to the hardened vent to provide passive overpressure relief	Set vent failure modes to zero for non-ATWS sequences	2	2	32,000		>100,000

Phase 2 SAMA	Assumptions	% Risk Reduction		Total Benefit ($)		Cost ($)
		CDF	Population Dose	Baseline [1]	Best Estimate	
7 - Provide an alternate means of opening a pathway to the RPV for standby liquid control (SBLC) injection	Set the random and common cause failure of the explosive valves to zero	2	6	122,500		>100,000
8 - Enrich boron to reduce the time required to achieve shutdown, thereby increasing time available for successful activation of SBLC	Reduce the HEPs for boron initiation and reactor pressure vessel water level control by 50%	<1	0	7,000		>50,000
9 - Install a modification to allow operator intervention to bypass the low RPV pressure permissive signal that inhibits the opening of the ECCS injection valves when RPV pressure is too high	Set logic, sensor, and miscalibration failure modes to zero	1	5	123,000		>100,000
10 - Improve instrument air reliability, thereby increasing ability to vent containment via backup bottles or portable air compressors to open valves when instrument air is lost	Set instrument air recovery basic event to zero	2	2	30,000	10,000	50,000
11 - Align LPCI or core spray to the CST on loss of suppression pool cooling	Reduce HEP for aligning ECCS pump suction from 0.1 to 0.01	1	1	18,500		25,000
12 - Bypass MSIV in turbine trip ATWS scenarios	Reduce HEP for operator failure to bypass MSIV low RPV level interlock (or ATWS) from 0.93 to 0.01	1	1	30,500		>100,000

[1] Values are based on Exelon averted cost estimates reported in the ER, but are increased by a factor of 5 to account for additional risk reduction benefits in external events.

G.6 Cost-Benefit Comparison

Exelon's cost-benefit analysis and the staff's review are described in the following sections.

G.6.1 Exelon Evaluation

The methodology used by Exelon was based primarily on NRC's guidance for performing cost-benefit analysis, i.e., NUREG/BR-0184, *Regulatory Analysis Technical Evaluation Handbook* (NRC 1997d). The guidance involves determining the net value for each SAMA according to the following formula:

Net Value = (APE + AOC + AOE + AOSC) - COE

where,

APE = present value of averted public exposure ($)
AOC = present value of averted offsite property damage costs ($)
AOE = present value of averted occupational exposure costs ($)
AOSC = present value of averted onsite costs ($)
COE = cost of enhancement ($).

If the net value of a SAMA is negative, the cost of implementing the SAMA is larger than the benefit associated with the SAMA and it is not considered cost-beneficial. Exelon's derivation of each of the associated costs is summarized below.

Averted Public Exposure (APE) Costs

The APE costs were calculated using the following formula:

APE = Annual reduction in public exposure (Δperson-rem/year)
x monetary equivalent of unit dose ($2,000 per person-rem)
x present value conversion factor (10.76 based on a 20-year period with a 7-percent discount rate).

As stated in NUREG/BR-0184 (NRC 1997d), it is important to note that the monetary value of the public health risk after discounting does not represent the expected reduction in public health risk due to a single accident. Rather, it is the present value of a stream of potential losses extending over the remaining lifetime (in this case, the renewal period) of the facility. Thus, it reflects the expected annual loss due to a single accident, the possibility that such an accident could occur at any time over the renewal period, and the effect of discounting these potential future losses to present value. For the purposes of initial screening, Exelon calculated an APE of approximately $220,200 for the 20-year license renewal period, which assumes elimination of all severe accidents.

Averted Offsite Property Damage Costs (AOC)

The AOCs were calculated using the following formula:

AOC = Annual CDF reduction
x offsite economic costs associated with a severe accident (on a per-event basis)
x present value conversion factor.

For the purposes of initial screening which assumes all severe accidents are eliminated, Exelon calculated an annual offsite economic risk of about $18,400 based on the Level 3 risk analysis. This results in a discounted value of approximately $198,100 for the 20-year license renewal period.

Averted Occupational Exposure (AOE) Costs

The AOE costs were calculated using the following formula:

AOE = Annual CDF reduction
x occupational exposure per core damage event
x monetary equivalent of unit dose
x present value conversion factor.

Exelon derived the values for averted occupational exposure from information provided in Section 5.7.3 of the regulatory analysis handbook (NRC 1997d). Best estimate values provided for immediate occupational dose (3300 person-rem) and long-term occupational dose (20,000 person-rem over a 10-year cleanup period) were used. The present value of these doses was calculated using the equations provided in the handbook in conjunction with a monetary equivalent of unit dose of $2,000 per person-rem, a real discount rate of 7-percent, and a time period of 20 years to represent the license renewal period. For the purposes of initial screening, which assumes all severe accidents are eliminated, Exelon calculated an AOE of approximately $700 for the 20-year license renewal period.

