RAS 12561

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Environmental Analysis for Exelon Early Site Permit

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Template=SECY-028

SECY-02

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Purpose

- Provide brief description of the Site Redress Plan and Environmental Report (ER)
- Describe how NRC Staff's Environmental Impact Statement (EIS)
  - fully complies with the National Environmental Policy Act (NEPA) and 10 CFR Part 51 (Environmental Finding 1)
  - appropriately considers and evaluates the environmental factors (Environmental Finding 2)
  - considers reasonable alternatives, and appropriately determines that the ESP should be issued, subject to a Permit Condition (Environmental Finding 3)

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Site Redress Plan

- Under Part 52, an ESP holder with Site Redress Plan may perform site preparation activities if:
  - the activities will not result in any significant adverse environmental impacts that cannot be redressed
- These activities could include:
  - preparation for construction activities at the site
  - installation of temporary construction support facilities
  - excavation for facility structures
  - construction of service facilities
  - construction of other non safety-related structures, systems, and components

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Site Redress Plan

- Objective
  - Reconfigure the site to environmentally stable and aesthetically acceptable condition suitable for non-nuclear uses
  - Account for pre-existing site conditions and future non-nuclear uses at the site
- NRC Staff reviews of Site Redress Plan in Section 4.11 of the EIS
  - Staff concludes that site-preparation activities would not result in any significant adverse environmental impacts that could not be redressed
- Prior to site preparation, Exelon must secure a number of permits related to hydrologic impacts, including
  - Clean Water Act (CWA) permits from the U.S. Army Corps of Engineers and state agencies
  - Either CWA 401 certification from Illinois Environmental Protection Agency (IEPA) or a determination that no 401 certification is required

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Environmental Report

- Exelon submitted an ER with its application in 2003
- ER discusses:
  - existing environment at site, vicinity, and region
  - bounding description of nuclear plant using Plant Parameter Envelope (PPE)
  - environmental impacts of construction and operation and considers appropriate mitigation measures
  - interaction between proposed site and surrounding environment
  - alternative energy sources and sites
- ER complies with following principal regulatory bases:
  - 10 CFR Part 51 (Environmental Protection Regulations)
  - 10 CFR Part 52, Subpart A (Early Site Permits)
  - Review Standard RS-002 (Processing Applications for ESPs)
  - NUREG-1555 (Environmental Standard Review Plan)

NRC Review of ER

- Staff required to review the ER under NEPA and 10 CFR Part 51
- Staff's NEPA obligations include:
  - discuss impacts of the proposed action (grant or deny the ESP for the Exelon Site) and potential construction & operation of the plant
  - consider mitigation measures
  - analyze alternatives to the proposed action
  - make recommendations on proposed action

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NRC Review of ER

- NRC Staff prepared EIS for ESP, including:
  - *Federal Register* Notice of Intent to prepare an EIS and conduct scoping
  - Public scoping meeting in Clinton in December 2003
  - Site visits (to Clinton and alternative sites)
  - Issuance of draft EIS, and request for public comments on draft EIS
  - Consultation with Federal, State, Tribal, and local agencies
  - Consideration of public comments (Appendices D and E of EIS)

EIS

- EIS evaluates environmental issues using 3-level standard of significance
  - 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

EIS

- Exelon elected not to analyze the following issues, as is permitted by 10 CFR § 52.17(a)(2) and 52.18:
  - need for power
  - cost-benefit analysis
  - severe accident mitigation design alternatives (SAMDAs), which are typically addressed by design certifications
- These issues are not reviewed in the EIS nor resolved by the ESP
  - As required by 10 CFR § 52.79(a)(1), the combined license (COL) applicant must resolve any outstanding environmental issues not previously considered

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EIS

- General Issues reviewed:
  - Affected Environment (Chapter 2)
  - Site Layout and Plant Parameter Envelope (Chapter 3)
  - Impacts of Construction and Operation (Chapters 4 & 5)
  - Fuel Cycle Issues (Chapter 6)
  - Cumulative Impacts (Chapter 7)
  - Alternative Analyses (Chapters 8 & 9)
  - Summary and Recommendations (Chapter 10)

