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UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of	)	**Docket No. 52-007-ESP**
Exelon Generation Company, LLC	)	**ASLBP No. 04-821-01-ESP**
(Early Site Permit for Clinton ESP Site)	)	**September 14, 2006**

EXELON GENERATION COMPANY, LLC'S BRIEF IN RESPONSE TO THE BOARD'S AUGUST 2, 2006 ORDER REGARDING SAFETY AND ENVIRONMENTAL FINDINGS

On August 2, 2006, the Atomic Safety and Licensing Board ("Licensing Board" or "Board") in the above captioned proceeding issued an order ("Order") requesting, among other things, that the Exelon Generation Company, LLC ("EGC" or "Applicant") file a brief or briefs indicating how EGC's application ("Application") for an early site permit ("ESP") and the record in this proceeding support: (a) a negative finding as to whether the issuance of an ESP will be inimical to the common defense and security or to the health and safety of the public (Safety Finding 1); and (b) a positive finding as to whether, taking into consideration the site criteria contained in 10 C.F.R. Part 100, a reactor, or reactors having characteristics that fall within parameters for the site, can be constructed and operated without undue risk to the health and safety of the public (Safety Finding 2).[1]

[1] The Board also asked the Nuclear Regulatory Commission Staff ("NRC" or "Staff") to file a brief in support of Safety Findings 1 and 2. In addition, the Board asked the Staff to file a brief indicating how the Application and record of this proceeding support (1) a finding that the requirements of section 102(2)(A),(C), and (E) of (NEPA) and subpart A of 10 C.F.R. Part 51 have been complied with in this proceeding; (2) its view of the balance among conflicting environmental factors contained in the record of the proceeding with a view to determining appropriate action to be taken; and (3) its view (and that of the Applicant) of the consideration of reasonable alternatives (within the constraints of the Commission guidance on this matter), and how that

In response to the Board's Order, EGC provides in this brief: (a) description of the Applicant and Application; (b) a description of the proposed site; and (c) key facts and conclusions in support of Safety Findings 1 and 2, with appropriate citations to the Application and the record. Also, in accordance with EGC's August 15, 2006 letter to the Board and as confirmed by the Board in a September 5 teleconference, EGC also provides in this brief key facts and conclusions in support of the three Environmental Findings, with appropriate citations to the Application and the record.

The Board's Order states that the briefs shall be limited to no more than twenty pages per item addressed. Order at 6. Since many of the facts support more than one Finding, we believe that it is most efficient to provide one integrated brief, rather than separate briefs on each Finding. Accordingly, this brief is limited to 100 pages as it addresses the two Safety Findings and the three Environmental Findings.

I. BACKGROUND ON THE ESP APPLICANT AND APPLICATION

A. Description of the Applicant

The Applicant is EGC. EGC is a limited liability company formed to own, operate, and acquire nuclear and other electric generating stations, to engage in the sale of electrical energy, and to perform other business activities. Exelon Generation Company, LLC Early Site Permit Application, Administrative Information (Rev. 4) ("Admin.") at 3-1. EGC is also one of the nation's largest power producers and wholesale marketers and employs approximately 7,300 individuals. *Id.* Exelon Nuclear, a business unit within EGC, is responsible for the operation of EGC's ten nuclear stations. *Id.*

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affects the determination regarding whether the ESP should be issued, denied, or appropriately conditioned to protect environmental values (hereinafter referred to as the "Environmental Findings 1-3").

EGC is a wholly-owned subsidiary of Exelon Ventures Company, LLC which, in turn, is wholly owned by Exelon Corporation. *Id.* The directors and principal officers of EGC, Exelon Ventures, and Exelon Corporation are U.S. citizens. *Id.* at 3-2. Neither EGC nor its parent, Exelon Ventures, are owned, controlled or dominated by an alien, a foreign corporation, or a foreign government. *Id.*

EGC selected a vacant parcel of land on the Clinton Power Station ("CPS") property, near Clinton, Illinois, as the location of the possible future facility (hereinafter referred to as the "EGC ESP facility"). *Id.* at 3-1. The CPS is a nuclear power plant owned and operated by AmerGen Energy Company, LLC ("AmerGen"). AmerGen was created in 1997 as an equally owned venture of EGC and British Energy. In December 2003, EGC purchased British Energy's fifty percent interest and became the sole owner of AmerGen.[2] *Id.*

As described above, EGC is the Applicant for the ESP. CH2M Hill, under contract with EGC, served as the primary contractor for the development of the Application, including the Site Safety Analysis Report ("SSAR"). The principal expert subcontractors who also assisted in the development of the information in the SSAR include: Parsons Power Group, Inc. (engineering services in preparing the SSAR); Testing Service Corporation (engineering, technical, and laboratory services associated with geotechnical activities); Geomatrix Consultants, Inc. (seismic and geologic data collection, site response studies, and safe-shutdown earthquake determinations); GRL Engineers, Inc. (standard penetration test measurement work); Stratigraphics (cone penetrometer measurements and testing for the geotechnical aspects of the ESP); and the University of Texas (soil sample resonant column and torsional shear testing).

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[2] There is a pending merger of Exelon Corporation and Public Service Enterprise Group ("PSEG"). As a result of the merger, EGC will remain a wholly owned subsidiary of Exelon Corporation and AmerGen will continue to be the owner of the Clinton Power Station and the associated property. The relationship of AmerGen and EGC will not be affected by the merger, and the authorization of the AmerGen officers to support the EGC ESP Application will not be affected. Admin. at 3-2.

Safety Evaluation Report for an Early Site Permit (ESP) at the Exelon Generation Company, LLC (EGC) ESP Site (NUREG-1844) ("SER"), May 2006, at 1-7. Sargent & Lundy and Idaho National Engineering and Environmental Laboratory also conducted independent reviews of draft SSAR sections. The scope of the reviews included all documents and information including reference materials that formed the entire ESP application. Further, an independent board of review evaluated the implementation plan for the seismic hazards work, the interim results of the work, and the conclusions reached during the work. SER at 17-39.

Each of the above contractors and consultants had the necessary technical expertise and nuclear experience to help make EGC's Application both complete and accurate.[3] Through the use of skilled EGC project personnel and key expert contractors, EGC established a qualified, interdisciplinary team with expertise in all key areas of the SSAR and ER.

B. Purpose of the ESP Application

The purpose of the ESP Application is to resolve key site-related safety, environmental and emergency preparedness issues before an NRC decision to authorize construction of a nuclear power facility on that site. Admin. at 1-1. If granted, the ESP would allow EGC to set aside or "bank" the ESP site for possible future construction of one or more new nuclear power generation facilities. *Id.* at 1-2. However, an ESP does not authorize EGC to construct a nuclear facility. Under 10 C.F.R. § 50.10(b), EGC may not construct a nuclear facility without a construction permit ("CP") or combined operating license ("COL").

The Application is premised on the assumption that should EGC ultimately decide to exercise the ESP and seek a CP or COL, the actual facility would be constructed and operated as a merchant plant or plants, co-located with the CPS facility. Admin. at 1-2.

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[3] During its review, the NRC Staff held several meetings with EGC's contractors and consultants to discuss the various technical matters associated with their respective areas of expertise. SER at 1-8; *see id.*, Appendix B.

EGC requests an ESP with a permit duration of 20 years pursuant to 10 C.F.R. Part 52, Subpart A. *Id.* at 3-2. During preparation and review of the ESP Application, EGC did not identify any time-dependant site characteristics that would not fully support a 20 year ESP. *Id.* Such site characteristics would normally involve issues such as demography, meteorology, and locations of nearby industrial hazards. *Id.* None of the data provided in the Application contains conditions or limitations, beyond those normally expected in such an application, which would invalidate a 20 year ESP. *Id.*

EGC also requests approval for certain pre-construction activities on the EGC ESP site in accordance with 10 C.F.R. § 50.10(e)(1) and § 52.17(c). *Id.* at 1-2. EGC has submitted a Site Redress Plan in support of that request. *Id.* at 2-7.

C. Description of the ESP Application

1. Contents of the Application

The ESP application is composed of the following documents: the SSAR, the Environmental Report ("ER"), information related to the Emergency Plan ("EP"), and the Site Redress Plan. 10 C.F.R. Part 52, "Early Site Permits; Standard Design Certifications; and Combined Licenses for Nuclear Power Plants," was used as the principal regulatory criterion for developing the ESP. The following is a brief description of the documents included in the Application.

- The SSAR includes a description of the site, assessment of site features affecting the design(s), meteorological, hydrologic, geologic, and seismic characteristics of the site, dose evaluations, natural and man-made hazards on or near the site, and the impact of site characteristics on preparation of adequate security plans and measures.

- The ER documents the postulated environmental impacts associated with the construction and operation of the EGC ESP facility and considers appropriate mitigation measures, reviews the impacts of design basis and severe accidents, and reviews alternative energy sources and alternative sites.
- As required by 10 C.F.R. § 52.17(b)(1), the Application evaluates whether there are "significant impediments" to the development of an Emergency Plan. Additionally, as permitted by 10 C.F.R. § 52.17(b)(2)(i), the Application identifies the "major features" of an Emergency Plan.
- Should the ESP holder implement those site activities authorized under 10 C.F.R. § 50.10(e)(1), the Site Redress Plan addresses measures that may be necessary to restore the site to the condition suitable for other appropriate use in the event that the project does not proceed to construction.

2. The Plant Parameter Envelope

The regulations in 10 C.F.R. Part 52 and Part 100, "Reactor Site Criteria," that apply to an ESP do not require an ESP applicant to provide specific design information. However, sufficient information must be provided to address 10 C.F.R. § 52.17(a)(1), which calls for an analysis and evaluation of the major structures, systems and components ("SSCs") of the facility that bear significantly on the acceptability of the site under the radiological consequence evaluation factors identified in 10 C.F.R. § 50.34(a)(1).

As permitted by 10 C.F.R. Part 52, EGC has not selected a specific reactor type for the EGC ESP site. SSAR at 1.4-1. To support its application, EGC utilized available information from several reactor plant designs that are either currently commercially available or anticipated to be commercially available within the term of the ESP. *Id.* at 1.3-1. Depending on the reactor

type selected, the EGC ESP facility could have a total core thermal power rating between approximately 2,400 and 6,800 MWt. The EGC ESP facility may consist of a single reactor or multiple reactors (or modules) of the same reactor type. *Id.* at 1.2-1. Designs considered include the Advanced Boiling Water Reactor ("ABWR"), AP1000 Reactor, Pebble Bed Modular Reactor ("PBMR"), Gas Turbine Modular Helium Reactor ("GTMHR"), the Advanced CANDU Reactor ("ACR"), the International Reactor Innovative and Secure ("IRIS") reactor, and the Economic Simplified Boiling Water Reactor ("ESBWR"). *Id.* at 1.3-1 to -4. These reactor designs formed the basis for the development of the Plant Parameter Envelope ("PPE"). *Id.* at 1.3-1. The PPE identifies a set of design parameters that are expected to bound the design of a reactor or reactors that might be deployed at the site, and serves as a surrogate for actual facility information. *Id.* at 1.4-1.

Appropriate design parameters were identified for inclusion in the PPE through a systematic review of regulatory criteria and guidance, ESP application content requirements, and experience with previous site suitability studies. *Id.* at 1.4-1. The actual plant parameter values were developed considering the values provided by various reactor vendors and by applying appropriate conservatism where required to characterize the surrogate facility. *Id.* at 1.4-2. As applicable, the most limiting (maximum or minimum) bounding value was selected. *Id.* The plant parameters were used to characterize (1) the functional or operational needs of the plant from the site's natural or environmental resources, (2) the plant's impact on the site and surrounding environs, and (3) the site-imposed requirements on the plant. *Id.* at 1.4-1. The set of EGC ESP plant parameter values, which are listed in Table 1.4-1 of the SSAR, envelops the EGC ESP facility. This type of facility characterization is considered sufficient to assess the future use of the site from both a safety and environmental perspective. SER at 1-6.

The NRC Staff reviewed the PPE values and concluded that the PPE values are generally based on certified design information and the best available information for not yet certified designs. *Id.* at 1-5 to -6. The Staff also found EGC's PPE values to be reasonable and that some of the PPE values have been modified to include margin. *Id.* at 1-6.

Under the PPE approach, any future design that is demonstrated to be bounded by the PPE is suitable for the site, and the ESP will remain valid. Therefore, the EGC ESP facility may consist of one or more of the reactors considered in development of the PPE, or may consist of a different design that falls within the range of parameters included in the PPE. In terms of safety reviews, this means that potential designs will be no more demanding from a site suitability and safety perspective than the bounding design parameters of the PPE. SSAR at 1.4-1; SER at 1-5. In terms of environmental reviews, this means that environmental impacts of the selected design will not be significantly greater than environmental impacts evaluated in the bounding design parameters of the PPE. SSAR at 1.4-1; *see* EIS at 3-2 to -5.

It is possible that one or more parameters of the actual EGC ESP facility may not fall within the bounds of the PPE. In such an event, the applicant for the CP or COL may need to request a variance from the ESP in accordance with 10 C.F.R. § 52.39(b).

3. Quality Assurance (QA) for the ESP Application

ESP holders and applicants are not required to implement QA programs compliant with 10 C.F.R. Part 50 Appendix B. Nevertheless, the Applicant employed quality assurance measures for ESP activities. CH2M HILL, the Applicant's primary contractor for developing the ESP application, provided quality assurance for its ESP activities, as well as oversight of subcontractors that worked on various aspects of the application. The Staff reviewed the implementation of the QA program developed by CH2M HILL and the other subcontractors.

The SER concludes that the quality assurance measures conform to the guidance in Review Standard (RS) RS-002, "Processing Applications for Early Site Permits," ("RS-002"), Attachment 2, as well as appropriate industry standards. SER at 1-2. The SER further states that the QA measures used by the Applicant and its contractors help provide reasonable assurance that any information derived from ESP activities that is used in the design and/or construction of structures, systems, and components important to safety will support satisfactory performance once these are placed in service. *Id.* at 17-40.

II. DESCRIPTION OF THE PROPOSED SITE

The ESP site is located approximately 700 feet south of the existing CPS. SSAR at 2.1-1. The EGC ESP site boundary is the same as the CPS property lines. *Id.* at 2.1-2. The site and its environs consist primarily of area for the future EGC ESP facility, the existing CPS facilities, Clinton Lake, woodlands, pasture land, cultivated farm land, and recreation areas. *Id.* The total area encompassed by the site boundary is about 14,180 acres. *Id.* Except for CPS, the CPS Energy and Environmental Center, and the site recreational facilities, there are no industrial or commercial structures on the site. Four residential structures on the site property are leased by AmerGen. *Id.*

EGC selected the location in part because the existing nuclear site is already developed and dedicated to nuclear use. *Id.* at 1-1. Initially, two identical units were planned for the CPS site, but only one was constructed and is operating. *Id.* at 1.2-1. Considerable site data exist and have been submitted to and reviewed by the NRC for the present CPS facility. *Id.* at 1-1.