Averted Onsite Costs (AOSC)

Averted onsite costs (AOSC) include averted cleanup and decontamination costs and averted power replacement costs. Repair and refurbishment costs are considered for recoverable accidents only and not for severe accidents. Exelon derived the values for AOSC based on information provided in Section 5.7.6 of the regulatory analysis handbook (NRC 1997d).

Exelon divided this cost element into two parts – the Onsite Cleanup and Decontamination Cost, also commonly referred to as averted cleanup and decontamination costs, and the replacement power cost.

Averted cleanup and decontamination costs (ACC) were calculated using the following formula:

ACC = Annual CDF reduction
x present value of cleanup costs per core damage event
x present value conversion factor.

The total cost of cleanup and decontamination subsequent to a severe accident is estimated in the regulatory analysis handbook to be $\$1.5 \times 10^9$ (undiscounted). This value was converted to present costs over a 10-year cleanup period and integrated over the term of the proposed license extension. For the purposes of initial screening, which assumes all severe accidents are eliminated, Exelon calculated an ACC of approximately $22,300 for the 20-year license renewal period.

Long-term replacement power costs (RPC) were calculated using the following formula:

RPC = Annual CDF reduction
x present value of replacement power for a single event
x factor to account for remaining service years for which replacement power is required
x reactor power scaling factor

Exelon based its calculations on the value of 912 MWe. Therefore, Exelon applied a power scaling factor of 912 MWe/910 MWe to determine the replacement power costs. For the purposes of initial screening, which assumes all severe accidents are eliminated, Exelon calculated an RPC of approximately $14,900 for the 20-year license renewal period.

Using the above equations, Exelon estimated the total present dollar value equivalent associated with completely eliminating severe accidents at Dresden to be about $456K.

<u>Exelon's Results</u>

If the implementation costs were greater than the MAB of $456K, then the SAMA was screened from further consideration. Forty of the 50 SAMAs surviving the initial Phase 1 screening were eliminated from further consideration in this way leaving 10 for final analysis. The Phase 1 screening was revisited using a screening value of $2M rather than $456K to account for the potential impact of external events, and two additional SAMAs were identified.

Exelon applied a multiplier of five to the averted cost estimates (for internal events) for each SAMA to account for the potential impact of external events and uncertainties. As a result, four of the 12 SAMAs were found to be potentially cost-beneficial. Exelon performed a more detailed assessment of each of the four SAMAs to more realistically estimate the risk reduction and implementation costs for each SAMA. Based on this assessment, Exelon concluded that none of the four SAMAs would be cost-beneficial.

G.6.2 Review of Exelon's Cost-Benefit Evaluation

The cost-benefit analysis performed by Exelon was based primarily on NUREG/BR-0184 (NRC 1997d) and was executed consistent with this guidance.

In response to an RAI, Exelon considered the uncertainties associated with the internal events CDF (see Table G-4 below). Since Exelon does not currently have an uncertainty analysis for the Dresden PRA, it estimated the uncertainty distribution by reviewing representative distributions for several plants (Exelon 2003b). Exelon used the results of the LaSalle Risk Methods Integration and Evaluation Program (RMIEP) PRA to obtain the Dresden 95th percentile value. The ratio of the 95th percentile CDF to the mean CDF value in the LaSalle RMIEP study is 4.5. The $1.9x10^{-6}$ per year point estimate mean CDF for Dresden was multiplied by this ratio, yielding a 95th percentile value of $8.5x10^{-6}$ per year for Dresden. This value and an error factor of eight are used to obtain the median value, and subsequently the 5th percentile value. If the 95th percentile value of the CDF were utilized in the cost-benefit analysis instead of the mean CDF value, the estimated benefits would increase by about a factor of five.

Table G-4. Uncertainty in the calculated CDF for Dresden

Percentile	CDF (per year)
95th	$8.5x10^{-6}$
mean	$1.9x10^{-6}$
median	$1.1x10^{-6}$
5th	$1.3x10^{-7}$

In the IPEEE, Exelon reported a fire CDF of $1.7x10^{-5}$ and $3.1x10^{-5}$ per year for Units 2 and 3, respectively. This is approximately 9 to 16 times higher than the internal events CDF of $1.9x10^{-6}$ per year. Due to the relatively large contribution from fire events, the staff asked Exelon to consider the impact on the SAMA identification and screening process if risk from external events is included. In response to the RAI, Exelon stated that the methodology used to determine the fire CDF is judged to be highly conservative, particularly in the areas of initiating event frequencies, response/fire modeling and human reliability analysis/level of detail. In Attachment A to its response, Exelon discusses the conservatism it believes exists in the model in each of these areas, and the approximate reduction that the conservatism affords. Exelon's rationale and the staff's assessment are summarized below.