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Affected Environment

- ER § 2.1 (EIS § 2.1) provides information on site location
  - ESP site is in DeWitt County on site of existing Clinton Power Station (CPS)
  - Site located on man-made Clinton Lake
    - Lake constructed for purpose of supporting operation of CPS (which is currently single unit but originally intended as two-unit station)
- ER § 2.2 (EIS § 2.2) provides information on land use
  - Site vicinity is 84 percent agricultural land; region is primarily agricultural
  - Exception to this general rule include urban areas of Springfield, Bloomington-Normal, Decatur and Champaign-Urbana
  - Recreational uses of Clinton Lake and two other small recreational areas
  - Existing transmission lines right-of-way will likely be used with no change to land use

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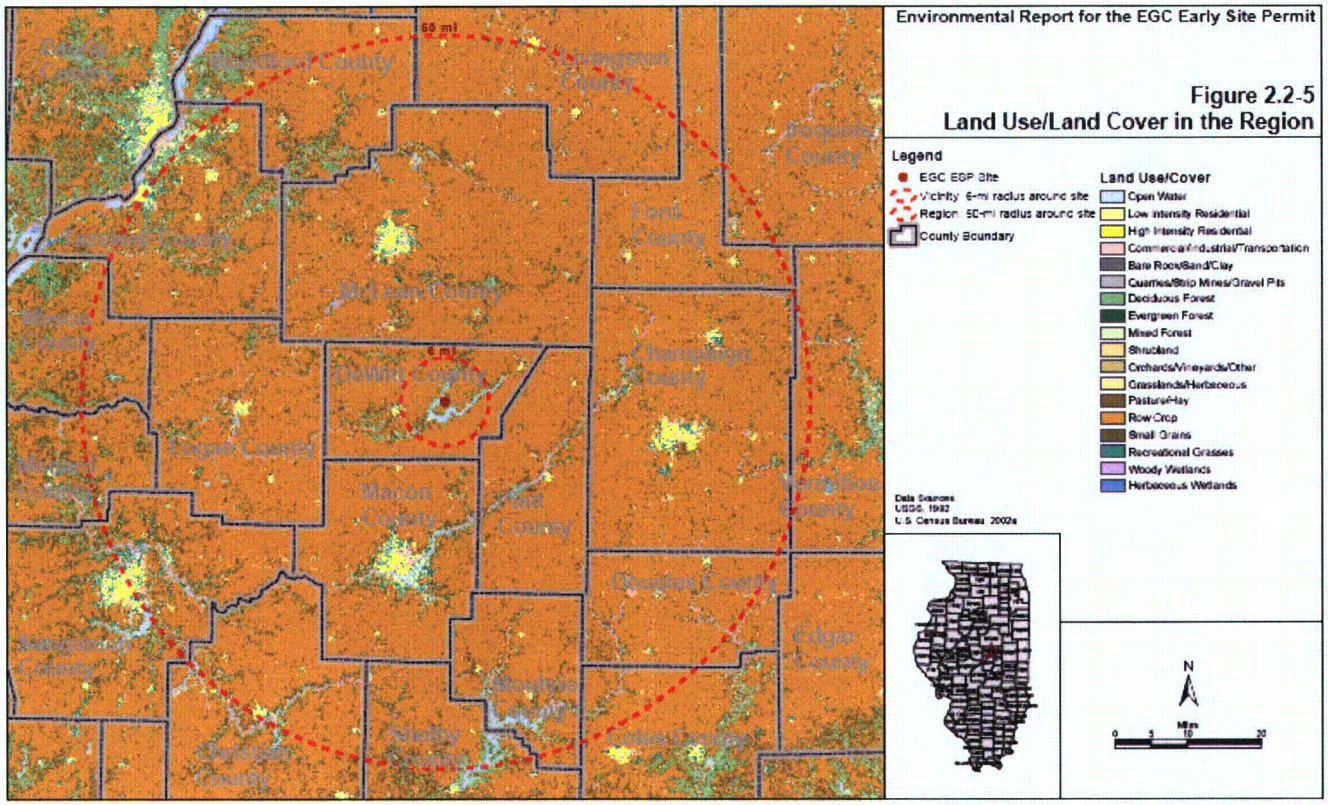