While the EGC ESP facility will be co-located with the CPS, the EGC ESP facility will be essentially independent of the CPS. With the exception of the CPS ultimate heat sink ("UHS") (which may be used as an emergency source of makeup water for the EGC ESP facility

UHS), no CPS safety-related systems or equipment will be shared or cross-connected.[4] *Id.* at 1.2-2. Clinton Lake will be used as the normal source of makeup water for the cooling water system. *Id.*

III. SAFETY FINDINGS 1 AND 2

As described above, the Application includes the SSAR and information related to the Emergency Plan. The results of the Staff review of the SSAR and Emergency Plan information are documented in the SER.[5] Together, these documents demonstrate how the Application and record of this proceeding fully support a negative finding as to whether the issuance of an ESP will be inimical to the common defense and security or to the health and safety of the public (Safety Finding 1) and a positive finding as to whether, taking into consideration the site criteria contained in 10 C.F.R. Part 100, a reactor, or reactors having characteristics that fall within parameters for the site, can be constructed and operated without undue risk to the health and safety of the public (Safety Finding 2).

A. EMERGENCY PLAN

As required by 10 C.F.R. § 52.17(b), the ESP Application must:

- (1) "identify physical characteristics unique to the proposed site . . . that could pose a significant impediment to the development of emergency plans," and
- (3) describe "contacts and arrangements with local, state, and federal government agencies with emergency planning responsibilities."

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[4] Some structures, such as warehouse and training buildings, and some support facilities, such as domestic water supply and sewage treatment, may be shared. The existing switchyard will be expanded to accommodate the output of the new facility and provide the necessary offsite power. The portion of the existing switchyard intended for the cancelled unit will be used for this purpose. SSAR at 1.2-2.

[5] The Staff's review of the ER and the Site Redress Plan are documented in the Environmental Impact Statement for an Early Site Permit (ESP) at the Exelon ESP Site (NUREG-1815) ("EIS"), July 2006, which is discussed in Section IV below.

In addition, under 10 C.F.R. § 52.17(b)(2), the Applicant may provide complete and integrated emergency plans or may propose major features of emergency plans. Guidance for major features is provided in NUREG-0654/FEMA-REP-1, Rev. 1, Supplement 2, "Criteria for Emergency Planning in an Early Site Permit Application" (1996). In the event that an ESP applicant elects to describe major features, a COL applicant would need to provide complete and integrated emergency plans for a new facility or facilities at the COL stage, which the NRC Staff will review to ensure compliance with the requirements in 10 C.F.R. § 50.47 and 10 C.F.R. Part 50, Appendix E. SER at 13-2. EGC elected to propose the major features of the Emergency Plan for the EGC ESP facility, as permitted by 10 C.F.R. § 52.17(b).

1. Applicable Regulatory Criteria

The principal regulatory bases for the Emergency Plan information provided in the Application include the following:

- 10 C.F.R. § 52.17(b)
- 10 C.F.R. § 100.21(g)
- NUREG-0654/FEMA-REP-1, Rev. 1, "Criteria for Preparation and Evaluation of Radiological Emergency Response Plans and Preparedness in Support of Nuclear Power Plants" (1980)
- NUREG-0654/FEMA-REP-1, Rev. 1, Supplement 2, "Criteria for Emergency Planning in an Early Site Permit Application" (1996)

2. NRC Review of Emergency Plan Information

The results of the NRC Staff review of the Emergency Plan information are documented in Section 13 of the SER. The Staff conducted its review of the Application in accordance with RS-002. SER at 13-1.

In summary, the Staff made the required findings on whether the Emergency Plan provides sufficient information to demonstrate that no physical characteristics unique to the

proposed ESP site could pose a significant impediment to the development of emergency plans. *Id.* at 13-14. The Staff also determined that the Emergency Plan provides an acceptable description of contacts and arrangements made with Federal, State, and Local governmental agencies with emergency response planning responsibilities. *Id.* at 13-17. Finally, the Staff determined whether the Emergency Plan provides sufficient information for the Staff to evaluate and conclude that the major features for emergency planning are adequately addressed and consistent with NRC guidance and regulatory requirements. *See id.* at 13-17 to -79. The bases for these determinations are provided below.

Significant Impediments to Development of an Emergency Plan. The Emergency Plan provides information demonstrating that no physical characteristics unique to the proposed ESP site could pose a significant impediment to the development of emergency plans. *See* Emergency Plan at 2.4-1. The 1993 evacuation time estimate ("ETE") for the CPS plume exposure pathway served as the basis for the ESP ETE. *Id.* at 2.3-1. The SER concludes that the Applicant adequately evaluated evacuation times for potentially affected areas surrounding the ESP site and, using population growth rate projections and considering demography, topography, land characteristics and use, road networks, and jurisdictional boundaries. SER at 13-2 to -11. The SER states that the Emergency Plan demonstrates that no physical characteristics unique to the ESP site could pose a significant impediment to the development of emergency plans. *Id.* at 13-14. The information is also consistent with NRC guidance in RS-002 and meets the requirements of 10 C.F.R. § 52.17(b)(1) and 10 C.F.R. § 52.18. *Id.*

Contacts and Arrangements with Federal, State, and Local Agencies. The Emergency Plan provides a description of contacts and arrangements made with Federal, State, and Local governmental agencies with emergency response planning responsibilities. *See* Emergency Plan

at 3.2-2 to -3, Appendix A. The SER states that this information is consistent with NRC guidelines and meets the requirements of 10 C.F.R. § 52.17(b)(3). SER at 13-17.

Major Features of the Emergency Plans. The Emergency Plan provides information on the major features for emergency plans. With one exception, the SER concludes that the major features are adequately addressed and consistent with NRC guidance and regulatory requirements. *See id.* at 13-17 to -79. Compliance with each major feature is described below.

	MAJOR FEATURE	DESCRIPTION
A	Assignment of Responsibility (Organization Control)	Section 3.1 of the EP identifies the Federal, State, local, and private sector organizations that are intended to be part of the overall emergency response organization, including the functions and the responsibilities for major elements of response, and the legal bases for State and local authorities. The SER states that proposed Major Feature A is acceptable and consistent with the guidance in RS-002 and Supplement 2. SER at 13-22.
B	Onsite Emergency Organizations	Section 3.1 of the EP identifies the interfaces between and among the onsite functional areas of emergency activity, local services support, and State and local government response organizations. The EP also identified services to be provided by local agencies for handling emergencies. The SER states that proposed Major Feature B is acceptable and consistent with the guidance in RS-002 and Supplement 2. SER at 13-25.
C	Emergency Response Support and Services	Sections 3.1 and 3.4 of the EP describes provisions for requesting Federal assistance, identifies nuclear and other organizations that can provide assistance in an emergency, and describes contacts and arrangements made with the response organizations. The SER states that proposed Major Feature C is acceptable and consistent with the guidance in RS-002 and Supplement 2. SER at 13-28.
D	Emergency Classification System	Sections 4.1, 4.2, 4.3, and 4.4 of the EP identify the emergency classification scheme comprising four categories – unusual event, alert, site area emergency, and general emergency. The SER states that proposed

		Major Feature D is acceptable and consistent with the guidance in RS-002 and Supplement 2. SER at 13-28 to -29.
E	Notification Methods and Procedures	Section 5.1 of the EP describes the mutually agreeable bases for notifying response organizations, consistent with NUREG-0654/FEMA-REP-1, and includes the method for alerting, notifying, and mobilizing personnel and the means for notifying and promptly instructing the public within the 10-mile emergency planning zone (EPZ). The SER states that proposed Major Feature E is acceptable and consistent with the guidance in RS-002 and Supplement 2. SER at 13-31.
F	Emergency Communications	Section 6.1 of the EP identifies communication provisions with State and local governments within the EPZs and describes provisions for alerting and activating emergency personnel. The SER states that proposed Major Feature F is acceptable and consistent with the guidance in RS-002 and Supplement 2. SER at 13-28.
G	Public Education and Information	Sections 7.1, 7.2, and 7.5 of the EP describe the program to provide information to the public and news media, on a periodic basis, that addresses public notification and emergency actions. The SER states that proposed Major Feature G is acceptable and consistent with the guidance in RS-002 and Supplement 2. SER at 13-38.
H	Emergency Facilities and Equipment	Sections 8.1.2, 8.1.3, and 8.2 of the EP describe the facilities and related equipment in support of emergency response, including the Emergency Operations Facility (EOF), the Operations Support Center (OSC) and Technical Support Center (TSC). The EP has minimal information related to the OSC and TSC, because design certifications typically contain the design information for an OSC and TSC. Therefore, the SER states that the Applicant did not provide sufficient information in support of Major Feature H and did not make findings regarding its acceptability. SER at 13-43. Complete and integrated emergency plans will, however, be required at the COL stage.
I	Accident Assessment	Sections 3.1, 9.1 and 9.2 (among others) describe methods, systems, and equipment for assessing and

		monitoring actual and potential offsite radiological consequences of a radiological emergency at the EGC ESP site, including associated contacts and arrangements. The SER states that proposed Major Feature I is acceptable and consistent with the guidance in RS-002 and Supplement 2. SER at 13-45.
J	Protective Response	Section 10.1 of the EP describes a range of protective actions for the plume exposure pathway EPZ for both public and emergency workers, including guidance for the choice of protective actions that are consistent with Federal guidance and protective actions for the ingestion pathway EPZ. The SER states that proposed Major Feature J is acceptable and consistent with the guidance in RS-002 and Supplement 2. SER at 13-63 to -64.
K	Radiological Exposure Control	Section 11.1 of the EP describes the means for controlling radiological exposures to emergency workers in an emergency. The SER states that proposed Major Feature K is acceptable and consistent with the guidance in RS-002 and Supplement 2. SER at 13-70.
L	Medical and Public Health Support	Section 12.1 of the EP describes the contacts and arrangements for medical services for contaminated, injured individuals, including local and backup hospital and medical services having the capability for evaluating radiation exposure and uptake. The SER states that proposed Major Feature L is acceptable and consistent with the guidance in RS-002 and Supplement 2. SER at 13-72.
O	Radiological Emergency Response Training	Section 15.1 of the EP describes a radiological emergency response training program (including initial and periodic training) for those who may be called on to assist in an emergency, including a training program for instructing and qualifying personnel who would implement the radiological emergency response plans. The SER states that proposed Major Feature O is acceptable and consistent with the guidance in RS-002 and Supplement 2. SER at 13-75.
P	Responsibility for the Planning Effort: Development, Periodic Review, and Distribution of	Section 16.1 of the EP describes the responsibilities for plan development and review, as well as for distribution and update of emergency plans. The SER

	Emergency Plans	states that proposed Major Feature P is acceptable and consistent with the guidance in RS-002 and Supplement 2. SER at 13-80.

Conclusions. In conclusion, the Applicant's Emergency Plan information satisfies 10 C.F.R. § 52.17(b)(1) and (3), in that it demonstrates that there is no significant impediment to the development of emergency plans for the EGC ESP facility, and it contains a description of contacts and arrangements made with local, state, and federal governmental agencies with emergency planning responsibilities. Additionally, the Application provides sufficient information to satisfy 10 C.F.R. § 52.17(b)(2)(i) with respect to thirteen major features of the Emergency Plan.

B. SSAR

As noted above, the SSAR includes a description of the site and an assessment of site characteristics affecting the design(s). The SSAR contains the following principal sections: (1) Chapter 1 – Introduction and Description of the Proposed facility, including an overview of the site and possible reactor types, along with a PPE listing; (2) Chapter 2 – Site Characteristics, addressing geography and demography, nearby industrial transportation and military facilities, meteorology, hydrologic engineering, and geologic and seismic engineering; and (3) Chapter 3 – Site Safety Assessment, addressing effluents, thermal discharges, radiological consequences of accidents, and conformance with 10 C.F.R. Part 100.

1. Applicable Regulatory Criteria

The principal regulatory bases for the SSAR include the following:

- 10 C.F.R. Part 50, "Domestic Licensing of Production and Utilization Facilities," primarily applicable provisions in §§ 50.33 and 50.34.

- 10 C.F.R. Part 52, "Early Site Permits; Standard Design Certifications; and Combined Licenses for Nuclear Power Plants," including § 52.17 which requires the applicant to submit information needed to evaluate the factors involving the characteristics of the site.
- Subpart B to 10 C.F.R. Part 100, "Reactor Site Criteria," which requires the consideration of factors relating to the size and location of the proposed site.
- Review Standard (RS) RS-002, "Processing Applications for Early Site Permits," which provides detailed guidance for the review of ESP applications, provides references to applicable review criteria, and is based upon NUREG-0800, "Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants"

2. NRC Review of the SSAR

The results of the NRC Staff's review of the SSAR are documented in Sections 1 to 19 of the SER. The SER delineates the scope of technical matters the Staff considered in evaluating the ESP application and the suitability of the proposed site. The NRC standards for review of an ESP application are outlined in 10 C.F.R. § 52.18. The NRC conducted its review of the Application in accordance with RS-002. SER at v.

The SER provides the required findings on the safety-related matters addressed in the Application, including seismology, geology, meteorology, hydrology, and hazards from man-made facilities and activities on or in the vicinity of the site. *Id.* at 2-11 to -309. The SER also assesses the risks of potential accidents that could occur as a result of operation of a nuclear power facility at the site and whether the site would support adequate physical security measures for a nuclear power facility. *Id.* at 13-80 to -82, 15-1 to -9.

During its review, the Staff confirmed that all open and confirmatory items from the draft SER ("DSER") had been resolved or completed. *Id.* at 1-9. The Staff also identified 32 COL Action Items. COL Action Items identify issues that do not need to be resolved prior to the issuance of the ESP (*e.g.*, because they pertain to the design of the facility that will not be finalized until the COL proceeding), but that will need to be addressed at the COL stage. The

Staff also recommended six Permit Conditions; issuance of the ESP will be contingent on these limitations. The Permit Conditions, or limitations on the ESP, are based on the provisions of 10 C.F.R. § 52.24, "Issuance of Early Site Permit." The COL Action Items and Permit Conditions are listed in Appendix A of the SER. The conclusions of the Staff's evaluation and independent review of the SSAR are described in Section 19 of the SER.

3. Review by the Advisory Committee on Reactor Safeguards

The Advisory Committee on Reactor Safeguards ("ACRS") reviewed the ESP application and the NRC Staff's Draft Safety Evaluation Report ("DSER") and supplemental DSER. The ACRS ESP subcommittee met with the Applicant and the NRC Staff on September 7, 2005, and the full ACRS committee met to discuss the ESP DSER on September 8, 2005. The final SER documents the Staff's actions taken in response to the ACRS comments and recommendations. In accordance with 10 C.F.R. § 52.23, the ACRS issued a March 24, 2006 letter to the NRC Chairman (included as Appendix E of the final SER) concluding that: (1) the ESP application and final SER show that the proposed facility adjacent to the existing CPS is an acceptable site for nuclear power plants that meet the PPE proposed by the Applicant and (2) the Staff has thoroughly reviewed a performance-based method proposed by the Applicant for determining the safe shutdown earthquake ground motion.