For initiating events, Exelon refers to a recently issued NRC report concerning a revised fire events database (NRC 2002b). Exelon states that the NRC data would support the use of lower fire initiating event frequencies than used in the Dresden IPEEE. Based on a comparison of the initiating event frequencies from the report and from the Dresden model for several fire areas, Exelon states that a factor of two reduction in the initiating event frequency portion of the fire CDF can be made as a reasonable assumption to provide a more accurate comparison to the internal events CDF. Exelon essentially argues that reductions in initiating event frequencies in these fire areas directly translate into similar reductions in specific equipment ignition frequencies. A staff review of the NRC report verified that the initiating frequencies were lower than those originally reported in the Dresden IPEEE; however, the data is only provided for fire areas and does not support the determination of ignition frequencies for specific equipment. In addition, less significant fires were screened from the data. Therefore, the data represent the fire ignition frequencies for more severe fires. These data are not directly comparable to the ignition frequencies in the IPEEE. Although the staff believes that reductions in the ignition frequencies have occurred, it does not believe that the evidence provided by the licensee is sufficient to justify a factor of two reduction. This is especially true for the risk-significant fires where ignition frequencies are typically low and the development of the ignition frequency is typically more rigorous.

For system response/fire modeling, Exelon states that the Dresden fire model typically utilized bounding approaches regarding the immediate effects of the fire (e.g., all cables in a tray are always failed for a cable tray fire, and all failed cables lead to failure states of the associated equipment). Severity factors were utilized for the purposes of distinction (size and consequence of fire). The complement of the severity factor was also maintained in the analysis such that the total frequency was always preserved. In addition, Exelon repeats its discussion regarding lower initiating event frequencies. The staff finds that there are three points presented in support of this reduction factor: lower ignition frequencies, lower severity factors, and bounding approaches regarding the fire's immediate effects. The staff's view on lower ignition frequencies is discussed above. For severity factors, a review of the NRC report did not find evidence that it supported a reduction in severity factor. The report states "Fire severity, risk implications, and duration of power operation fire events were not updated from the initial study." As a result the staff can not support this contribution to the system response/fire modeling reduction. The final point is the claim that the bounding approaches were used regarding the fire's immediate effects. A review of the Dresden IPEEE submittal found that detailed fire modeling practices were used for risk-significant contributors. Given these observations, the staff believes that the proposed reduction factor is not supported.

For human reliability analysis and level of detail, Exelon provides examples of what it believes are simplified human reliability analysis (HRA) modeling and lack of sufficient level of detail in the model, and concludes that such factors can easily lead to an additional factor of 1.5 reduction in the fire CDF. The IPEEE Revision 1 submittal states that the fire PRA model incorporated all of the operator actions included in the plant's internal events PRA. Actions in the main control room were not considered adversely impacted by postulated fire events outside the control room. For fires in the control room, actions with a required response time of 30 minutes or less were considered failed. For all actions outside the control room, the HEP was set to 1.0 except for two. These two actions were considered as applicable and not modified from their internal-events values. The IPEEE submittal also states "The extensive use of a HEP of 1.0 for potential operator actions outside the control room is conservative but does not have a significant impact on the overall analysis results. This is because these events do not appear in the dominant cutsets for the analysis." Although the staff believes that the consideration of additional actions would likely reduce the calculated risk, it does not believe that the factor of 1.5 reduction due to HRA and level of detail is fully supported.

As a result of the improvements in ignition frequency, response/fire modeling and human reliability analysis/level of detail, Exelon states that it believes the fire CDF can be reduced by a factor of six. As such, the fire CDF would be about 1.5 to three times the internal events CDF for Units 2 and 3. Based on this assessment, Exelon applied a multiplier of five to the averted cost estimates (for internal events) for each SAMA, and characterized the result as an upper bound averted cost estimate. These values could be considered to account for SAMA benefits in internal events, external events, and internal floods. These values would also represent the impact of uncertainties in internal event frequencies (i.e., the impact if the CDF was increased from the mean value of 1.9×10^{-6} per year to the 95th percentile value of 8.5×10^{-6} per year).