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Affected Environment

- ER § 2.5.1 (EIS § 2.8.1) provides information on demography
  - Generally, the vicinity is sparsely populated
  - DeWitt is nearest community, approximately 3 miles from site
  - Clinton (population of 7,000) is about 6 miles from site
  - More urban areas of Springfield, Bloomington-Normal, Decatur, Champaign-Urbana are all more than 20 miles from site
- ER § 2.7 (EIS § 2.3) provides information on meteorology and air quality
  - ESP site has typical continental climate with moderately cold winters and warm summers
  - Severe weather can be in form of thunderstorms, hail, tornadoes, snow, and ice
  - Regional air quality is Good or Moderate on vast majority of days

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Affected Environment, cont'd

- ER § 2.6 (EIS § 2.4) provides geological, seismological, and geotechnical information
  - Summarizes information available in the Site Safety Analysis Report
  - Engineered fill material will need to be brought to construction area
- ER § 6.2 (EIS § 5.9.6) provides information on CPS radiological monitoring
  - EIS concludes that doses attributable to CPS are small fraction of radiation standards (10 CFR Part 20; 10 CFR Part 50, Appendix I; 40 CFR Part 190)
- ER § 2.3 (EIS § 2.6) provides information on hydrology, water use, and water quality
  - Before a new nuclear unit could begin to operate, Exelon would need to obtain a National Pollutant Discharge Elimination System (NPDES) permit
- ER § 2.4 (EIS § 2.7) provides information on ecology
  - No critical aquatic or terrestrial habitats are located on site
  - No threatened or endangered plant or aquatic species are known to occur in vicinity of site or on anticipated transmission rights-of-way

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Affected Environment, cont'd

- ER § 2.5 (EIS § 2.8) provides information on socioeconomics
  - Population distribution based on 2000 Census, with projections to 2060 based on methodology by Illinois State University
  - 2000 Census found population of 12,358 within 10 miles of site
  - 2060 projections estimate a decline to 10,462 within 10 miles
- ER § 2.5.3 (EIS § 2.9) describes known historic and archaeological resources
  - Illinois Historic Preservation Agency may require cultural resource studies prior to construction
- ER § 2.5 (EIS § 2.10) provides information on environmental justice
  - DeWitt County is 97.1 percent white, with small African American, American Indian, and Hispanic populations
  - Between 8 and 10 percent of the population is low income or below poverty level
  - Low income populations are centered near urban areas in the region away from site

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Site Layout

- Technology and design for new plant has not been selected
- Exelon used bounding plant parameter envelope (PPE)
  - Applicant will verify selected reactor is bounded by PPE at COL stage
- Cooling systems
  - Cooling tower system for normal cooling
  - Mechanical draft cooling tower system for ultimate heat sink (UHS)
  - Cooling tower blowdown and other discharges through CPS discharge
- ER § 3.7 (EIS § 3.3) provides information on anticipated power transmission system
  - Existing transmission system has excess capacity to handle some of output of new facility
  - Widening of existing rights-of-way may be required for new transmission