4. Key Facts and Conclusions in Support of Safety Findings 1 and 2

The following summarizes key facts and conclusions from the SSAR and SER that demonstrate how the Application and record of this proceeding fully support a negative finding on Safety Finding 1 and a positive finding on Safety Finding 2. The facts and conclusions are numbered for the convenience of the Board, and appropriate citations to the Application and record are provided for each fact and conclusion.

The facts and conclusions are arranged as follows:

- First, key facts are provided pertaining to the safety issues that are required to be addressed by 10 C.F.R. § 52.17 and Part 100, including key facts pertaining to Geography and Demography; Nearby Industrial, Transportation, and Military Facilities; Meteorology; Hydrologic Engineering; Geology, Seismology, and Geotechnical Engineering; Radiological Effluents; Thermal Discharges; Radiological Consequences of Accidents; and Security, as these issues pertain to siting.
- Second, based upon the key facts and the Application, key conclusions are provided related to conformance of the Application to each of the applicable NRC regulations.
- Finally, given the above, a basis is provided for each of the two safety findings that the Board is required to make.

Geography and Demography

1. Site Location and Description. SSAR § 2.1.1 provides information regarding site location and boundary that could affect the design of systems, structures, and components important to safety of a nuclear facility that might be constructed on the proposed EGC ESP site. SSAR Figures 1.2-1 to -4 show the site property boundary and the areas of proposed new facility construction. The approximately 14,180 acre property site and its environs include woodlands, pasture land, cultivated farmland, recreational areas, and the man-made Clinton Lake. SSAR at 2.1-2. The SER reviews the site location and description information and concludes that it is sufficient to evaluate compliance with siting evaluation factors in 10 C.F.R. Part 100 and 10 C.F.R. § 52.17, subject to a COL action item.[6] SER at 2-3.

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[6] The COL or CP Applicant should provide latitude, longitude, and Universal Transverse Mercator coordinates for new unit(s) on the ESP site. (COL Action Item 2.1-1) SER at A-4.

2. Exclusion Area Authority and Control. SSAR § 2.1.2 provides information regarding the exclusion area for the EGC ESP site and the authority and control over ingress to and egress from the exclusion area. The boundary lines for the exclusion area for both the currently operating unit and the new facility (as defined in 10 C.F.R. Part 100) are shown on SSAR Figure 2.1-8. AmerGen, a subsidiary of Exelon Corporation, owns the real estate on which the EGC ESP facility will sit, including the exclusion area, with the exception of a right of way for a township road that traverses the exclusion area to provide access to privately held property outside the exclusion area. SSAR at 2.1-3 and Figure 1.2-3. AmerGen has the authority to control activities within the exclusion area. *Id.* at 2.1-3. In an emergency, EGC and local law enforcement will control access to the exclusion area via this township road. *Id.* To meet the exclusion area control requirements of 10 C.F.R. § 100.21(a) and 10 C.F.R. § 100.3, the applicant need not demonstrate total control of the property before issuance of the ESP. SER at 2-5. Should EGC decide to apply for a CP or COL, EGC anticipates entering into an agreement whereby AmerGen would grant EGC an exclusive and irrevocable option, exercisable prior to the start of construction, to purchase, enter a long-term lease for, and/or procure other legal right in the land required by the EGC ESP facility. In addition to the rights EGC acquires in the land for the EGC ESP facility, the EGC will enter an Exclusion Area Agreement with AmerGen. SSAR at 2.1-3. The AmerGen Management Committee has authorized AmerGen's officers to negotiate an Exclusion Area Agreement with EGC. Admin. at 3-4. The aggregate result will provide EGC with full control of the exclusion area for the EGC ESP facility, to the extent necessary to comply with applicable NRC guidance. *Id.* at 3-3 to -4. The SER identifies Permit Conditions and a COL action item to ensure this occurs at the COL stage.[7]

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[7] The COL or CP applicant should demonstrate that it has been granted the legal right to exercise sufficient control of the exclusion area to satisfy the requirements of 10 C.F.R. Part 100. (Permit Condition 1) SER at A-

3. Population Distribution. SSAR § 2.1.3 provides information regarding current and predicted population in the area surrounding the ESP site, including the exclusion area, 2.5 mile low population zone ("LPZ"), and nearest population center based on U.S. Census Bureau data from 2000 and projections through 2060, based on Illinois State University studies. *Id.* at 2.1-5 to -6. No member of the public lives within the exclusion area. The community of Clinton, with a population of over 7,000, is approximately 6 miles west of the ESP site. *Id.* at 2.1-4. The closest population center (a community with 25,000 or more inhabitants) likely to exist over the lifetime of the proposed ESP site is Decatur, approximately 22 miles south-southwest of the ESP site, with a 2000 population of 81,860. *Id.* at 2.1-8. This distance is well in excess of the minimum population center distance of 3.3 miles as calculated in accordance with the requirements of 10 C.F.R. § 100.21(b). SER at 2-9. The SER concludes that the SSAR provides an acceptable description of current and projected population densities in and around the site and properly specified the LPZ and population center distance, and that the supplied data meets the requirements of 10 C.F.R. § 52.17 and 10 C.F.R. Part 100. *Id.* at 2-10.

Nearby Industrial, Transportation, and Military Facilities

4. Locations and Routes; Descriptions. SSAR § 2.1 and 2.2 provide information regarding potential man-made hazards in the site vicinity. Nearby highway, rail, and pipeline locations are shown in SSAR Figure 2.2-1. The only rail line within five miles of the site is the Gilman Line of the Canadian National Railroad, which passes approximately one mile from the proposed EGC facility. SSAR at 2.2-1. The closest military installation is 23 miles from the ESP site and there are no missile sites within 50 miles of the ESP site. *Id.* at 2.2-4, and Table 2.2-1. SSAR

2. Also, the COL or CP applicant should obtain the authority to undertake the preparatory activities authorized by 10 C.F.R. § 52.25 and the corresponding right to implement the site redress plan described in the Staff's final EIS, in the event that no plant is built on the ESP site. (Permit Condition 2) *Id.* at A-2. Additionally, the COL or CP applicant should make arrangements with the appropriate public agencies to provide for control of the portion of Clinton Lake within the exclusion area. (COL Action Item 2.1-2) *Id.* at A-4.

Figure 2.2-1 shows the location of oil and gas pipelines within the vicinity of the ESP site. One pipeline traverses the current CPS exclusion area within one mile of the ESP site. *Id.* at 2.2-2. This pipeline transports low volatility gasoline and diesel fuel. While it is configured for more volatile fuels, such as propane, the use of the pipeline appears unlikely to change. *Id.* In the unlikely event that the pipeline owner wants to transport propane in this pipeline, the pipeline would be relocated or appropriate mitigating measures would be implemented. *Id.* The area around the ESP site is not heavily industrialized, and CPS is the largest industrial facility in the vicinity. *Id.* at 2.2-1 to -2. DeWitt County has no passenger air service or public airports, but has seven private airstrips, three of which are within six miles of the ESP site. *Id.* at 2.2-3 and Figure 2.2-1. The SER reviews the information included in the SSAR, as well as information obtained from other sources, to evaluate the potential for man-made hazards in the vicinity of the ESP site, and concludes that the SSAR has adequately identified the hazards, subject to a COL action item.[8] SER at 2-14 to -15. Further, the SER reviews the information on aircraft hazards in SSAR § 2.2.2.5 and contains an independent analysis to determine that aircraft hazards pose no undue risk to the health and safety of the public, and concludes that the site is acceptable from the perspective of aircraft hazards. *Id.* at 3.4.

5. Evaluation of Potential Accidents. SSAR § 2.2.3 provides information regarding potential accidents related to the presence of hazardous materials or activities in the vicinity of the ESP site. This information includes evaluation of flammable vapor clouds, aircraft crashes, toxic chemicals, and railroad accident fires. The SER concludes that the site location is acceptable with regard to potential accidents that could affect a nuclear power facility based on the PPE and that the site location meets the requirements of 10 C.F.R. § 52.17(a)(1)(vii), 10 C.F.R. §

[8] A COL or CP applicant should also assess design-specific interactions between the existing and new units and, if necessary, propose measures to account for such interactions. (COL Action Item 2.2-1) SER at A-4.

100.20(b), and 10 C.F.R. § 100.21(e). SER at 2-18. When the control room location and design is identified at the COL stage, the applicant will need to perform a new analysis of the airborne hazards associated with a toxic chemical accident on the Gilman railroad line. This evaluation will be based on control room location, ventilation system design, and the analytic methodology for dispersion and transport of airborne hazardous materials. *Id.* at 2-17 to -18.

Meteorology

6. Regional Climatology. SSAR § 2.3.1 provides information concerning regional climatology and meteorology, including the averages and extremes of climatic conditions that could affect the design and siting of a nuclear power plant(s) that falls within the PPE values and that might be constructed on the site. SSAR § 2.3.1.2.2 provides information regarding tornado parameters consistent with NRC guidance and interim Staff position on design-basis tornado characteristics for a tornado with a maximum wind speed of 300 miles per hour. As described in the SER, the Staff directed Pacific Northwest National Laboratories to perform an independent review, and the SER concludes that the proposed design-basis tornado site characteristics are acceptable. SER at 2-28. The SER also states that the SSAR considers the most severe regional weather phenomenon (hail, thunderstorms, tornadoes, winter precipitation, high and low temperature conditions, and high air pollution potential) in establishing the regional and site meteorological characteristics and it concludes that such characteristics meet the requirements in 10 C.F.R. § 100.20(c) and 10 C.F.R. § 100.21(d). *Id.* at 2-33 to -34.

7. Local Meteorology. SSAR § 2.3.2 provides information concerning local meteorological, air quality and topographical characteristics of importance to the safe design and operation of a nuclear power plant(s) falling within its PPE that might be constructed on the proposed site. The SER also states that the SSAR identifies the most severe local weather phenomenon at the site

and surrounding area. SER at 2-39. After the COL Action Item[9] is taken into account, the SER concludes that the SSAR's identification and consideration of the meteorological, air quality, and topographical characteristics of the site and surrounding area meet the requirements of 10 C.F.R. § 100. 20(c) and 10 C.F.R. § 100.21(d). *Id.* at 2-39.

8. Onsite Meteorological Measurements Program. SSAR § 2.3.3 provides information regarding the onsite meteorological measurements program and the data used to characterize atmospheric dispersion conditions for the site. In response to the Staff's Request for Additional Information (RAI) 2.3.3-1, the Applicant provided to the Staff the onsite meteorological database used to generate the short and long-term diffusion estimates in SSAR §§ 2.3.4 and 2.3.5. The SER concludes that the supplied information provides data adequate to represent onsite meteorological conditions, as required by 10 C.F.R. § 100.20. SER at 2-43.

9. Short-Term Diffusion Estimates. SSAR § 2.3.4 provides information regarding short-term diffusion estimates for postulated accidental airborne releases of radioactive effluents to the exclusion area boundary ("EAB") and LPZ (atmospheric dispersion factors or χ/Q values). The SER contains an independent evaluation and concludes that the short-term diffusion and atmospheric dispersion estimates provided in the SSAR are adequately conservative and appropriate for the assessment of consequences from radioactive releases for postulated design-basis accidents in accordance with 10 C.F.R. § 100.21, subject to a COL Action Item.[10] SER at 2-47 to -49.

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[9] The COL or CP applicant should, as part of detailed engineering, assess the potential impact of icing and moisture plumes due to natural and/or mechanical cooling towers on local meteorological conditions and therefore on the design and operation of the new facility. (COL Action Item 2.3-1) SER at A-5.

[10] The COL or CP applicant should assess the dispersion of airborne radioactive materials to the control room. (COL Action Item 2.3-2) SER at A-5.

10. Long-Term Diffusion Estimates. SSAR § 2.3.5 provides information regarding diffusion estimates for long-term (routine releases) of effluents to the atmosphere, including bounding values for routine release points. The SSAR provides atmospheric diffusion estimates for routine airborne releases of radioactive effluents to the site boundary, EAB, LPZ, and special receptors of interest. As described in the SER, the Staff conducted an independent evaluation and obtained similar results. SER at 2-52. When the COL Action Item[11] is taken into account, the SER concludes that characterization of long-term atmospheric transport and diffusion conditions in the SSAR complies with the requirements of 10 C.F.R. § 100.21(c)(1) and is appropriate for demonstrating compliance with the numerical guides for dose contained in Appendix I to 10 C.F.R. Part 50. *Id.* at 2-55.

Hydrologic Engineering

11. Hydrologic Description. SSAR § 2.4.1 provides information regarding hydrology of the ESP site, including descriptions of rivers, streams, lakes, water-control structures, and users of these waters. The proposed EGC ESP facility would use Clinton Lake as the source of cooling water, using closed-cycle cooling with wet, dry, or wet/dry hybrid cooling towers as the plant's normal heat sink. SER at 2-56. The UHS, if required, would consist of mechanical draft cooling tower(s) with no water storage. The submerged UHS pond for CPS would supply the makeup water to the UHS for the EGC ESP facility for a period of 30 days. When the COL Action Items[12] are taken into account, the SER concludes that SSAR § 2.4.1 conforms to RS-002 §

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[11] The COL or CP applicant should verify specific release point characteristics and specific locations of potential receptors of interest used to generate the long term (routine release) atmospheric dispersion site characteristics. (COL Action Item 2.3-3) SER at A-5.

[12] A COL or CP applicant should ensure that the ESP facility intake is installed with adequate clearance from the CPS facility piping. (COL Action Item 2.4-1) SER at A-5. A COL or CP applicant should also provide the detailed design of the UHS system, if a UHS system is required by the selected reactor type for the facility. (COL Action Item 2.4-1) *Id.*

2.4.1, and that the SSAR meets the requirements for general hydrologic descriptions with respect to 10 C.F.R. § 52.17(a) and 10 C.F.R. § 100.20(c). *Id.* at 2-56, 2-70.

12. Floods. SSAR § 2.4.2 provides information regarding potential for flooding at the Clinton Lake and ESP site. Flood history data indicates that Clinton Lake is significantly attenuating flood flows in Salt Creek. SSAR at 2.4-3. (Clinton Lake was formed by a dam across Salt Creek.) All safety-related structures at the EGC ESP facility would either be above the maximum combined effects Clinton Lake water surface elevation, or be designed to withstand the effects of inundation. *Id.* at 2.4-4. The SER states that the SSAR appropriately considers the most severe flooding that has been historically reported for the site and surrounding area, with sufficient margin for the limited accuracy, quantity, and period of time in which the historical data has been accumulated. SER at 2-80. When the COL Action Items[13] are taken into account, the SER concludes that SSAR § 2.4.2 conforms to Section 2.4.2 of RS-002, and that the SSAR meets the requirements concerning floods with respect to 10 C.F.R. § 52.17(a) and 10 C.F.R. § 100.20(c). SER at 2-80.