The staff agrees that the Dresden IPEEE fire analysis contains numerous conservatisms, and that a more realistic assessment could result in a substantially lower fire CDF. In the staff's view, the factor of six reduction in CDF claimed by Exelon represents the maximum reduction that could be justified. However, the staff believes that the information provided by Exelon is not sufficient to support the full reduction, and that the reduction in fire CDF may be smaller than claimed by Exelon, and closer to a factor of two to three. Given a factor of three reduction in the IPEEE fire CDF, the resulting fire CDF would be about three to five times higher than the internal events CDF for Units 2 and 3, respectively. This would justify use of a multiplier of five to the averted cost estimates (for internal events) to represent the additional SAMA benefits in external events. Consideration of uncertainties would result in further increases in this multiplier.

In assessing the cost-benefit results for the various SAMAs, the staff adopted Exelon's upper bound averted cost estimates as baseline estimates of the benefits for each SAMA. This implicitly assumes that each SAMA would offer the same percentage reduction in external event CDF and population dose as it offers in internal event CDF and population dose. The baseline benefit values are shown in Table G-3 for the 12 Phase 2 SAMAs. To account for a potentially greater contribution from external events and the impact of uncertainties, the staff also considered the impact that further increases in the multiplier would have on the identification and dispositioning of candidate SAMAs, as described below.

As shown in Table G-3, the baseline benefits exceed the estimated implementation costs for three of the Phase 2 SAMAs (3,7, and 9). Exelon re-examined each of these SAMAs to ensure that the averted cost estimates from the internal events analysis appropriately represent the potential benefit rather than the maximum benefit. This included re-examining the assumptions used in the initial screening analysis, as well as recognizing existing model limitations that could lead to over-estimation of the averted costs. In some cases, the implementations costs were also refined to better represent the actual costs that would be incurred. The results of this reassessment are provided in Table 7-4 of the RAI response (Exelon 2003b), and summarized below. The revised benefit values, where provided, are also reported in Table G-3.

- SAMA 3 involves two options for enhancing the drywell (DW) spray system: a) installing a hardware modification and developing procedural guidance to use the fire protection system (FPS) as an alternative source of water, and b) developing procedural guidance to use a cross connect to the other unit's LPCI as an alternate containment spray source. The staff initially estimated the benefit of this SAMA to be $345,000 per unit based on Exelon's risk reduction estimate reported in the ER and a factor of five adjustment to account for external events. Exelon states that two classes of scenarios account for much of the calculated averted cost and that these scenarios would not benefit from SAMA 3. In one scenario class, Exelon states that power would not be available to the DW spray valves precluding any benefit from the proposed improvement. The other scenario class does not credit the recovery of the LPCI pumps for the DW spray function even though these pumps are available. The staff finds this rationale to be reasonable. When credit for the SAMA is eliminated for these two scenarios, the total benefit is reduced to $38,000 per unit for option a. Exelon estimated the cost of implementing this option to be $265,000, of which $250,000 is attributed to a hardware modification that includes installation of a flange on safety-related piping and associated engineering analyses. Therefore, this option has a negative net value. The cost for a similar SAMA evaluated for Quad Cities was estimated to be $50,000; however, the implementation at Quad Cities did not include a hardware modification. Accordingly, the staff agrees that this SAMA would not be cost-beneficial at Dresden.

  For option b, in addition to the rationale presented above, Exelon states that the averted risk is high by a factor of at least two due to the conservatisms and uncertainty associated with the very unlikely global common cause failure value of all of the suppression pool suction strainers assumed within the PRA model, and that with more realistic treatment the total benefit would be reduced, by a factor of two, to $19,000 per unit. The staff agrees that there is considerable uncertainty associated with the likelihood of sump clogging. However, given this uncertainty, and the estimated $1x10^{-4}$ failure likelihood that is currently used for the common cause failure of the strainers, the staff does not believe that an adequate technical basis has been provided to reduce the value by a factor of two. This is especially true in light of the stated bases for the current number as "engineering judgement." The staff therefore considers the original benefit of $38,000 to be reasonable. Costs to implement option b were estimated by Exelon to be about $25,000 to $50,000 per unit. The staff expects the costs to be at the upper end of this range because of the need to develop new procedures and to perform engineering analysis to support procedure development. The staff concludes that this SAMA has a negative net value. However, the costs and benefits are generally comparable, and the SAMA could be cost-beneficial given a more detailed assessment of its benefits in external events, or when uncertainties are taken into account.