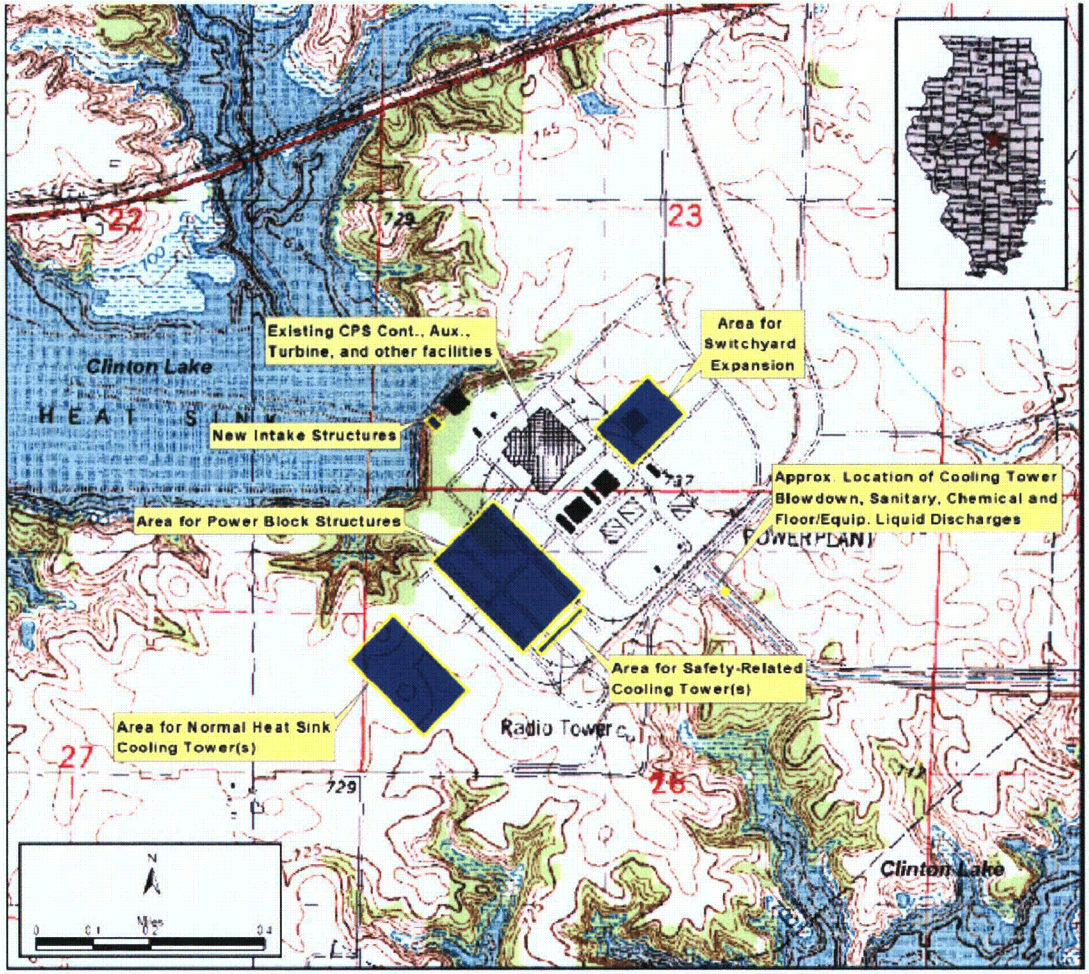

Figure 4-1. Areas Proposed for the Structures of a New Nuclear Unit (Exelon 2006a)

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Construction Impacts

- ER § 4.1 (EIS § 4.1) provides information on land-use impacts
  - Construction activities, except transmission, would take place on site in previously disturbed areas
  - Work with potential impact on wetlands or Clinton Lake Recreational Area to be conducted in accordance with applicable laws and permits
  - Environmental impact of construction on land use would be SMALL
- ER § 4.4.1.2 (EIS § 4.2) analyzes impacts on meteorology and air quality during construction
  - Sources of potential air pollution include dust, smoke, engine exhaust from construction vehicles, and concrete facility operation
  - Impacts would be minimized by compliance with applicable regulations, permitting requirements, and good operating practices
  - Impacts are expected to be temporary and limited in magnitude
  - Impacts would be SMALL

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Construction Impacts, cont'd