13. Probable Maximum Flood on Streams and Rivers. SSAR § 2.4.3 provides information regarding the probable maximum flood ("PMF") on streams and rivers that are reasonably possible in the region. The PMF analyses were performed in accordance with NRC Regulatory Guide 1.59. SSAR at 2.4-5. The Staff performed an independent analysis to verify the Applicant's PMF analysis. SER at 2-85. The SER states that the SSAR considers the most severe natural phenomena that have been historically reported for the site and surrounding area in establishing the stream and river design flood, with sufficient margin for the limited accuracy,

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[13] A COL or CP applicant should design the ESP intake structure(s) to withstand the combined effects of the probable maximum flood, coincident wind wave activity, and wind setup. (COL Action Item 2.4-3) SER at A-5. A COL or CP applicant should also demonstrate that the ESP site drainage from intense local precipitation can be discharged to Clinton Lake without relying on any active drainage systems that may be blocked during such an event. (COL Action Item 2.4-4) *Id.* at A-6.

quantity, and period of time in which the historical data has been accumulated. *Id.* at 2-95. The SER concludes that SSAR § 2.4.3 conforms to Section 2.4.3 of RS-002, and that the SSAR meets the requirements concerning PMF on streams and rivers with respect to 10 C.F.R. § 52.17(a) and 10 C.F.R. § 100.20(c). *Id.* at 2-95.

14. Potential Dam Failures. SSAR § 2.4.4 provides information regarding potential dam failures at the site. There are no dams upstream or downstream of Clinton Dam the loss of which could affect the ESP site safety-related facilities or the cooling water supply, and the loss of Clinton Dam will not result in a loss of water from the submerged UHS pond. SSAR at 2.4-10. The Staff independently verified the information in the SSAR. The SER states that the SSAR considers the most severe natural phenomenon that have been historically reported for the site and surrounding area in establishing the design basis dam failure, with sufficient margin for the limited accuracy, quantity, and period of time in which the historical data has been accumulated. SER at 2-100. The SER concludes that the SSAR conforms to Section 2.4.4 of RS-002, Attachment 2, and that it meets the requirements of 10 C.F.R. § 52.17(a) and 10 C.F.R. § 100.20(c) with respect to potential dam failures. *Id.* at 2-96, 2-100.

15. Probable Maximum Surge and Seiche Flooding. SSAR § 2.4.5 provides information regarding surge and seiche flooding at the site, conservatively estimating that the maximum storm surge at the site is 0.3 feet. SSAR at 2.4-10. The Staff concluded that the ESP site is not subject to storm surge. Further, the Staff performed an independent evaluation to estimate seiche effects, concluding that forced resonance and seismically induced seiche were unlikely on Clinton Lake. SER at 2-102 to -105. The SER also states that the seismically induced flooding analysis reflects the most severe seismic event historically reported for the site and surrounding areas (with sufficient margin for the limited accuracy, quantity, and period of time in which the

historical data has been accumulated). *Id.* at 2-105. The SER concludes that SSAR § 2.4.5 conforms to Section 2.4.5 of RS-002, Attachment 2, and that the SSAR meets the requirements concerning probable maximum surge and seiche flooding with respect to 10 C.F.R. § 52.17(a) and 10 C.F.R. § 100.20(c). *Id.* The SER also concludes that the SSAR conforms to General Design Criteria ("GDC") 2, insofar as the flooding analysis defines design bases for seismically induced surge and seiche. *Id.*

16. Probable Maximum Tsunami Flooding. SSAR § 2.4.6 provides information regarding the probable maximum tsunami flooding, including the effects of a lake tsunami caused by a hillslope failure, concluding that landslide-induced tsunamis do not pose a threat to the site. SSAR at 2.4-10. The Staff conducted an independent review, concluding that the effects of even the largest ocean or Great Lakes tsunami would not affect the Clinton ESP Site in central Illinois, and that hillslope failure-induced tsunamis did not pose a risk to the ESP site. SER at 2-107. The SER also states that the SSAR considers the most severe natural phenomenon that have been historically reported for the site and surrounding area in establishing the design bases for tsunamis, with sufficient margin for the limited accuracy, quantity, and period of time in which the historical data has been accumulated. *Id.* The SER concludes that the SSAR meets the requirements to identify and evaluate tsunami flooding under 10 C.F.R. § 52.17(a) and 10 C.F.R. § 100.20(c), and that the SSAR conforms to that portion of GDC 2 related to tsunamis. *Id.* at 2-108.

17. Ice Effects. SSAR § 2.4.7 provides information regarding the identification and evaluation of ice effects on Clinton Lake on the EGC ESP facility. The SSAR evaluates the effects of ice jams, estimates the average thickness of an ice sheet that could form on Clinton Lake, and evaluates the effects of such an ice sheet. SSAR 2.4-10 to -13. The Staff performed an

independent estimation of maximum ice thickness and proposed a maximum ice thickness of 27 inches as a site characteristic. SER at 2-127. When the COL Action Items[14] are taken into account, the SER concludes that the SSAR considers the most severe natural phenomenon that have been historically reported for the site and surrounding area in establishing the design basis information pertaining to ice effects, with sufficient margin for the limited accuracy, quantity, and period of time in which the historical data has been accumulated. *Id.* at 2-128. Similarly, taking the COL Action Items into account, the SER concludes that the SSAR conforms to RS-002, Attachment 2, Section 2.4.7, and that the SSAR meets the requirements to identify and evaluate ice effects with respect to 10 C.F.R. § 52.17(a) and 10 C.F.R. § 100.20(c). *Id.*

18. Cooling Water Canals and Reservoirs. SSAR § 2.4.8 provides information identifying and evaluating cooling water canals and reservoirs at the site. The EGC ESP facility would use Clinton Lake as the source of cooling water and raw water, and no changes will be made to the Clinton Dam. SSAR at 2.4-13. A new intake structure will be added to supply water to the EGC ESP facility. *Id.* The SSAR evaluates lake capacity in drought conditions, the effects of the estimated PMF, and the impact of the new facility on the submerged UHS pond, its submerged dam, baffle dike, and the existing discharge flume. As described in the SER, the Staff visually inspected the site on May 11, 2004 and determined that the SSAR accurately describes the intakes, discharge canals, outfalls, and reservoirs near the ESP site. SER at 2-137. When the COL Action Items[15] are taken into account, the SER concludes that the SSAR considers the most

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[14] The COL or CP applicant should demonstrate that the intake structure can withstand the effects of any ice sheet crushing, bending, buckling, splitting, or a combination of these modes. (COL Action Item 2.4-5) SER at A-6. The COL or CP applicant should also design the ESP facility UHS intake to maintain a minimum water temperature of 40 degrees F at all times to preclude formation of frazil and anchor ice on the intake inlet. (COL Action Item 2.4-6) *Id.* Additionally, the COL or CP applicant should ensure that the ice sheet formed on Clinton Lake would not constrain the intake. This is predicated on the ESP facility UHS intake being located at an elevation of 669 ft MSL. (COL Action Item 2.4-7) *Id.*

[15] A COL or CP applicant should ensure that any water-cooled UHS that may be required is designed to a maximum of 30-day makeup water requirement not exceeding 87 acre-ft. (COL Action Item 2.4-8) SER at A-

severe natural phenomenon that have been historically reported for the site and surrounding area in establishing the design basis information pertaining to cooling water canals and reservoirs, with sufficient margin for the limited accuracy, quantity, and period of time in which the historical data has been accumulated. *Id.* at 2-144. Similarly accounting for the COL Action Items, the SER concludes that the SSAR conforms to "Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants," (SRP) § 2.4.8, and that the SSAR meets the requirements for cooling water canals and reservoirs at the site under 10 C.F.R. § 52.17(a) and 10 C.F.R. § 100.20(c)(3). *Id.*

19. Channel Diversions. SSAR § 2.4.9 provides information regarding channel diversion and notes that there is no historical evidence of channel diversion in Salt Creek or the North Fork of Salt Creek upstream of Clinton Dam. SSAR at 2.4-18. Based on topographic characteristics and geologic features of the drainage basin, landslides that might lead to blockage of stream flow into Clinton Lake are not possible. *Id.* The Staff's independent review and research confirmed that there is no historical evidence of major channel diversion in the area. SER at 2-146. The SER states that even if channel migration were to stop all flow into Clinton Lake, it would not adversely affect the safety of the EGC ESP facility. *Id.* at 2-147. The SER further states that the SSAR considers the most severe natural phenomenon that have been historically reported for the site and surrounding area in establishing the design basis information related to channel diversions, with sufficient margin for the limited accuracy, quantity, and period of time in which the historical data has been accumulated. *Id.* The SER concludes that SSAR § 2.4.9 conforms to

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6. The COL or CP applicant should also establish that the ESP facility normal heat sink is designed such that there is no over-reliance on the UHS for frequent plant shutdowns. (COL Action Item 2.4-9) *Id.* at A-7. Additionally, the COL or CP applicant should ensure the monitoring and any required dredging of the submerged UHS pond. (COL Action Item 2.4-10) *Id.*

Section 2.4.9 of RS-002, and that the SSAR meets the requirements to identify and evaluate channel diversion at the site under 10 C.F.R. § 52.17(a) and 10 § C.F.R. § 100.20(c). *Id.*

20. Flooding Protection Requirements. SSAR § 2.4.10 provides information regarding flooding protection of the site. The approximate grade level for the EGC ESP facility of 735 ft. above sea level is approximately 19 ft. above the maximum wave run-up level and 25 ft. above the PMF still water level. SSAR at 2.4-19. The safety-related facilities in the station area would not be affected by the PMF conditions in the lake. The only EGC ESP facility structure that may be affected by the PMF is the intake structure, which, if required, will be designed with appropriate flood protection. *Id.* The Staff independently estimated the maximum water surface elevation at the site for the design basis, and accepted the Applicant's calculations. *See* SER at 2-93; SSAR at 2.4-19.[16] The SER further found that the SSAR considers the most severe natural phenomenon that have been historically reported for the site and surrounding area in establishing the design basis information for flood protection, with sufficient margin for the limited accuracy, quantity, and period of time in which the historical data has been accumulated. SER at 2-149 to -150. The SER concludes that the SSAR conforms to SRP Section 2.4.10 as applicable to the ESP site, and that the SSAR meets the flooding protection requirements at the site under 10 C.F.R. § 52.17(a) and 10 C.F.R. § 100.20(c), when COL Action Item 2.4-3 is taken into account (*see* discussion in Paragraph 12 above). *Id.* at 2-149.

21. Low-Water Considerations. SSAR § 2.4.11 provides information regarding low-water considerations (*e.g.*, low flow in Salt Creek, seiches, wind-induced set-down, intake blockages from sediment or ice). The SSAR estimates the minimum lake water levels at 685 and 681.4 feet above mean sea level during 50 and 100-year droughts, respectively. SSAR at 2.4-22. Both

[16] Page 2-148 of the SER states that the Staff's design basis flood calculation was 721.7 feet. This is incorrect. *See* SER at 2-73, 2-93, 2-97, 2-147, 2-175, A-20 (identifying 716.5 feet as the maximum water elevation).

minimum lake levels are well above the minimum CPS lake level of 677 feet above sea level. *Id.* The SER states that the SSAR considers the most severe natural phenomenon that have been historically reported for the site and surrounding area in establishing the design basis information for low-water conditions, with sufficient margin for the limited accuracy, quantity, and period of time in which the historical data has been accumulated. SER at 2-157. When the COL Action Item[17] is taken into account, the SER concludes that the SSAR conforms to Section 2.4.11 of RS-002 and meets the requirements for low water conditions under 10 C.F.R. § 52.17(a) and 10 C.F.R. § 100.20(c). *Id.*

22. Accidental Releases of Liquid Effluents to Ground and Surface Waters. SSAR §§ 2.4.12 and 2.4.13.3 provide information pertaining to the identification and evaluation of accidental releases of liquid effluents in ground water and surface water at the site. When the COL Action Item and Permit Conditions[18] are taken into account, the SER concludes that the SSAR conforms to Section 2.4.13 of RS-002, Attachment 2, and meets the requirements to identify and evaluate accidental releases of liquid effluents to ground and surface water at the site under 10 C.F.R. § 52.17(a) and 10 C.F.R. § 100.20(c). SER at 2-169.

23. Ground Water. SSAR § 2.4.13 provides information regarding ground water for the site and notes that ground water would not be used for either normal or safety-related plant operations. The SER states that the SSAR's description of regional hydrogeologic conditions and onsite and offsite groundwater use is accurate. SER at 2-161. When the COL Action Items and Permit

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[17] A COL or CP applicant should develop a plant shutdown protocol when water level falls to 677 feet above sea level. (COL Action Item 2.4-11) SER at A-7.

[18] A COL or CP applicant should conclusively prove that there will be no likely scenario that can lead to liquid radioactive release to the ambient groundwater, either above the ambient groundwater table, or below it. (COL Action Item 2.4-14) SER at A-8. Also, proposed Permit Condition 4 requires that a radwaste facility design include features to preclude any and all accidental releases of radio-nuclides to any potential liquid pathway. *Id.* at A-3. Additionally, proposed Permit Condition 5 requires the institution and maintenance of a ground water monitoring program for the life of the EGC facility, including decommissioning. *Id.*

Condition[19] are taken into account, the SER concludes that the SSAR conforms to Section 2.4.12 of RS-002, Attachment 2, and meets the requirements to identify and evaluate ground water characteristics at the site under 10 C.F.R. § 52.17(a) and 10 C.F.R. § 100.20(c). *Id.* at 2-164.

Geology, Seismology, and Geotechnical Engineering

24. Site and Regional Geology. SSAR § 2.5.1 provides information regarding regional and site geology, including potential hazard conditions caused by human activities (*e.g.*, mining activities or ground water depression), as input for the characterization of the geological and seismological characteristics of the site. The Staff, assisted by the U.S. Geological Survey, evaluated the SSAR's information, focusing on tectonic and seismic information, nontectonic deformation information, and conditions caused by human activities. The SER states that the SSAR provides a thorough characterization of the geological and seismological characteristics of the site, as required by 10 C.F.R. § 100.23. SER at 2-200. These results provide an adequate basis to conclude that no capable tectonic sources exist in the site areas that have the potential to cause near-term surface fault displacement. *Id.* The SER also states that the SSAR identifies and appropriately characterizes the seismic sources significant to determining the safe shutdown earthquake ("SSE") for the ESP site, and therefore satisfies 10 C.F.R. § 100.23(c) and General Design Criterion 2. *Id.* Additionally, the SER concludes that the proposed ESP site is acceptable from a geological and seismological standpoint and meets the requirements of 10 C.F.R. § 100.23. *Id.*

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[19] A COL or CP applicant should ensure ground water will not be used in normal or safety-related plant operations. (COL Action Item 2.4-12) SER at A-7. A COL or CP applicant should also establish conservative ground water flow velocities and conservative soil properties representative of the hydrogeologic conditions at the site. (COL Action Items 2.4-13) *Id.* Also, proposed Permit Condition 3 requires that the hydraulic gradient will always point inwards into the radwaste holding and storage facility from ambient ground water during construction and operation of the EGC ESP facility. *Id.* at A-3.