- SAMA 7 involves a modification to the explosive valves to provide an alternate means of opening a pathway to the RPV for SBLC injection. The staff estimates the benefit of this SAMA to be $122,500 per unit based on Exelon's risk reduction estimate reported in the ER and a factor of five adjustment to account for external events. Exelon did not provide details on the modification but stated that any hardware change would easily exceed the minimum hardware cost of $100,000. It is expected that the modification would involve wiring circuits and switches into the control room, or changes to the valves. The staff expects that such a hardware modification would cost much more than the minimal cost provided by Exelon, and could be on the order of $1M, especially when the costs associated with the required engineering analysis, procedure modification, and training are taken into account. Therefore, the staff agrees that this SAMA would not be cost-beneficial.

- SAMA 9 involves installation of a bypass switch and associated circuitry that would allow the LPCI and core spray injection valves to open in the event that the two pressure sensors in these systems fail to generate the permissive signal needed to open the valves. The staff estimates the benefit of this SAMA to be $123,000 per unit based on Exelon's risk reduction estimate reported in the ER and a factor of five adjustment to account for external events. As is the case for SAMA 7, Exelon stated that any hardware change would easily exceed the minimum hardware cost of $100,000. It is expected that the modification would involve changes to safety-related circuits and switches. The staff expects that such a hardware modification would cost much more than the minimal cost provided by Exelon, and could be on the order of $1M, especially when the costs associated with the required engineering analysis, procedure modification, and training, and possible licensing changes (e.g., license amendment) that would accompany such a modification are taken into account. Therefore, the staff agrees that this SAMA would not be cost-beneficial.

The staff also considered the impact that further increases in the contribution from external events or analysis uncertainties would have on the dispositioning of the nine Phase 2 SAMAs that were screened out. It is noted that SAMA 1, which involves a procedure change to the emergency operating procedures (EOPs) that would direct RPV depressurization given the loss of recirculation pump seal cooling or damage to the seals, is close to being cost-beneficial. The staff estimated the benefit of this SAMA to be $41,500 per unit based on Exelon's risk reduction estimate reported in the ER and a factor of five adjustment to account for external events. In estimating the risk reduction for this SAMA, Exelon assumes that the recirculation pump seals would never fail. This assumption is optimistic. Exelon stated that such a procedure change would be contrary to current BWROG EOP strategies, and that extensive engineering analysis would be required in order to validate a recommended approach. This would raise the cost for this SAMA to well over $50K per unit. The staff agrees with Exelon's cost estimate, and therefore, concludes that this SAMA would have a negative net value, even when uncertainties are taken into account.

Two SAMAs have estimated benefits within a factor of two of the estimated implementation costs, i.e., Phase 2 SAMAs 10 and 11. SAMA 10 involves the use of backup nitrogen bottles or portable air compressors to supply air to open the containment vent valves. The staff initially estimated the benefit of this SAMA to be $30,000 per unit based on Exelon's risk reduction estimate reported in the ER and a factor of five adjustment to account for external events. Exelon's estimated benefit in the ER is based on the assumption that recovery of instrument air is perfect. Exelon claims that the instrument air recovery is less than perfect, and that existing capabilities could be more realistically credited. To further support its position, Exelon compares the 0.9 instrument failure recovery probability used in the Dresden PRA model with a more realistic value of 0.148 used in the Quad Cities model. When this conservatism is removed, Exelon estimates that the averted cost estimate is high by at least a factor of three, and should be reduced to $10,000 per unit. Considering the limited credit for recovery and the similarities between Dresden and Quad Cities, the staff finds the revised risk reduction estimate, and benefit of $10,000 per unit to be reasonable. The cost estimate for this improvement is estimated to be $25,000 to $50,000 per unit. The staff expects the costs to be at the upper end of this range because of the need for a minor hardware modification. Therefore, the staff concludes that this SAMA is not cost-beneficial.

SAMA 11 involves developing procedures to align LPCI or core spray to the CST on loss of suppression pool cooling. The staff estimated the benefit of this SAMA to be $18,600 per unit based on Exelon's risk reduction estimate reported in the ER and a factor of five adjustment to account for external events. Exelon notes that current procedures exist to align LPCI or core spray to the CST on loss of suppression pool cooling and are assigned an HEP of 0.1 based on uncertainty associated with environmental conditions that may exist when performing the actions in the reactor building. Exelon estimated the benefits of this improvement by assuming a factor of ten reduction in the human error probability of aligning ECCS pump suction. However, Exelon notes that this benefit could only be achieved by significant restructuring of the procedures to make this action always viable before environmental conditions put its performance in doubt. Exelon estimates the cost of such procedural enhancements to be $25,000 per unit. The staff finds the potential cost of $25,000 per unit to be reasonable. The staff concludes that this SAMA would have a net negative value. However, the costs and benefits are generally comparable, and the SAMA could be cost-beneficial given a more detailed assessment of its benefits in external events, or when uncertainties are taken into account.