- ER § 4.2 (EIS § 4.3) provides information on impacts on water-related resources
  - Exelon must secure a number of permits related to hydrologic impacts
  - Water use would include dewatering during excavation and dust abatement
  - Impacts on water use and quality would be SMALL, localized, and temporary
- ER § 4.3 (EIS § 4.4) provides information on ecological impacts
  - Construction activities are not expected to impact adversely onsite wetlands
  - CWA permitting requirements require best construction management and mitigation practices to prevent storm water and other discharges
  - Impacts of construction activities on terrestrial habitat would be SMALL, assuming new rights-of-way would not be required for transmission lines
  - Construction impacts to wildlife would be negligible, due in part to compliance with regulations and permitting requirements
  - Aquatic impacts, such as the loss of some shoreline habitat and temporary displacement of some aquatic species, would be SMALL

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Construction Impacts, cont'd

- ER § 4.4 (EIS § 4.5) provides information on socioeconomic impacts
  - Impacts could include localized impacts, such as noise, dust, and vehicle emissions, some additional traffic on local roads, and some population increase and housing pressure
  - Demographic impacts expected to be SMALL, because most workers will come from region
  - Other impacts would be SMALL, except potential MODERATE impacts on roads and housing
  - Benefits include increased taxes and construction expenditures in surrounding counties
- ER § 4.1.3 (EIS § 4.6) addresses impact on historic and cultural resources
  - No identified traditional cultural properties in vicinity
  - Impacts would be SMALL

Construction Impacts, cont'd

- ER § 4.4.3 (EIS § 4.7) addresses impact of construction on environmental justice
  - No disproportionately high adverse impacts on low-income or minority populations
  - Impacts on minority and low-income populations would be SMALL
- ER § 4.4.1 (EIS § 4.8) addresses nonradiological health impacts
  - Applicable permits and regulations and dust-control systems should mitigate potential air pollution impacts
  - Occupational risks can be minimized by adherence to NRC, OSHA, state, and local requirements
  - Noise impacts will be minimal due to the distance to offsite activities
  - Nonradiological health impacts are SMALL

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Construction Impacts, cont'd

- ER § 4.5 (EIS § 4.9) provides information on radiological health impacts
  - Radiation exposure to construction workers from CPS
  - Estimated doses are well within NRC's exposure limits and impacts would be SMALL
- ER § 4.6 (EIS § 4.10) discusses measures to minimize adverse impacts
  - Compliance with environmental federal, state, and local laws, ordinances, and regulations
  - Compliance with existing permits and licenses
  - Compliance with existing Exelon processes and procedures
  - Incorporation of environmental requirements into construction contracts

Station Operation Impacts

- ER § 5.1 (EIS § 5.1) provides information on land use impacts
  - Land use impacts could include some new housing
  - Transmission rights-of-way impacts would include routine vegetation maintenance and clearing of temporary maintenance access roads
  - Land use impacts would be SMALL
- ER § 5.8.1.3 (EIS § 5.2) assesses air impacts of station operation
  - Impacts would include
    - emissions of heat and moisture from the cooling towers
    - intermittent emissions of pollutants from operation of auxiliary equipment and standby diesel generators
    - small amounts of ozone and nitrogen oxides from transmission lines
  - Air impacts from station operation would be SMALL

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Operation Impacts, cont'd

- ER § 5.2 (EIS § 5.3) provides information on water-related impacts
  - Increased lake water loss and increased water temperatures due to new cooling towers
  - EIS concludes that impacts would be SMALL in normal water years, but could be MODERATE in below-average precipitation conditions
  - Staff concluded that Exelon would need to coordinate with the IEPA in such cases to implement mitigation measures
  - Exelon's commitment to keep combined discharges within bounds of the existing CPS NPDES permit would ensure that water quality impacts will remain SMALL

Operation Impacts, cont'd

- ER §§ 5.3, 5.4.4, 5.6.1, and 5.6.2 (EIS § 5.4) discuss ecological impacts
  - Terrestrial impacts on local ecology, including those of cooling towers on Clinton Lake would be SMALL
  - Ecological impacts of transmission line right-of-way vegetation control, electromagnetic fields, and bird collisions would be negligible
  - Aquatic impacts would generally be SMALL
    - If best available technology is not used, cooling water intake system impacts could be MODERATE
    - Impact to available aquatic habitat could be MODERATE in low-water years
  - COL applicant will need to provide additional information on intake structure design
  - Operations will not impact any critical habitats, and impacts to listed species will be negligible