25. Vibratory Ground Motions. SSAR § 2.5.2 provides a description of the geological, seismological, and engineering characteristics of the ESP site and of the region surrounding the site, as required by 10 C.F.R. § 100.23. SSAR § 2.5.2 also contains evaluations that address the inherent uncertainties in the determination of the Safe Shutdown Earthquake (SSE) response spectrum through the use of a probabilistic seismic hazards analysis ("PSHA"). The SER states that the SSAR adequately addresses uncertainties inherent in the characterization of seismic hazards through a PSHA, and that the PSHA follows the guidance of Regulatory Guide 1.165 "Identification and Characterizations of Seismic Sources and Determination of Safe Shutdown Earthquake Ground Motion." SER at 2-273. The determination of the SSE response spectrum deviates from Regulatory Guide 1.165 guidance in one area. Regulatory Guide 1.165 states that a reference hazard probability of median 1E-5/year should be used to determine the SSE. This reference probability was established based upon an evaluation of the probability of exceeding the SSE design spectra for 29 existing nuclear power plants in Central and Eastern United States ("CEUS"), that have seismic designs that use the Regulatory Guide 1.60 standard design response spectrum based upon assessments of geological and seismological data available in the 1980's. More recent data indicates that the reference probability will continue to be subject to change as the seismic hazard for CEUS sites change with the collection of new data, making the reference probability an unstable metric for future application to determine SSE response spectra. Therefore, rather than develop a new reference probability based on this more recent data or conservatively use the reference probability in Regulatory Guide 1.165, EGC decided to use a national consensus standard, American Society of Civil Engineers (ASCE) / Structural Engineering Institute (SEI) Standard ASCE/SEI 43-05. ASCE/SEI 43-05 Standard establishes uniform performance goal-based procedures for the determination of the SSE response spectrum

for a site based on combining PSHA with seismic design criteria and procedures. The most stringent performance goal of ASCE/SEI 43-05 Standard is to keep SSCs essentially within elastic limits at a mean annual target performance frequency of 1E-5. For a plant using the methodology in ASCE/SEI 43-05 Standard, the seismic core damage frequency would be less than the mean seismic core damage frequency of existing nuclear plants. ASCE/SEI 43-05 provides for a consistent level of seismic risk performance for all plants using the methodology, whereas Regulatory Guide 1.165 provides for a shifting level of performance as new data impacting the seismic hazard becomes available for the reference plants. *See* SSAR § 2.5.4.9. After thorough review, the Staff concluded that the performance-based approach is an advancement over the reference probability approach recommended in Regulatory Guide 1.165. SER at 2-273. The SER states that the SSE, which was developed using the performance-based approach, adequately represents the regional and local seismic hazards and accurately includes the effects of the local ESP site subsurface properties. *Id.* Accordingly, the SER concludes that the proposed ESP site is acceptable from a geological and seismological standpoint and meets the requirements of 10 C.F.R. § 100.23. *Id.*

26. Surface Faulting. SSAR § 2.5.3 provides information regarding the potential for surface faulting and the potential for surface tectonic deformation at the ESP site. The Staff evaluated the investigations performed by the Applicant, including a site visit with the assistance of U.S. Geological Survey advisors. SER at 2-275. The SER concludes that the Applicant performed its surface faulting investigations for the site in accordance with 10 C.F.R. § 100.23 and Regulatory Guide 1.165 and that the SSAR provides an adequate basis to establish that no capable tectonic sources exist in the site vicinity that would cause surface deformation in the site area. *Id.* at 2-

276. The SER also concludes that the site is suitable from the perspective of tectonic surface deformation and meets the requirements of 10 C.F.R. § 100.23. *Id.*

27. Stability of Subsurface Materials and Foundations. SSAR § 2.5.4 provides information regarding the overall subsurface profile and the engineering properties of the soil and rock underlying the ESP site. The SER reviews and agrees with the site characteristics and the values for those characteristics, subject to COL Action Items and a Permit Condition.[20] SER at 2-307.

28. Stability of Slopes. SSAR § 2.5.5 states that slope stability analyses were not carried out for the Application – either for the CPS UHS or any other slopes that could be associated with future development – because the design of the EGC ESP facility has not yet been developed. As provided in COL Action Item 2.5.5-1,[21] a COL or CP applicant will conduct a more detailed dynamic analysis of the stability of the existing slope and any new slopes using the SSE ground motion.

29. Embankments and Dams. SSAR § 2.5.6 describes the assessment of the Clinton Lake main dam and the CPS UHS as it relates to the potential for seismically induced floods and water

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[20] The analysis of the liquefaction potential of the soil revealed that portions of the upper 60 feet of soil are susceptible to liquefaction; these soils would be either removed or replaced during construction. (Permit Condition 6). SER at A-3. Additionally, the COL applicant should: (1) conduct a soil-rock-structure analysis (COL Action Item 2.5.4-1); (2) address Regulatory Guide 1.132 requirements for geologic mapping of future excavation for safety-related structures when determining the number, location, depth, and type of explorations for soil drilling and sampling (COL Action Item 2.5.4-2); (3) submit plot plans and profiles of all seismic Category I facilities for comparison with subsurface profile and material properties (COL Action Item 2.5.4-3); (4) provide detailed excavation and backfill plans or plot plans and profiles as outlined in Section 2.5.4 of RS-002 (COL Action Item 2.5.4-4); (5) map any future excavation associated with the construction of a new nuclear plant to confirm that the soil types and consistency are in agreement with the conditions identified in the ESP explorations, and to inform the Staff (a) if it encounters previously unknown geologic features that could represent a hazard to the plant, and (b) when site excavations are open for examination and evaluation (COL Action Item 2.5.4-5); (6) submit evaluations of ground water conditions as they affect the loading and stability of foundation materials, the procedures for dewatering during construction, and ground water control throughout the life of the plant (COL Action Item 2.5.4-6); (7) perform a complete static stability assessment, including bearing capabilities, settlement analyses, and lateral load assessment, and ensure that the bearing capacities meet the minimum value of 25 tons per square foot (COL Action Item 2.5.4-7); and (8) develop and submit design criteria and methods for the ESP site Category I structures, including the factors of safety from the design analyses. (COL Action Item 2.5.4-8) *Id.* at A-8.

[21] A COL or CP applicant should conduct a more detailed dynamic analysis of the stability of the existing slope and any new slopes using the SSE ground motion. (COL Action Item 2.5.5-1) SER at A-9.

waves. The SER's conclusions regarding dam failures, seiche flooding, and slope stability are discussed above.[22] *See* Paragraphs 14, 15, and 28, above.

Radiological Effluents

30. Gaseous Effluents. SSAR § 3.1.1 provides information regarding the control, collection, processing, storage, and disposal of potentially radioactive gases during plant operation including startup, normal operations, shutdown, refueling, and anticipated operational occurrences. The normal gaseous effluents are released from the plant to the environment via waste processing systems designed to minimize the releases to and impact on the environment. SSAR at 3.1-1. The release of radioactive gaseous effluents from the facility is controlled and monitored based upon the regulatory limits specified in 10 C.F.R. Part 20 and 10 C.F.R. Part 50, Appendix I. *Id.*

31. Liquid Effluents. SSAR § 3.1.2 provides information regarding the control, collection, processing, storage, and disposal of potentially radioactive liquids during plant operation including startup, normal operations, shutdown, refueling, and anticipated operational occurrences. The system will typically be operated in a manner that minimizes release of radioactivity to the environment. The CPS facility currently does not routinely discharge radioactive liquid wastes into the Clinton Lake. SSAR at 3.1-2. It is likely that the EGC ESP facility will also not routinely discharge radioactive liquid to the environment. *Id.* However, the SSAR includes a bounding assessment to demonstrate the capability of complying with the 10 C.F.R. Part 20 and 10 C.F.R. Part 50, Appendix I regulatory requirements at the EGC ESP site. *Id.*

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[22] A COL or CP applicant should assess the performance of the submerged dam forming the UHS under the ESP SSE ground motion. (COL Action Item 2.5.6-1) SER at A-9.

32. Solid Waste. SSAR § 3.1.3 provides information regarding the control, collection, handling, processing, packaging, and temporary storage prior to off-site shipment of wet and dry solid radioactive waste materials generated during normal plant operations. Shipments of solid radioactive waste material will be made periodically between the EGC ESP Site and the permanent waste disposal facility. SSAR at 3.1-4. The waste will be packaged and shipped in accordance with applicable regulations in 10 C.F.R. Part 71 and 49 C.F.R. Part 173. *Id.*

33. NRC Conclusions Regarding Gaseous and Liquid Effluents and Solid Waste. The SER states that the SSAR provides adequate information to provide reasonable assurance that the Applicant would control, monitor, and maintain radioactive gaseous and liquid effluents and solid waste from the ESP facility within the regulatory limits in 10 C.F.R. Part 20, 10 C.F.R. Part 71, and 49 C.F.R. Part 173, and maintain them at ALARA levels in accordance with the effluent design objectives set forth in Appendix I to 10 C.F.R. Part 50, subject to a COL Action Item.[23] SER at 11-3.

Thermal Discharges

34. Normal Plant Heat Sink. SSAR § 3.2.1 provides information on the normal heat sink ("NHS") which provides cooling water for condensing turbine exhaust steam and cooling turbine auxiliaries in a light water reactor, helium cooling in a gas-cooled reactor plant, and cooling for other non-safety components during normal operation. Makeup water for the NHS cooling towers would be withdrawn from Clinton Lake. SSAR at 3.2-2. The SER states that the normal heat sink is likely to be able to perform its function consistent with the maximum thermal discharge assumed in the PPE and that the consequences of the normal heat sink operation on the

[23] A COL or CP applicant should verify the calculated radiological doses to members of the public from radioactive gaseous and liquid effluents are bounded by the radiological doses described in the SSAR and reviewed by the Staff. (COL Action Item 11.1-1) SER at A-10.

UHS are acceptable and should not lead to frequent plant shutdown or frequent use of the UHS. SER at 2-173.

35. Ultimate Heat Sink. SSAR § 3.2.2 provides information on the UHS. Some of the possible reactor technology designs considered for the PPE will require safety-related cooling water systems. For these designs, the UHS will provide safety-related cooling water to various reactor plant cooling water systems and components that are used for accident mitigation and safe shutdown. The UHS function for the EGC ESP facility may be provided by the safety-related cooling towers that will provide the heat rejection from the safety-related cooling water systems. SSAR at 3.2-3. The safety class supply of makeup water for the cooling tower basins is provided from Clinton Lake. *Id.* at 3.2-3 and 3.2-4. The SER concludes that the SSAR meets the requirements of 10 C.F.R. § 52.17(a) and 10 C.F.R. § 100.20(c). SER at 2-176.

Radiological Consequences of Accidents

36. 10 C.F.R. § 50.34(a) Requirements. 10 C.F.R. § 52.17(a) and § 50.34(a) require the SSAR to evaluate a postulated fission product release from the core into the containment, assuming that the facility is operated at the ultimate power level contemplated, and determine that: (1) an individual located at any point on the EAB for any two hour period following the accident would not receive a radiation dose in excess of 25 rem total effective dose equivalent; and (2) an individual located at any point on the outer boundary of the LPZ, who is exposed to the radioactive cloud resulting from the accident during the entire period of its passage would not receive a radiation dose in excess of 25 rem total effective dose equivalent.

37. Selection of Postulated Accidents. SSAR § 3.3.1 provides information on a bounding and representative set (in terms of frequency and consequences) of postulated accidents that cover a spectrum of design basis accidents ("DBAs") and reactor types. Consistent with regulatory

objectives for determining site suitability, the selection includes low probability accidents postulated to result in significant releases of radioactivity to the environs. SSAR at 3.3-1. In addition, accidents of higher frequency but with lower potential for significant releases are considered to permit quantitative assessment of the spectrum of potential risks at the EGC ESP Site. *Id.* The SER concludes that the SSAR includes DBAs that are consistent with those analyzed in NUREG-0800 and provides an acceptable DBA selection for evaluating the compliance of the proposed ESP site with the dose consequence evaluation factors specified in 10 C.F.R. § 50.34(a)(1). SER at 15-5.

38. Source Terms. Since a plant design has not yet been selected for the EGC ESP facility, actual source terms do not exist for the performance of accident dose analyses. However, as described in SSAR § 3.3, EGC performed bounding accident dose analyses for the ESP, using PPE source terms derived from the ABWR and AP1000. *See* SER at 15-5; SSAR at 3.3-4 and Table 3.3-2. The SER states that the PPE values described in the SSAR for source terms included as inputs to the radiological consequence analyses are reasonable and acceptable. SER at 15-8 to -9.

39. Postulated Accidents. SSAR §§ 3.3.2 and 3.3.4 provide information regarding postulated accidents and accident dose consequences, including radiological consequence analyses using site-specific χ/Q values and PPE source term values. The SSAR evaluates a representative set of design bases accidents selected to demonstrate site suitability. SSAR at 3.3-1. The proposed distances to the EAB and the LPZ outer boundary of the proposed ESP site, in conjunction with the fission product release rates to the environment provided by the PPE values, are adequate to provide reasonable assurance that the radiological consequences of the design bases accidents will be within the dose consequence evaluation factors set forth in 10 C.F.R. § 50.34(a)(1) for the

ESP site. SER at 15-9. The SER concludes that the SSAR demonstrates that the proposed ESP site is suitable for power reactors with source term characteristics bounded by those of the ABWR and AP1000 without undue risk to the health and safety of the public, and the SSAR complies with the requirements of 10 C.F.R. § 52.17 and 10 C.F.R. Part 100. *Id.* at 15-10.

Security

40. Security Planning. SSAR § 3.4.1.6 provides information on the site characteristics pertaining to development of security plans for reactors that might be constructed and operated on the site. The Staff examined pedestrian, vehicle, and water approaches, including existing culverts, nearby railroad lines, nearby hazardous materials facilities, nearby pipelines, and other transportation routes and terrain features. SER at 13-82. The SER concludes that: (1) the EGC ESP facility owner-controlled area is sufficiently large to provide adequate distances between vital areas and the probable location of a security boundary; (2) the owner controlled area is also large enough to meet the 360-feet distance criterion from vital equipment to the protected area fence, as specified in Regulatory Guide 4.7, Rev. 2, "General Site Suitability Criteria for Nuclear Power Stations;" (3) EGC has a security program in place for the existing unit and that there are no identified impediments to the eventual development of an adequate security plan for the EGC ESP facility; and (4) there is sufficient distance available to satisfy the criteria of 10 C.F.R. § 73.55 and the revised design basis threat, subject to a COL Action Item.[24] *Id.* at 13-80.