As discussed previously, Exelon plans to implement modifications related to Phase 2 SAMA 2 during Fall 2003, and has argued that further improvements to the seismic capacity of the plant (i.e., Phase 2 SAMA 5) would not be cost-beneficial.

Two additional SAMAs have estimated benefits within a factor of four of the estimated implementation costs, i.e., Phase 2 SAMAs 6 and 12. The benefits for these SAMAs are estimated to be around $31,000 (including a factor of five adjustment to account for external events) and the implementation costs are estimated by Exelon to be greater than $100,000. The staff notes that each of these SAMAs involve hardware modifications as well as procedure changes. In response to an RAI, Exelon indicated that the cost of hardware modifications would generally range from $100,000 to $1M or more. Although Exelon did not provide details on the specific hardware modifications needed for these SAMAs, the staff believes that such modifications would be significantly greater than the minimal hardware cost provided by Exelon. Therefore, the staff does not believe that these SAMAs would be cost-beneficial at Dresden.

Exelon also performed a sensitivity analysis that addressed variations in discount rate. The use of a three-percent real discount rate (rather than seven percent used in the baseline) results in an increase in the maximum attainable benefit of approximately 37 percent. The results of the sensitivity study are bounded by Exelon's upper bound averted cost estimates, which applied a multiplier of five to the internal events benefits, and were adopted by the staff as baseline estimates for each SAMA.

The staff concludes that the costs of all of the SAMAs assessed would be higher than the associated benefits. Two SAMAs (3b and 11) have a negative net value in the baseline analysis (which includes a multiplier of five on internal events benefits) but could be cost-beneficial given a more detailed assessment of its benefits in external events, or when uncertainties are taken into account.

G.7 Conclusions

Exelon compiled a list of 265 SAMA candidates using the SAMA analyses as submitted in support of licensing activities for other nuclear power plants, NRC and industry documents discussing potential plant improvements, and the plant-specific insights from the Dresden IPE, IPEEE, and current PRA model. A qualitative screening removed SAMA candidates that (1) were not applicable at Dresden due to design differences, (2) were sufficiently similar to other SAMAs, and therefore combined with another SAMA, (3) had already been implemented at Dresden, or (4) had no significant safety benefit or had implementation costs greater than any risk benefit. A total of 215 SAMA candidates were eliminated based on the above criteria, leaving 50 SAMA candidates for further evaluation.

Using guidance in NUREG/BR-0184 (NRC 1997d), the current PRA model, and a Level 3 analysis developed specifically for SAMA evaluation, a MAB of about $456K, representing the total present dollar value equivalent associated with completely eliminating severe accidents at Dresden, was derived. Forty of the 50 SAMAs were screened from further evaluation because their implementation costs were greater than this MAB. Exelon performed a revised screening based on consideration of the potential impact of external events and uncertainties, and two additional SAMAs were identified. For the 10 SAMA candidates and two additional alternatives identified during the re-screening, a more detailed assessment and cost estimate were developed. Exelon applied a multiplier of five to the averted cost estimates (for internal events) for each SAMA, and characterized the result as an upper bound averted cost estimate. Based on a comparison of averted costs and estimated implementation costs, four of the Phase 2 SAMAs were retained for further analysis. Exelon re-examined each of these SAMAs to ensure the averted cost estimates from the internal events analysis appropriately represent the potential (realistic) benefit rather than the maximum benefit, and used the estimated averted costs and implementation costs accordingly. As a result of this reassessment, the cost-benefit analyses showed that none of the candidate SAMAs were cost-beneficial.

The staff reviewed the Exelon analysis and concluded that the methods used and the implementation of those methods were sound. The treatment of SAMA benefits and costs, the generally large negative net benefits, and the inherently small baseline risks support the general conclusion that the SAMA evaluations performed by Exelon are reasonable and sufficient for the license renewal submittal. The unavailability of a seismic and fire PRA model precluded a detailed quantitative evaluation of SAMAs specifically aimed at reducing risk of these initiators; however, to account for external events, the estimated internal events benefits were increased by a multiplier of five. Based on this evaluation, and the sue of realistic estimates of averted costs and implementation costs, none of the SAMAs appear to be cost-beneficial. However, two SAMAs could become cost-beneficial given a more detailed assessment of their benefits in external events, or when uncertainties are taken into account. These involve development of procedures to use a cross connect to the other unit's CCSW as an alternate containment spray source (SAMA 3b), and procedural changes to align LPCI or core spray to the CST on loss of suppression pool cooling (SAMA 11). Improvements realized as a result of the IPEEE process and resolution of seismic outliers at Dresden would minimize the likelihood of identifying further cost-beneficial enhancements. It is also noted that, although not cost-beneficial, Exelon plans to implement modifications related to SAMA 2 during Fall 2003 independent of this SAMA evaluation.