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Operation Impacts, cont'd

- ER § 5.8 (EIS § 5.5) provides information on socioeconomic impacts
  - Impacts include noise, odors, exhausts, and thermal emissions, visual impacts of structures; small increases in local population, traffic, housing demand, public services, and education
  - Most impacts would be SMALL
  - EIS states MODERATE aesthetic and recreational impacts due to lowered lake water level during severe drought and MODERATE housing impacts in DeWitt County
  - SMALL beneficial economic and tax impacts for surrounding counties
  - DeWitt County would receive MODERATE economic benefits and LARGE tax benefits
- ER § 5.1.3 (EIS § 5.6) addresses impacts on historic properties
  - Operation is not expected to have any significant historic or cultural resources impact
  - Impact would be SMALL
- ER § 5.8.3 (EIS § 5.7) addresses impact of operation on environmental justice
  - No disproportionately high adverse impacts on low income or minority populations
  - Impacts on minority and low income populations would be SMALL

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Operation Impacts, cont'd

- ER Chapter 7 (EIS § 5.8) discusses nonradiological health impacts from operation
  - Expected small temperature increase would not significantly increase abundance of microorganisms
  - Postulated noise levels would be of small significance
  - Transmission operator compliance with applicable regulations and standards will minimize electromagnetic field (EMF) and occupational health impacts
  - Health risks would be SMALL
  - Conclusive information on the chronic effects of EMF is unavailable, but current research does not suggest that impact would be significant
- ER § 5.4 (EIS § 5.9) provides information on radiological impacts of normal operation
  - Combined radiation dose from CPS and proposed plant would be well within 40 CFR Part 190, 10 CFR Part 20, and 10 CFR Part 50, Appendix I
  - No observable health impacts on the public
  - Occupational doses would be within regulatory limits and health impacts would be SMALL

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Operation Impacts, cont'd

- ER Chapter 7 (EIS § 5.10) describes impacts of postulated accidents using ABWR and AP1000
  - These designs have been analyzed under design certification process
  - Environmental risks of accidents would be small compared to safety goals
  - EIS did not evaluate the impacts of severe accidents involving other reactor designs
  - If non-LWR design is chosen, further analysis would be required at COL stage
- ER § 5.10 (EIS § 5.11) provides information on measures and controls to limit adverse impacts during operation
  - Compliance with applicable laws, ordinances, and regulations to prevent or minimize adverse environmental impacts
  - Compliance with applicable permit and licensing requirements
  - Compliance with Exelon procedures
  - EIS concludes that procedures and controls are technically and economically feasible, and adequate to avoid or mitigate adverse impacts

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Impacts of the Fuel Cycle, Transportation and Decommissioning

- ER § 5.7 (EIS § 6.1) provides information on the impact of the uranium fuel cycle
  - Fuel cycle impacts given in Table S-3 of 10 CFR § 51.51(b)
  - Impacts would be SMALL
    - EIS concludes that additional reviews required at COL stage because of uncertainty associated with design of gas-cooled reactors
- ER § 5.7 (EIS § 6.2) addresses transportation of radioactive materials
  - Environmental effects of transportation contained in Table S-4 to 10 CFR Part 51
  - EIS adjusts Table S-4 to account for difference in reactor output
  - Impacts of transportation would be SMALL
    - EIS concludes that additional reviews required at COL stage because of uncertainty associated with design of gas-cooled reactors
- Impacts of decommissioning
  - At the ESP stage, an applicant need not discuss decommissioning
  - EIS states that impacts are expected to be SMALL
  - This issue will be addressed at COL stage