Conformance with NRC Regulations

41. 10 C.F.R. § 52.17(a)(1). The primary regulation governing the content of the SSAR is 10 C.F.R. § 52.17(a)(1). As shown in the following table, the SSAR complies with each of the requirements in that section.

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[24] A COL or CP applicant should provide specific designs for protected area barriers. (COL Action Item 13.6-1) SER at A-10.

Section 52.17(a)(1) Provision	SSAR Section
Information required by § 50.33 (a) through (d); *i.e.*, name of applicant; address of applicant; a description of the business or occupation of applicant; the state of incorporation and the principal location where it does business; the names, addresses and citizenship of its directors and of its principal officers; and whether it is owned, controlled, or dominated by an alien, a foreign corporation, or foreign government	Administrative Information § 3; see also Section I.A above
Information required by § 50.34 (a)(12) and (b)(10); *i.e.*, information complying with the earthquake engineering criteria in Appendix S to Part 50	2.5; see also Paragraphs 24-29 above
Information required by § 50.33 (g) and (j), and § 50.34 (b)(6)(v) related to emergency planning information and control of restricted data in the application	• See discussion of Emergency Plan information and Section III.A above) • The application does not contain restricted data
An analysis and evaluation of the major structures, systems, and components of the facility that bear significantly on the acceptability of the site under the radiological consequence evaluation factors identified in § 50.34(a)(1)	3.3; see also paragraphs 36-39 above
Site characteristics that comply with Part 100	See discussion below
The number, type, and thermal power level of the facilities for which the site may be used	1.2.3, 1.3, 1.4; see also Section I.C. 2 above
The boundaries of the site	1.2.1, 2.1.1; see also paragraphs 1-2 above
The proposed general location of each facility on the site	1.2, 2.1.1; see also paragraphs 1-3 above
The anticipated maximum levels of radiological and thermal effluents each facility will produce	3.1, 3.2; see also paragraphs 30-35 above
The type of cooling systems, intakes, and outflows that may be associated with each facility	3.2; see also paragraphs 34-35 above

The seismic, meteorological, hydrologic, and geologic characteristics of the proposed site	2.3, 2.4, 2.5; see also paragraphs 6-29 above
The location and description of any nearby industrial, military, or transportation facilities and routes	2.2; see also paragraphs 4-5 above
The existing and projected future population profile of the area surrounding the site	2.1.3; see also paragraph 3 above

42. 10 C.F.R. § 100.21- Non-Seismic Site Criteria. SSAR § 3.4 provides information demonstrating conformance with the requirements of 10 C.F.R. § 100.21, as follows:

Non-Seismic Site Criteria	**SSAR Section**
Exclusion Area and Low Population Zone	3.4.1.1; see also paragraph 2 above
Population Center Distance	3.4.1.2; see also paragraph 3 above
Site Atmospheric Dispersion Characteristics and Dispersion Parameters	3.4.1.3; see also paragraphs 8, 9, 10, 30, 38, and 39 above
Site Characteristics – Meteorology, Geology, Seismology, and Hydrology	3.4.1.4; see also paragraphs 6-29 above
Potential Off-Site Hazards	3.4.1.5; see paragraphs 4 and 5 above
Site Characteristics – Security Plans	3.4.1.6; see also paragraph 40 above
Site Characteristics – Emergency Plans	3.4.1.7; see Section III.A above
Population Density	3.4.1.8; see paragraph 3 above

The criteria in 10 C.F.R. § 100.21 address the "factors to be considered" in 10 C.F.R. § 100.20. Therefore, by demonstrating conformance to § 100.21, the table provided above also demonstrates conformance to § 100.20.

43. 10 C.F.R. § 100.23 - Geologic and Seismic Siting Criteria. As shown in the following table and as discussed in paragraphs 24-29 above, the SSAR contains information demonstrating conformance to the geologic and seismic siting criteria in Section 100.23.

Summary of Applicable Provisions in 10 C.F.R. § 100.23	**SSAR Section**
c) The geological, seismological, and engineering characteristics of a site and its environs must be investigated in sufficient scope and detail to permit an adequate evaluation of the proposed site, to provide sufficient information to support evaluations performed to arrive at estimates of the SSE, and to permit adequate engineering solutions to actual or potential geologic and seismic effects at the proposed site. Data on the vibratory ground motion, tectonic surface deformation, nontectonic deformation, earthquake recurrence rates, fault geometry and slip rates, site foundation material, and seismically induced floods and water waves must be obtained by reviewing pertinent literature and carrying out field investigations.	2.5.1 2.5.2
(d)(1) The SSE for the site is characterized by both horizontal and vertical free-field ground motion response spectra at the free ground surface. The SSE for the site is determined considering the results of the investigations required by paragraph (c) of this section. Uncertainties must be addressed through an appropriate analysis, such as a probabilistic seismic hazard analysis or suitable sensitivity analyses.	2.5.2.6
(d)(2) Sufficient geological, seismological, and geophysical data must be provided to clearly establish whether there is a potential for surface deformation.	2.5.3
(d)(3) The size of seismically induced floods and water waves that could affect a site from either locally or distantly generated seismic activity must be determined.	2.5.6.2
(d)(4) Siting factors for other design conditions that must be evaluated include soil and rock stability, liquefaction potential, natural and artificial slope stability, cooling water supply, and remote safety-related structure siting. Each applicant shall evaluate all siting factors and potential causes of failure, such as, the physical properties of the materials underlying the site, ground disruption, and the effects of vibratory ground motion that may affect the design and operation of the proposed nuclear power plant(s).	2.5.4 2.5.5 2.5.6.1

D. Conclusions on Safety Findings 1 and 2

Safety Finding 1. The Board is required to make a negative finding as to whether the issuance of an ESP will be inimical to the common defense and security or to the health and safety of the public. The information summarized above supports this finding. The site is the within the jurisdiction of the United States. The ESP does not authorize any safety-related construction activities to be conducted on the site. All of the Applicant's and its parent company's directors and principal officers are citizens of the United States, and the Applicant is not owned, dominated or controlled by any alien, foreign corporation, or a foreign government. Additionally, as described in paragraphs 41-43 above, the SSAR complies with the applicable requirements in 10 C.F.R. § 52.17(a) and 10 C.F.R. Part 100 (including the applicable criteria on radiological doses to the public), and as described in Section III.A above, the Emergency Plan information complies with the requirements in 10 C.F.R. § 52.17(b). The Staff's evaluation and independent review of the SSAR and Emergency Planning portions of the ESP application concluded that, taking into consideration the site criteria contained in 10 C.F.R. Part 100, a reactor(s) with the proposed characteristics can be constructed and operated without undue risk to the public. SER at 19-1. For these reasons the issuance of the ESP for the Clinton site will also not be inimical to the common defense and security. *Id.*

Safety Finding 2. The Board is required to make a positive finding as to whether, taking into consideration the site criteria contained in 10 C.F.R. Part 100, a reactor, or reactors having characteristics that fall within parameters for the site, can be constructed and operated without undue risk to the health and safety of the public. The information summarized above supports this finding. As discussed in paragraphs 41-43 above, the EGC ESP site characteristics comply

with the requirements of 10 C.F.R. § 52.17 and 10 C.F.R. Part 100. Further, taking into consideration the site criteria contained in 10 C.F.R. Part 100, reactors having characteristics that fall within the parameters for the site, and which meet the terms and conditions proposed by the Staff in the SER, can be constructed and operated without undue risk to the health and safety of the public. *See* SER at 19-1.

Summary. For the foregoing reasons, the safety review conducted by the NRC Staff has been adequate; the SSAR and SER contain sufficient information to support the Safety Findings and issuance of the ESP; the Clinton ESP site is a suitable location for a nuclear station of the general size and type bounded by the PPE; and the ESP should be issued subject to the terms and conditions specified in the SER.

IV. ENVIRONMENTAL FINDINGS

The Application includes the ER and Site Redress Plan. The results of the Staff's review of the ER and Site Redress Plan are documented in the EIS. As demonstrated below, (a) the EIS fully complies with the requirements of Section 102(2)(A),(C), and (E) of the National Environmental Policy Act, 42 U.S.C. § 4321 *et seq.* (NEPA) and subpart A of 10 C.F.R. Part 51; (2) the EIS appropriately considers and evaluates the environmental factors contained in the record of the proceeding; and (3) the EIS considers reasonable alternatives (within the constraints of the Commission guidance on this matter), and appropriately determines that the ESP should be issued with the Permit Condition identified in Section 4.3.1 of the EIS.

A. Site Redress Plan

The holder of an ESP with an approved Site Redress Plan may, in accordance with 10 C.F.R. §§ 52.17(c) and 52.25(a), perform the site activities allowed by 10 C.F.R.§ 50.10(e)(1), provided that the final ESP EIS concludes that the activities will not result in any significant

adverse environmental impacts that cannot be redressed. These activities could include: preparation for construction, including clearing, grading, and construction of temporary access roads; installation of temporary construction support facilities; excavation for facility structures; construction of service facilities; drilling sample/monitoring wells or other borings; construction of non safety-related cooling towers, plant intake structures, and fire protection equipment; expansion of the existing switchyard and transmission system; modification of the existing discharge flume; and construction of other non safety-related structures, systems, and components. EIS at 4-2 to -3.

In accordance with 10 C.F.R. § 52.17(c), EGC submitted a Site Redress Plan that would be implemented if site-preparation activities were performed, and the ESP were to expire. *Id.* at 4-45. The objective of the Site Redress Plan is to ensure that the EGC ESP site would be returned to an environmentally stable and aesthetically acceptable condition suitable for non-nuclear uses. *Id.* Under the Site Redress Plan, areas that were permanently disturbed would be stabilized and contoured to conform to surrounding areas. *Id.* Revegetation of disturbed lands would also be conducted. *Id.*

Prerequisites of site-preparation activities that must be fulfilled before performing such activities include:

- Documentation of existing site conditions within the EGC ESP site by way of photographs, surveys, listings of existing facilities and structures, or other documentation. This record would serve as the baseline for redressing the site in the event ESP site-preparation activities were terminated as a result of project cancellation or expiration of the ESP.
- Coordination of the movement of the existing CPS protected area boundary, as required.

- Movement, demolition, or ownership transfer of existing CPS buildings and structures within the EGC ESP site.
- Obtaining the necessary permits to perform preconstruction activities, such as local building permits, Illinois Environmental Protection Agency ("IEPA") NPDES permit, IEPA Clean Water Act ("CWA") permit, and the IEPA General Storm Water Permit.

After these prerequisites are completed, planned site-preparation activities could proceed and might include none, some, or all of the activities pursuant to 10 C.F.R. §§ 52.17(c) and 50.10(e)(1). *Id.* at 4-46.

The Staff's review of the Site Redress Plan is included in Section 4.11 of the EIS. The EIS considers whether the pre-construction activities allowed pursuant to 10 C.F.R. § 50.10(e)(1) and as described by EGC are bounded by the environmental impacts for construction of the entire facility as analyzed in preceding sections of the EIS. *Id.* at 4-47. The EIS concludes that the potential site-preparation activities described in the Site Redress Plan would not result in any significant adverse environmental impacts that could not be redressed. *Id.* at 4-48.

B. Environmental Report

As required by 10 C.F.R. Part 51 and 10 C.F.R. § 52.17(a)(2), the Applicant submitted an ER. The ER was developed using the format and content guidance provided in the "Environmental Standard Review Plan" (NUREG-1555). ER at 1-1. The ER discusses the existing environment at the site and in the vicinity; summarizes environmental impacts of construction and operation and considers appropriate mitigation measures; and reviews alternatives. *Id.*

The ER does not assess impacts based on a specific power facility design. Rather the ER considers a spectrum of feasible designs, based upon the PPE. *Id.* at 1-1, 1.1-2 to -3.

The following categories of information regarding interfaces of the site and facilities are reviewed in the ER: (1) comparison of the functional and operational needs of the EGC ESP facility as they relate to the site's natural and environmental resources; and (2) direct impact of the EGC ESP facility on the site's natural and environmental resources. *Id.* at 1-1.

1. Applicable Regulatory Criteria

The principal regulatory bases for the ER include the following:

- 10 C.F.R. Part 51, "Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions," including §§ 51.45, 51.50, 51.71, 51.75.
- 10 C.F.R. Part 52, "Early Site Permits; Standard Design Certifications; and Combined Licenses for Nuclear Power Plants," including §§ 52.17(a)(2), 52.18.
- NUREG-1555, "Standard Review Plans for Environmental Reviews of Nuclear Power Plants"
- Review Standard (RS) RS-002, "Processing Applications for Early Site Permits"

2. NRC Review of the ER

Section 102 of NEPA requires an EIS for major Federal actions that significantly affect the quality of the human environment. 10 C.F.R. Part 52 contains the NRC regulations related to ESPs. As set forth in 10 C.F.R. § 52.18, the Commission has determined that an EIS will be prepared during the review of an application for an ESP.

Upon acceptance of the EGC ESP application for docketing, the NRC began the environmental review process described in 10 C.F.R. Part 51 by publishing in the *Federal Register* a Notice of Intent (68 Fed. Reg. 66,130) to prepare an EIS and conduct scoping. The Staff held a public scoping meeting in Clinton, Illinois on December 18, 2003, and visited the EGC ESP site in March 2004. EIS at 10-2. Subsequent to the site visit and the scoping meeting and in accordance with NEPA and 10 C.F.R. Part 51, the Staff evaluated the potential environmental impacts of constructing and operating a new nuclear unit at the EGC ESP site. *Id.*

During the course of preparing this EIS, the Staff reviewed the ER, consulted with Federal, State, Tribal, and local agencies, and followed the guidance set forth in RS-002 to conduct an independent review of the issues. *Id.* That Review Standard draws from the previously published NUREG-0800, "Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants," (NRC 1987), and NUREG-1555, "Environmental Standard Review Plans (NRC 2000)." In addition, the NRC considered the public comments related to the environmental review received during the scoping process. *Id.* These comments are provided in Appendix D of the EIS.

Following the practice the Staff uses in the "Generic Environmental Impact Statement for License Renewal of Nuclear Plants" (NUREG-1437) (NRC 1996) and supplemental license renewal EISs, environmental issues were evaluated using the three-level standard of significance – SMALL, MODERATE, or LARGE – developed by NRC using guidelines from the Council on Environmental Quality (40 C.F.R. § 1508.27). EIS at 10-3. The footnote to Table B-1 of 10 C.F.R. Part 51, Subpart A, Appendix B, provides the following definitions of the three significance levels: 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. *Id.* Mitigation measures were considered for each environmental issue and are discussed in the appropriate sections. *Id.*

During its environmental review, the Staff considered commitments, estimates, planned activities, and actions that EGC indicated it and others would likely take should EGC decide to apply for a CP or COL, including:

- Commitments to address certain issues in the design, construction, and operation of the facility;
- Statements of planned compliance with current laws, regulations, and requirements;
- Commitments to future activities and actions that it would take should it decide to apply for a CP or COL;
- Descriptions of its estimate of the environmental impacts resulting from the construction and operation of a new nuclear unit at the ESP site; and
- Descriptions of its estimates of future activities and actions of others and the likely environmental impacts of those activities and actions that would be expected should an applicant holding an Exelon ESP decide to apply for a CP or COL.