Based on its review of the Exelon SAMA analysis, the staff concurs that none of the candidate SAMAs are cost-beneficial, except as noted above. This is based on conservative treatment of costs and benefits. This conclusion is consistent with the low residual level of risk indicated in the Dresden PRA and the fact that Dresden has already implemented many plant improvements identified from the IPE and IPEEE processes. Given the potential risk reduction and the relatively modest implementation costs of the two SAMAs identified above, the staff concludes that further evaluation of these SAMAs by Exelon is warranted. However, these SAMAs do not relate to adequately managing the effects of aging during the period of extended operation. Therefore, they need not be implemented as part of license renewal pursuant to 10 CFR Part 54.

G.8 References

Commonwealth Edison Company (ComEd). 1996. Letter from John B. Hosmer (ComEd) to U. S. NRC Document Control Desk. Subject: Dresden Station Units 2 and 3, Response to NRC Review of Individual Plant Examination Submittal – Internal Events, NRC Docket Nos. 50-237 and 50-249, June 28, 1996.

Commonwealth Edison Company (ComEd). 1997. Letter from J. M. Heffley (ComEd) to Nuclear Regulatory Commission Document Control Desk. Subject: Dresden Nuclear Power Station Units 2 and 3 Final Report - Individual Plant Examination of External Events (IPEEE) Generic Letter 88-20, Supplement 4, December 30, 1997.

Commonwealth Edison Company (ComEd). 2000. Letter from Preston Swafford (ComEd) to USNRC Document Control Desk. Subject: Dresden Nuclear Power Station, Units 2 and 3, Facility Operating License Nos. DPR-19 and DPR-25, NRC Docket Nos. 50-237 and 50-249, Request for Additional Information Regarding Individual Plant Examination of External Events, March 30, 2000.

Electric Power Research Institute (EPRI). 1991. *A Methodology for Assessment of Nuclear Power Plant Seismic Margins*, Revision 1. EPRI Report NP-6041-SL.

Electric Power Research Institute (EPRI). 1995. *Fire PRA Implementation Guide*. Science Applications International Corporation, EPRI Report TR-104031, December 1995.

Exelon Generation Company, LLC (Exelon). 2001. Letter from K. A. Ainger, Exelon, to USNRC Document Control Desk. Subject: Dresden Nuclear Power Station, Units 2 and 3, Facility Operating License Nos. DPR-19 and DPR-25, NRC Docket Nos. 50-237 and 50-249, Additional Information Supporting the License Amendment Request to Permit Uprated Power Operation at Dresden Nuclear Power Station, September 26, 2001.

Exelon Generation Company, LLC (Exelon). 2003a. *Applicant's Environmental Report–Operating License Renewal Stage, Dresden Nuclear Power Station Units 2 and 3.* Exelon Generation Company, LLC, Warrenville, Illinois. January 2003.

Exelon Generation Company, LLC (Exelon). 2003b. Letter from Patrick R. Simpson, Exelon, to USNRC Document Control Desk. Subject: Dresden Nuclear Power Station, Units 2 and 3, Facility Operating License Nos. DPR-19 and DPR-25, NRC Docket Nos. 50-237 and 50-249, Response to Request for Additional Information – License Renewal Environmental Report for Dresden Nuclear Power Station, Units 2 and 3, July 23, 2003.

U.S. Nuclear Regulatory Commission (NRC). 1988. Generic Letter 88-20, "Individual Plant Examination for Severe Accident Vulnerabilities," November 23, 1988.

U.S. Nuclear Regulatory Commission (NRC). 1990. *Severe Accident Risks: An Assessment for Five U.S. Nuclear Power Plants.* NUREG-1150, Washington, D.C.

U.S. Nuclear Regulatory Commission (NRC). 1991. *Procedural and Submittal Guidance for the Individual Plant Examination of External Events (IPEEE) for Severe Accident Vulnerabilities.* NUREG-1407, Washington, D.C.

U.S. Nuclear Regulatory Commission (NRC). 1995. Letter from John F. Stang, U.S. NRC, to D. L. Farrar, Commonwealth Edison Company. Subject: Review of [Dresden] Nuclear Power Station, Units [2 and 3], Individual Plant Examination Submittal (Subject line actually says Quad Cities, Units 1 and 2), November 9, 1995.