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Cumulative Impacts

- EIS § 7 considers potential cumulative impacts
  - Cumulative fuel cycle and transportation impacts for non-LWRs and decommissioning impacts will be addressed at COL stage
  - For other areas, EIS concludes that impacts would be generally SMALL
  - However, several areas have potential for MODERATE impact:
    - Cumulative water use and quality impacts in dry years
    - Water intake structure impacts, if best available technology not used
    - Aquatic environment impacts following dry years
    - Cumulative impacts of thermal discharge
    - Physical impacts to roads due to heavy truck traffic
    - Aesthetic and recreational impacts in severe drought
  - In these cases, mitigation measures may be warranted, such as derating or shutdown of the unit

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Alternatives

- ER § 9.1 (EIS § 8.1) considers the no-action alternative
  - Proposed action is to grant the ESP
  - No-action alternative means ESP is denied
  - If ESP is denied, no new construction or operation of facility occurs at site
  - However, it would accomplish none of the benefits of an ESP, including:
    - early resolution of siting and environmental issues
    - banking site for future nuclear plant
    - facilitation of future decisions on whether to build new plants

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Design Alternatives and Energy Alternatives

- ER § 9.2 (EIS § 8.2) discusses energy alternatives
  - Conservation is not a reasonable alternative to base load generation
  - Service life extensions are not reasonable alternatives, because they would not provide additional baseload generation capacity
  - Other types of economically viable new baseload facilities, such as coal and natural gas, are not environmentally preferable
  - Combination of renewable sources and non-nuclear sources are not environmentally preferable
  - Purchased power would likely come from coal, natural gas, or nuclear generation facilities and would not avoid environmental impacts
- EIS § 8.3 considers plant design alternatives to the proposed heat dissipation systems
  - No information is available on impact of dry cooling towers, which will be reviewed at COL stage if applicant proposes this design
  - Design alternatives not required for ESP; Exelon assumed wet/dry design as bounding

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Alternative Sites

- ER § 9.3 (EIS § 8.5) evaluates alternative sites in Region of Interest (Illinois)
- Greenfield or former industrial sites are not environmentally preferable to an existing nuclear site
- Impact on non-nuclear site would be greater than on site with existing nuclear facility
- Six nuclear sites were evaluated

Byron	Braidwood
Quad Cities	Zion
Dresden	LaSalle

- Exelon eliminated Byron, Quad Cities, and Dresden for insufficient land
- Remaining three sites were compared with Clinton for environmental preferability
- None of the alternative sites is environmentally preferable

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Other Factors

- ER § 10.1 (EIS § 10.1) discusses unavoidable adverse impacts
  - There would be no unavoidable adverse impacts from granting of the ESP
  - New nuclear plant would disturb land, decrease lake level during dry periods, increase use of local services, and result in radiation doses
  - EIS concludes that most of these impacts would be SMALL, but impact of cooling system on water in low water years would be MODERATE
- ER § 10.2 (EIS § 10.1) discusses irreversible and irretrievable commitments of resources
  - Commitment of construction materials such as concrete and steel, and of uranium during operation.
  - Commitment is expected to be small in comparison to availability
- ER § 10.3 (EIS § 10.3) evaluates short-term uses versus long-term productivity
  - Activities authorized by ESP are unlikely to adversely affect the long-term productivity of the environment
  - A full assessment of impact of construction and operation on long-term productivity will be performed at COL stage

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EIS Complies with NEPA (Environmental Finding 1)

- EIS complies with NEPA § 102(2)(A), which requires federal agencies to utilize a systematic, interdisciplinary approach
  - NRC's EIS closely parallels NUREG-1555
  - NRC Staff utilized the expertise of professional scientists, engineers, and social scientists
- EIS complies with NEPA § 102(2)(E), which requires federal agencies to evaluate alternatives
  - EIS § 8 considers no action alternative, energy alternatives, plant design alternatives, and alternative sites

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EIS Complies with NEPA (Environmental Finding 1)