EIS at K-1. These items are summarized in EIS Appendix K (Key Statements Made in the ER Considered in the NRC Staff's Environmental Review), and the Staff's evaluation of environmental impacts relied on this information. EIS at 3-6. Should the requested ESP be issued and later referenced in a CP or COL application, the Applicant and Staff will verify that the assumptions identified in Appendices J (PPE Values) and K remain applicable. EIS at 10-11.

The final EIS describes the plant site, the PPE, the environmental impacts of site preparation, plant construction and operation, fuel cycle, transportation of radioactive materials, accidents, and decommissioning. The EIS discusses the cumulative impacts of the proposed action and examines the impacts of alternatives, including the no-action alternative, alternative energy sources, system design alternatives, and alternative sites.[25] For some matters (such as need for power and the cost-benefit analysis), the Applicant elected not to provide information,

[25] The analysis of alternative energy sources includes consideration of wind and solar power, and a "combination alternative" that would use alternative energy sources such as wind, biomass, and demand-side management. *See* EIS at 8-22. This issue was the subject of Intervenors' contention, which was the subject of summary disposition in this proceeding. *See* LBP-05-19, 62 NRC 134 (2005), *petition for review denied,* CLI-05-29, 62 NRC 801 (2005). Therefore, this matter is final and is not discussed in detail herein.

as is permitted by 10 C.F.R. § 52.17(a)(2).[26] In accordance with 10 C.F.R. § 52.18, the EIS also does not discuss those matters. Accordingly, those issues are not resolved for the ESP site, and as required by 10 C.F.R. § 52.79(a)(1), a COL applicant referencing the ESP would need to provide additional environmental information on those matters. EIS at 10-11.

C. Key Facts and Conclusions in Support of Environmental Findings

The following summarizes key facts and conclusions from the EIS and ER that demonstrate how the Application and record of this proceeding fully support the three required environmental Findings. The facts and conclusions are numbered for the convenience of the Board, and appropriate citations to the Application and record are provided for each fact and conclusion.

The facts and conclusions are arranged as follows:

- First, key facts are provided pertaining to the environmental issues that are required to be addressed by Section 102(2)(A),(C), and (E) of NEPA and subpart A of 10 C.F.R. Part 51, including key facts pertaining to Affected Environment, Site Layout and Plant Parameter Envelope, Construction Impacts, Station Operation Impacts, Fuel Cycle, Transportation, Decommissioning, Cumulative Impacts, Environmental Impacts of the Alternatives, and Other Factors.
- Second, based upon the key facts and the Application, key conclusions are provided related to conformance of the Application and EIS to each of the applicable statutory provisions and NRC regulations.

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[26] The Applicant's ER and the Staff's EIS also do not address severe accident design mitigation alternatives (SAMDAs). Evaluation of SAMDAs is dependent upon design information that is not available at the ESP stage. However, the design certifications do include an evaluation of SAMDAs. *See* Section VI.B.7 of the design certification rules in Appendices A, B, C, and D to 10 C.F.R. Part 52. If the COL applicant does not reference a design certification, it would need to include an evaluation of SAMDAs as required by 10 CFR § 52.79(a)(1).

- Third, given the above, a basis is provided for each of the three environmental findings that the Board is required to make.

Affected Environment

1. Site Location. ER § 2.1 provides information on the site location, and this matter is discussed in § 2.1 of the EIS. The ESP site is located in rural DeWitt County, Illinois, on the site of the existing Clinton Power Station (CPS). *See* EIS Figure 2-2 and 2-3. The site is located on man-made Clinton Lake. *Id.* at 2-1 and Figure 2-1. Clinton Lake was constructed for the purpose of supporting operation of CPS (which is currently a single unit but originally was intended as a two-unit station.) *See* ER at 2.3-3; SSAR at 1.2-1.

2. Land Use. ER § 2.2 provides information on the land use in the areas around the ESP site, and this matter is discussed in § 2.2 of the EIS. The site vicinity is 84 percent agricultural land, and the only special uses within the vicinity are recreational uses in the Clinton Lake State Recreation Area and two other small recreational areas. The topography is generally flat, with elevations ranging from 690 to 800 feet above mean sea level. EIS Figure 2-3 shows the transportation network in the vicinity. Anticipated transmission line rights-of-way would not interfere with existing local zoning plans because existing rights-of-way are assumed to be used. EIS at 2-8. Land use within the region is also primarily agricultural, with the exception of the population centers of Springfield, Bloomington-Normal, and Champaign-Urbana. *See* ER at 2.2-1, 2.2-4.

3. Demography. ER § 2.5.1 provides information on demography, and this matter is discussed in § 2.8.1 of the EIS. DeWitt is the nearest community, approximately three miles from the proposed site. *See* ER Figure 2.1-1. The City of Clinton, with a population of 7,485 in 2000 as of the 2000 U.S. Census, lies approximately six miles west of the site. *Id.* at 2.1-1, 2.5-1; EIS at

2-43. The nearest population centers are Bloomington-Normal (pop. 110,194), approximately 22 miles north of the site, Decatur, (pop. 81,860), 22 miles to the south, Champaign-Urbana (pop. 103,913), 28 miles to the east, and Springfield (pop. 114,454), 51 miles to the southwest. ER at 2.1-1; EIS at 2-42 to -43.

4. Meteorology and Air Quality. ER § 2.7 provides information on meteorology and air quality, and this matter is discussed in § 2.3 of the EIS. The ESP site has a typical continental climate with moderately cold winters and warm summers. Prevailing winds in the region are from the south. Severe weather can be in the form of thunderstorms, hail, tornadoes, snow, and ice. Regional air quality measurements in 2002 found air quality to be Good or Moderate on the vast majority of days. The EIS reviews the site meteorological monitoring program, and concludes that the program provides data that represent onsite conditions as required by 10 C.F.R. § 100.20 and provides an acceptable basis for atmospheric dispersion estimates under 10 C.F.R. Part 50, Appendix I. *See* EIS at 2-13 to -19.

5. Geology. SSAR § 2.5 provides a detailed geological, seismological, and geotechnical description of the ESP site, and ER § 2.6 summarizes that information. The Staff's geological description and evaluation is in § 2.5 of the SER, and summarized in § 2.4 of the EIS. Fill material will need to be imported onsite during construction because the glacial material beneath the site is geotechnically unsuitable for use as a fill material. EIS at 2-19.

6. Radiological Environment. ER § 6.2 provides information on the existing CPS radiological monitoring program, and the Staff reviewed the program's historical data and periodic reporting for the existing unit. The EIS concludes that the data show that doses to the maximally exposed individuals around the site are a small fraction of the Federal environmental radiation standards (10 C.F.R. Part 20; 10 C.F.R. Part 50, Appendix I; 40 C.F.R. Part 190). EIS at 2-20.

7. Water. ER § 2.3 provides information on water, and this matter is discussed in § 2.6 of the EIS, including hydrology, water use, and water quality. The thermal load discharged into the lake from CPS results in local elevated temperatures. Before a new nuclear unit could begin to operate, EGC would need to obtain a National Pollutant Discharge Elimination System (NPDES) permit from the Illinois Environmental Protection Agency ("IEPA"). EIS at 2-24 to -25.

8. Ecology. ER § 2.4 provides information on ecology, and this matter is described in § 2.7 of the EIS. The Staff prepared a biological assessment for threatened and endangered species identified by the U.S. Fish and Wildlife Service as potentially occurring in the area. No critical habitats are located on site, and no threatened or endangered plant or aquatic species are known to occur in the vicinity of the site or on anticipated transmission rights-of-way. *See* EIS at 2-31 to -39.

9. Socioeconomics. ER § 2.5 provides information on socioeconomics, and this matter is described in § 2.8 of the EIS, including descriptions of demography and community characteristics. The Staff's investigation included visits and interviews with the local population. EIS at 2-52 to -56, 2-65. Population distribution was based on the 2000 U.S. Census, with projections at ten-year intervals to 2060 based on the 1990 Census and projection methodology developed by Illinois State University. *Id.* at 2-42. The 2000 Census found a population of 12,358 within 10 miles of the site, with a total of 764,366 within 50 miles, and the 2060 projections estimate a decline to 10,462 within 10 miles and regional growth of less then 0.5 percent per year. *Id.*

10. Historic and Cultural Resources. ER § 2.5.3 describes the cultural background and the known historic and archaeological resources at the ESP site and the surrounding area. This matter is also discussed in Section 2.9 of the EIS. The Staff consulted on the proposed action

with the Illinois State Historic Preservation Agency ("IHPA") and affected Native American tribes. EIS at 2-69. The IHPA may require cultural resource studies prior to construction, depending on construction location. *Id.* at 2-70.

11. Environmental Justice. ER § 2.5 provides information on environmental justice, and this matter is discussed in EIS § 2.10. ER Figures 2.5-8 and 2.5-9 and EIS Figures 2-6 and 2-7 show distributions of minority and low-income populations in the region. According to 2000 Census Bureau data, DeWitt County is 97.1 percent white, with small African American, American Indian, and Hispanic populations. ER at 2.5-13. Between 8 and 10 percent of the population in the vicinity and region is classified as low income or below the poverty level; the national percentage of low income population was 11.3 percent. *Id.* Concentrations of low-income and minority populations are present in the larger cities in the region, such as Champaign-Urbana, Decatur, and Springfield. EIS at 2-72.

Site Layout and Plant Parameter Envelope

12. Plant Parameter Envelope (PPE). ER § 3.1 indicates that a specific technology and design for the proposed new plant has not been selected. Given the absence of a specific plant design, the Applicant developed a set of bounding plant parameter values (PPE) for the ESP application. The PPE values are listed in Table 1.4-1 of the SSAR. *See* EIS at 3-2 to -12. At the CP or COL stage, the Applicant will need to verify that the actual parameters for the selected reactor are bounded by the PPE. *See* 10 C.F.R. § 52.79(a)(1). If the actual design characteristics are not bounded by the PPE, EGC and the Staff will need to evaluate whether the environmental impacts of construction and operation remain bounded by the impacts analyzed in the ESP application, and EGC may need to request a variance from the ESP in accordance with 10 C.F.R. § 52.39(b). EIS at 3-4.

13. Cooling System. The Applicant proposed a cooling tower system for normal cooling, and a second mechanical draft cooling tower system as the UHS, as appropriate. *See* ER at 1.1-2 and Figure 2.1-5. The water intake structure (shown in ER Figure 2.1-5 and EIS Figure 2-1) would be approximately 65 feet south of the CPS intake structure. Cooling tower blowdown and other discharges would be discharged through a flume near the CPS discharge. EIS at 3-9 to -10. Radioactive and nonradioactive plant effluents will be discharged in such a manner as to comply with applicable Federal and State requirements. *See id.* at 3-10 to -12.

14. Power Transmission System. ER § 3.7 provides information on the anticipated power transmission system and requirements for the proposed ESP facility, and this matter is discussed in § 3.3 of the EIS. The existing transmission system has excess capacity to handle some, but not all of the output of a new facility bounded by the PPE; thus, the widening of existing rights-of-way may be required. *See* EIS at 3-12 to -13. This would probably result in some additional environmental impacts. *See* Paragraphs 19 and 27, below. Once a COL applicant has applied to the Federal Energy Regulatory Commission ("FERC") for large-generator interconnection, a FERC transmission analysis would be required under 18 C.F.R. Part 35.

Construction Impacts at the Proposed Site

15. Scope of Analysis. Construction impact characterizations are summarized in EIS Table 4-1. These include land use, air quality, water-related, ecological, socioeconomic, historic and cultural resources, environmental justice, and nonradiological and radiological health impacts. EIS at 4-49 to -50. The EIS also investigates potential mitigation of adverse impacts, as discussed below.

16. Land Use. ER § 4.1 provides information on land-use impacts of construction, and this matter is discussed in § 4.1 of the EIS. All construction activities, except transmission, would

take place within the ESP site boundary, and would be expected to be contained within the footprint of previously disturbed areas. Any work with potential impact on wetlands or the Clinton Lake Recreational Area would be conducted in accordance with applicable laws, regulatory requirements, and permits. EIS at 4-3. The EIS concludes that the environmental impact resulting from land use would be SMALL, and that there were no land use impacts that would render the site unsuitable for a new nuclear unit. *Id.* at 4-4.

17. Meteorological and Air Quality. ER § 4.4.1.2 analyzes the impacts of construction on meteorological and air quality, and this matter is discussed in § 4.2 of the EIS. Sources of potential air pollution would include dust, smoke, engine exhaust from construction vehicles, and concrete facility operation. ER at 4.4-1. Such impacts would be minimized by compliance with applicable regulations, permitting requirements, and through good operating practices. *Id.* at 4.4-2. Thus, such impacts are expected to be temporary and limited in magnitude. EIS at 4-6. The EIS concludes that the impacts from both construction activities and related transportation activities would be SMALL. *Id.*

18. Water-Related Impacts. ER § 4.2 provides information on the impacts of construction on water-related resources, and this matter is analyzed in § 4.3 of the EIS. Prior to construction, EGC must secure a number of permits related to hydrologic impacts, including CWA permits from the U.S. Army Corps of Engineers and state agencies. EIS at 4-6 to -7. Prior to conducting any activity pursuant to the ESP, EGC must submit a copy of its CWA 401 certification issued by the IEPA, or its determination that no 401 certification is required. *Id.* at 4-8. The Staff concluded that this Permit Condition and the permit process would be adequate to ensure that the impacts of pre-construction activities would be SMALL, localized, and temporary. *Id.* Water use during construction would include dewatering during excavation and dust abatement

measures, and is likely to be only a small fraction of water use during operation. *Id.* at 4-9. Thus, the impacts of construction activities on water use would be SMALL, localized, and temporary. *Id.* The impacts of construction activities on water quality would likewise be SMALL, localized, and temporary, and could be minimized by good construction management practices to minimize the impact of accidental spills and storm water runoff. *Id.*

19. Ecological Impacts. ER § 4.3 provides information on ecological impacts, and this matter is analyzed in § 4.4 of the EIS. Activities associated with the construction of the proposed ESP facility are not expected to impact adversely the four minor wetlands onsite. EIS at 4-10. Based in part on compliance with Army Corps of Engineers CWA permitting requirements, which mandate best construction management and mitigation practices, the EIS concludes that the impacts of construction activities on habitat would be SMALL, unless new rights-of-way would be required to accommodate new transmission lines. *Id.* at 4-12 to -14. If new rights of way are required, habitat and terrestrial ecosystem impacts could range from SMALL to LARGE. The amount of disturbance would be determined by a CP or COL application. *Id.* at 4-10 to -13, 4-16. Construction impacts to wildlife, including threatened or endangered species, would be negligible if any, due in part to compliance with regulations and permitting requirements. *Id.* at 4-15 to -16, 4-20. Aquatic impacts, such as the loss of some shoreline habitat and the temporary displacement of some aquatic species, would be SMALL. *Id.* at 4-16 to -17. EGC has committed to consulting with the U.S. Fish and Wildlife Service to confirm whether further evaluation of the impact on threatened or endangered species is needed prior to construction. *Id.* at 4-20.