U.S. Nuclear Regulatory Commission. 1996. *Generic Environmental Impact Statement for License Renewal of Nuclear Plants.* NUREG-1437. Office of Nuclear Regulatory Research. Washington, D.C.

U.S. Nuclear Regulatory Commission (NRC). 1997a. *Individual Plant Examination Program: Perspectives on Reactor Safety and Plant Performance.* NUREG-1560, Washington, D.C.

U.S. Nuclear Regulatory Commission (NRC). 1997b. Letter from John F. Stang, U.S. NRC, to Irene Johnson, Commonwealth Edison Company. Subject: Dresden, Units 2 and 3, Modified Individual Plant Examination (IPE) Submittal – Internal Events, October 2, 1997.

U.S. Nuclear Regulatory Commission (NRC). 1997c. *SECPOP90: Sector Population, Land Fraction, and Economic Estimation Program.* NUREG/CR-6525, Washington, D.C.

U.S. Nuclear Regulatory Commission (NRC). 1997d. *Regulatory Analysis Technical Evaluation Handbook.* NUREG/BR-0184, Washington, D.C.

U.S. Nuclear Regulatory Commission (NRC). 1999. *Reliability Study, GE Reactor Protection System, 1984-1995.* NUREG/CR-5500, Vol. 3, Washington, D.C.

U.S. Nuclear Regulatory Commission (NRC). 2000. Letter from L. Rossbach, U.S. NRC to O. Kingsley, Exelon. Subject: Dresden–Plant-Specific Safety Evaluation for USI A-46 Program Implementation, February 23, 2000.

U.S. Nuclear Regulatory Commission (NRC). 2001a. Letter from Lawrence W. Rossbach, U.S. NRC to O. Kingsley, Exelon. Subject: Dresden Nuclear Power Station, Units 2 and 3 – Review of Individual Plant Examination of External Events (IPEEE) Submittal, September 28, 2001.

U.S. Nuclear Regulatory Commission (NRC). 2001b. Letter from L. Rossbach, U.S. NRC to O. Kingsley, Exelon. Subject: Dresden Nuclear Power Station, Units 2 and 3 -- Issuance of Amendments for Extended Power Uprate, December 21, 2001.

U.S. Nuclear Regulatory Commission (NRC). 2002a. *Perspectives Gained From the IPEEE Program,* Final Report, Vols. 1 and 2, NUREG-1742, Washington, D.C, April 2002.

U.S. Nuclear Regulatory Commission (NRC). 2002b. "Fire Events - Update of U.S. Operating Experience, 1986 - 1999; Commercial Power Reactors," RES/OERAB/S02-01, January 2002.

U.S. Nuclear Regulatory Commission (NRC). 2003. Letter from Louis L. Wheeler, U.S. NRC to John Skolds, Exelon. Subject: Request for Additional Information (RAI) Related to the Staff's Review of the License Renewal Environmental Report for the Dresden Nuclear Power Station, Unit 2 and 3, May 30, 2003.

U.S. Bureau of the Census (USBC). 2001. Census 2000 Redistricting Data (P.L. 94-171) Summary File and 1990 Census. Internet Release Date, April 2, 2001. Available online at: http://www.census.gov/population/cen2000/phc-t4/tab01.xls.

U.S. Department of Agriculture (USDA). 1998. 1997 Census of Agriculture, National Agriculture Statistics Service, 1998. Available online at: http://www.nass.usda.gov/census/census97/volume1/vol1pubs.htm

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11. ABSTRACT *(200 words or less)*

This draft supplemental environmental impact statement (SEIS) has been prepared in response to an application submitted to the Nuclear Regulatory Commission (NRC) on January 3, 2003, by Exelon Generation Company, LLC (Exelon) to renew the operating licenses for Dresden Nuclear Power Station, Units 2 and 3, for an additional 20 years under 10 CFR Part 54. This draft SEIS includes the staff's analysis that considers and weighs the environmental effects of the proposed action, the environmental effects of alternatives to the proposed action, and altenatives available for reducing or avoiding adverse effects. It also includes the staff's recommendation regarding the proposed action.

The NRC staff's preliminary recommendation is that the Commission determine that the adverse environmental impacts of license renewal fo Dresden Nuclear Power Station, Units 2 and 3 are not so great that preserving the option of license renewal for energy-planning decisionmakers would be unreasonable. This recommendation is based on (1) the anaylsis and findings in the Generic Environmental Impact Statement for License Renewal of Nuclear Plants (NUREG-1437); (2) the Environmental Report 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 public comments.

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