NEPA Section 102(2)(C) Requires Evaluation of	**EIS Section**
(1) the environmental impact of the proposed action	4 – Construction Impacts 5 – Operational Impacts 6 – Impacts of Fuel Cycle, Transportation, and Decommissioning 7 and 10.4 – Cumulative Impacts
(2) any adverse impacts which cannot be avoided	10.1 – Unavoidable Adverse Environmental Impacts
(3) alternatives to the proposed action	8.1 – No-Action Alternative 8.2 – Energy Alternatives 8.3 – System Design Alternatives 8.5, 8.6, and 9 – Alternative Sites
(4) the relationship between local short-term uses of man's environment and the maintenance and enhancement of long-term productivity	10.3 – Relationship between Short-Term Uses and Long-Term Productivity of the Human Environment
(5) any irreversible and irretrievable commitment of resources	10.2 – Irreversible and Irretrievable Commitments of Resources

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EIS Complies with Part 51 (Environmental Finding 1)

Part 51 Procedural Requirement	Conformance to Requirement
issuance of a notice of intent to prepare an EIS (§ 51.116)	68 Fed. Reg. 66,130 (November 25, 2003)
scoping (§§ 51.28 and 51.29)	EIS Appendix D
notice and distribution of a draft EIS for public comments (§§ 51.73, 51.74, and 51.117)	70 Fed. Reg. 12,022 (March 10, 2005)
responding to public comments (§ 51.91)	EIS Appendix E
notice and distribution of the final EIS (§§ 51.93 and 51.118)	71 Fed. Reg. 42,884 (July 28, 2006)
public availability of EIS (§ 51.120)	The draft EIS was publicly available, as discussed in EIS, p. E-1. The final EIS is publicly available at http://www.nrc.gov/reading-rm/doc-collections/nuregs/staff/sr1815/

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EIS Complies with Part 51 (Environmental Finding 1)

Substantive Requirement	**Conformance to Requirement**
Cover sheet	EIS, pp. i – iii; 71 Fed. Reg. 42,884 (July 28, 2006)
Summary	EIS Executive Summary
Table of Contents	EIS, pp. v – xix
Purpose of and Need for Action	EIS Section 1.3
Alternatives including the proposed action	EIS Sections 8 and 9
Affected Environment	EIS Section 2
Environmental Consequences and Mitigating Actions	EIS Sections 4, 5, 6, 7, and 10.1 – 10.3; including an assessment of aquatic impacts in Sections 4.3 and 5.3 and radiological impacts in Sections 4.9, 5.9, and 6, and fuel cycle impacts from Table S-3 in EIS Table 6-1.
List of Preparers	EIS Appendix A
List of Agencies, Organizations and Persons to whom Copies of the Statement are Sent	*See* EIS Appendices B and E
Substantive Comments Received and NRC Staff Responses	EIS Appendix E
Index	*See* Table of Contents
Appendices	EIS Volume 2
Status of compliance	EIS Section 1.5 and Appendix F
Recommendations	EIS Section 10.5

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Balance among Conflicting Factors (Environmental Finding 2)

- Most environmental impacts would be SMALL
  - Some impacts could be MODERATE and could be mitigated
- The ESP site is suitable from an environmental standpoint for ESP facility
- ESP should be issued to preserve option of using site for construction and operation of ESP facility
- Need for power from ESP facility and final cost-benefit balance will be determined at COL stage

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Consideration of Reasonable Alternatives (Environmental Finding 3)

- A range of reasonable alternatives has been considered
  - No-action alternative is not preferable because it would not accomplish purposes of the proposed action
  - There are no reasonable alternative energy sources that are both viable/competitive and environmentally preferable
  - There are no obviously superior sites
  - Due consideration has been given to design alternatives to reduce the impact of heat dissipation
- ESP does not need any additional conditions to protect environmental values
- ESP should be issued as recommended in the EIS

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Conclusions

- NEPA review conducted by NRC Staff has been adequate
- ER and EIS contain sufficient information to support Environmental Findings and ESP
- Exelon ESP site is suitable for a nuclear station bounded by the PPE
- ESP should be issued subject to the terms and conditions specified in the EIS