20. Socioeconomic Impacts. ER § 4.4 provides information on socioeconomic impacts, and this matter is analyzed in § 4.5 of the EIS. Such impacts could include localized physical impacts,

such as noise, dust, and vehicle emissions, some additional traffic on local roads, and some population increase and housing pressure due to the construction workforce. *See* EIS at 4-20 to -36. Demographic impacts are expected to be SMALL, because most workers will come from the region. *Id.* at 4-25. Other adverse socioeconomic impacts would be SMALL, except potential MODERATE impacts on roads and housing. *See id.* at 4-20 to -36. The impact on roads could be mitigated by upgrading the existing rail line, and market-driven mitigation should be sufficient to address housing impacts. *Id.* at 4-23, 4-33. The potential benefits include increased taxes to be collected by state and local jurisdictions, and beneficial economic impacts of construction expenditures on DeWitt and the surrounding counties. *See id.* at 4-26 to -27, 4-29.

21. Historic and Cultural Resources. Section 4.1.3 of the ER addresses the impact of construction on historic and cultural resources, and this matter is analyzed in § 4.6 of the EIS. The Staff's and EGC's research and consultation has not revealed any traditional cultural properties in the vicinity. Therefore, the EIS concludes that impacts on historical and cultural resources would be SMALL, but mitigation might be warranted if such properties are discovered during construction. EIS at 4-37.

22. Environmental Justice Impacts. Section 4.4.3 of the ER addresses the impact of construction on environmental justice, and this matter is analyzed in § 4.7 of the EIS. The Staff reviewed the Applicant's information and conducted its own independent review, which revealed no disproportionately high adverse impacts on low income or minority populations. The EIS concludes that the offsite impacts on minority and low income populations would be SMALL. EIS at 4-38.

23. Nonradiological Health Impacts. Section 4.4.1 of the ER addresses nonradiological health impacts of construction and this matter is analyzed in § 4.8 of the EIS. Such impacts could

include public health risks from air pollution associated with construction activities, occupational injuries to onsite workers, and noise impacts. Compliance with applicable permits and regulations and dust-control systems should mitigate potential air pollution impacts. EIS at 4-39. Occupational risks can be minimized by adherence to NRC, Occupational Safety and Health Administration, state, and local requirements. *Id.* at 4-39 to -40. Noise impacts will be minimal due to the distance to offsite activities and can be further reduced by compliance with applicable regulations, including the use of standard noise control devices and the maintenance of a hearing conservation program. *Id.* at 4-40 to -41. The EIS evaluated all nonradiological health impacts as SMALL, with no additional mitigation warranted. *Id.* at 4-41.

24. Radiological Health Impacts. ER § 4.5 provides information on radiological health impacts, and this matter is analyzed in § 4.9 of the EIS. Sources of radiation exposure for construction workers could include direct radiation exposure, liquid radioactive discharges, and gaseous radioactive effluents from the existing CPS during construction and site preparation. EIS at 4-41. The estimated doses are well within the NRC's exposure limits, and thus these impacts would be SMALL. *Id.* at 4-44.

25. Measures and Controls to Limit Adverse Impacts during Site-Preparation and Construction Activities. Section 4.6 of the ER discusses measures to minimize adverse impacts during construction. The potential impacts and mitigation measures are discussed and evaluated in Paragraphs 15 through 24, above. Section 4.10 of the EIS summarizes measures to limit adverse environmental impacts during site preparation as follows: (1) compliance with applicable federal, state, and local laws, ordinances, and regulations intended to prevent or minimize environmental hazards; (2) compliance with existing permits and licenses; (3) compliance with existing EGC processes and procedures; (4) incorporation of environmental requirements into construction

contracts; and (5) identification of environmental resources and potential impacts during the ER and ESP process. EIS at 4-45.

Station Operation Impacts at the Proposed Site

26. Scope of Analysis. Operational impact characterizations are summarized in EIS Table 5-15. These include land use, air quality, water-related, ecological, socioeconomic, historic and cultural resources, environmental justice, nonradiological and radiological health impacts, and the impacts of postulated accidents. EIS at 5-81 to -83. The EIS also investigates potential mitigation of adverse impacts, as discussed below.

27. Land Use. Section 5.1 of the ER provides information on land use impacts of station operation, and this matter is analyzed in § 5.1 of the EIS. Land use impacts on the site and vicinity could include some widely-dispersed new housing development and some temporary housing needs for outage workers. EIS at 5-1 to -2. Impacts along anticipated transmission rights-of-way would include routine vegetation maintenance and the clearing of temporary maintenance access roads. *Id.* at 5-3. The EIS concludes that land use impacts would be SMALL, and additional mitigation would not be warranted. *Id.* at 5-2 to -3.

28. Meteorological and Air Quality. Section 5.8.1.3 of the ER addresses the air impacts of station operation, and § 5.2 of the EIS analyzes meteorological and air quality impacts. Such impacts would include emissions of heat and moisture from the cooling towers, intermittent emissions of pollutants from the operation of auxiliary equipment and standby diesel generators, and small amounts of ozone and oxides of nitrogen produced by transmission lines. EIS at 5-3 to -5. There are no major air pollution sources near the site, so interactions between the cooling tower plume and other pollutants would not significantly impact air quality. *Id.* at 5-4. Assuming that the proposed facility's cooling towers would be similar to other towers at existing

sites, the EIS concludes that impacts from cooling towers would be SMALL. *Id.* The impacts from pollutants discharged during infrequent operation of auxiliary equipment and from the transmission lines would likewise be SMALL. *Id.* at 5-4 to -5.

29. Water-Related Impacts. Section 5.2 of the ER provides information on water-related impacts of station operation, and this matter is analyzed in § 5.3 of the EIS. Increased water loss and increased water temperatures due to new cooling towers would reduce the volume of water in Clinton Lake. EIS at 5-5. EGC and the Staff independently evaluated these water use impacts. *Id.* at 5-6. The Staff concluded that these impacts would be SMALL in normal water years, but could be MODERATE in below-average precipitation conditions. EGC would need to coordinate with the IEPA in such cases to implement mitigation measures, such as derating or temporary shutdown of the proposed new unit. *Id.* at 5-8. EGC's commitment to keep combined discharges from CPS and the ESP facility within the bounds of the existing National Pollutant Discharge Elimination System ("NPDES") permit would ensure that water quality impacts remain SMALL. *Id.* at 5-9.

30. Ecological Impacts. Sections 5.3, 5.4.4, 5.6.1, and 5.6.2 of the ER discuss the ecological impacts of station operation, and this matter is analyzed in § 5.4 of the EIS. Terrestrial ecological impacts, such as the impacts of cooling towers on local vegetation, noise level, and the size of shoreline habitat on Clinton Lake would be SMALL. EIS at 5-14. Ecological impacts of transmission line right-of-way management such as vegetation control, electromagnetic fields ("EMF"), and bird collisions would be negligible. *Id.* Aquatic impacts such as reduced volume of lake water and length of shoreline due to cooling system requirements, fish loss by cooling system intake, and localized water temperature impacts due to cooling system discharge would generally be SMALL. Depending on the intake structure design

and permit requirements that would be set by the IEPA, cooling water intake system impacts, however, could be MODERATE if the best available technology is not utilized. Further, the impact to available aquatic habitat could be MODERATE in low-water years. *Id.* at 5-23 to -24. The COL applicant will need to provide additional information on the intake structure design and expected permit requirements for the Staff to verify the significance determination for aquatic organisms. *Id.* Operations will not impact any critical habitats, and the impacts to listed species, including the bald eagle and Indiana bat, will be negligible. *Id.* at 5-26. Thus, impact on threatened or endangered species would also be SMALL, but EGC has committed to contact the U.S. Fish and Wildlife Service prior to operation to determine whether further evaluation is needed. *Id.*

31. Socioeconomic Impacts. Section 5.8 of the ER provides information on socioeconomic impacts of station operation, and this matter is analyzed in § 5.5 of the EIS. These impacts include physical impacts on nearby communities such as noise, odors, exhausts, and thermal emissions, visual aesthetic impacts of new structures, small increases in local population and attendant increases in traffic, demand for housing, public services, and education. EIS at 5-27 to -42. Most impacts would be SMALL, except for MODERATE aesthetic and recreational impacts due to lowered lake water level during severe drought and MODERATE housing impacts in DeWitt County. *See id.* Drought impacts could be mitigated if necessary by changing the way the proposed new unit is operated. *Id.* at 5-31, 5-38. Housing impacts would be mitigated over time through market forces. *Id.* at 5-39. The EIS also notes SMALL beneficial economic and tax impacts for the surrounding counties, except for DeWitt County, where the economic impacts would be beneficial and MODERATE, and the tax benefits could be LARGE. *Id.* at 5-33, 5-35 to -36.

32. Historical and Cultural Resources. Section 5.1.3 of the ER addresses the impact of operation on historic properties, and this matter is analyzed in § 5.6 of the EIS. The EIS states that operation of the facility is not expected to have any significant historic or cultural resources impact, and the EIS concludes that such impact from operations would be SMALL. EIS at 5-43; *see also* Paragraph 21, above. Mitigation would only be warranted if there is a discovery of cultural resources. EIS at 5-43.

33. Environmental Justice Impacts. Section 5.8.3 of the ER addresses the impact of operation on environmental justice, and this matter is analyzed in § 5.7 of the EIS. The Staff reviewed the Applicant's information and conducted its own independent review, which revealed no disproportionately high adverse impacts on low income or minority populations. The EIS concludes that the impacts on minority and low income populations would be SMALL, and mitigation would not be warranted. EIS at 5-43.

34. Nonradiological Health Impacts. Chapter 7 of the ER includes discussions of the nonradiological health impacts from station operation, and this matter is analyzed in § 5.8 of the EIS. Increase in lake temperatures could result in increased levels of thermophilic microorganisms, which can cause disease in humans. However, the expected small temperature increase would not significantly increase the abundance of these organisms. EIS at 5-44. Likewise, the postulated noise levels from the proposed facility would be of small significance. *Id.* at 5-45. Compliance with applicable regulations and standards will also minimize EMF and occupational health impacts. *Id.* at 5-45 to -47. The EIS concludes that the impact of thermophilic microorganisms, noise, acute effects of EMF, and potential occupational health risks would all be SMALL. *Id.* at 5-44 to -47. While conclusive information on the chronic

effects of EMF is unavailable, current research does not suggest that the impact would be significant. *Id.* at 5-46.

35. Radiological Impacts of Normal Operations. Section 5.4 of the ER provides information on radiological impacts of normal operations, and this matter is analyzed in § 5.9 of the EIS. The EIS evaluates the health impacts from routine radiological effluent releases from the proposed new facility at the ESP site. The combined radiation dose to the maximally exposed individual from the existing and proposed facilities would be well within the standards of 40 C.F.R. Part 190, 10 C.F.R. Part 20, and the design objectives of 10 C.F.R. Part 50, Appendix I. EIS at 5-55. Based on the information provided by the Applicant and the Staff's independent evaluation, the EIS concludes that there would be no observable health impacts on the public from normal operation of new nuclear units, that the health impacts would be SMALL, and that the radiological impact on biota would be SMALL. *Id.* at 5-56, 5-59. The EIS reviews potential impacts of occupational doses to workers and concludes that the doses would remain within regulatory limits and the health impacts would be considered SMALL. *Id.* at 5-57. The EIS also reviews the proposed radiological monitoring program and concludes that the program is adequate. *Id.* at 5-61.

36. Environmental Impacts of Postulated Accidents. Chapter 7 of the ER describes the environmental impacts of postulated design basis and severe accidents, primarily using the ABWR and the AP1000 to characterize the environmental impacts from advanced light-water reactors.[27] The impacts of accidents are analyzed in § 5.10 of the EIS. These designs were selected because they have already been analyzed under the NRC's design certification process, so the evaluation of postulated accidents for these designs is already well-established. EIS at 5-

[27] Because no design has been selected, Severe Accident Mitigation Alternatives (SAMAs) cannot be meaningfully addressed in this ESP proceeding. Thus, consideration of SAMAs will take place at the COL stage. *See* ER at 7.3-1.

62. Further, the potential consequences of accidents for other designs are expected to be bounded by these designs. *Id.* The EIS concludes that the environmental risks of the analyzed design basis accidents and severe accidents would be small compared with the safety review criteria and goals. *Id.* at 5-67, 5-77. Based on the information provided by EGC and an independent review by the Staff, the EIS concludes that the analyzed severe accident impacts for advanced light water reactors (LWR) would be SMALL. The EIS did not evaluate the impacts of severe accidents involving other reactor designs, so if a non-advanced LWR design is chosen, further analysis would be required at the CP or COL stage. *Id.* A CP or COL applicant would also need to demonstrate that the environmental impacts of severe accidents remain bounded by the analysis of the surrogate designs. *Id.* at 5-77.

37. Measures and Controls to Limit Adverse Impacts during Operation. In Section 5.10 of the ER, the Applicant provided information on measures and controls to limit adverse impacts during operation. The potential impacts and mitigation measures are discussed and evaluated in Paragraphs 26 through 36, above. Section 5.11 of the EIS summarizes measures to limit adverse environmental impacts during site preparation as follows: (1) compliance with applicable laws, ordinances, and regulations to prevent or minimize adverse environmental impacts; (2) compliance with applicable permit and licensing requirements; and (3) compliance with EGC procedures applicable to environmental control and management. EIS at 5-78. The EIS evaluates EGC's proposed measures and controls and concludes that they are technically and economically feasible, and adequate to avoid or mitigate adverse impacts. *Id.* at 5-80.

Fuel Cycle, Transportation, and Decommissioning

38. Fuel Cycle Impact and Solid Waste Management. Section 5.7 of the ER provides information on the impact of the uranium fuel cycle, and this matter is analyzed in § 6.1 of the

EIS. The EIS evaluates fuel cycle impacts as given in Table S-3 of 10 C.F.R. § 51.51(b), including land use requirements, water use, generation of electricity through the use of fossil fuel, chemical effluents, radioactive effluents and waste, occupational dose, and transportation. EIS at 6-9 to -15. The EIS concludes that the impacts for light-water reactors would be SMALL, and mitigation would not be warranted. *Id.* at 6-15. The EIS also concludes that the impacts for the proposed gas-cooled reactors would also be SMALL, but because of the uncertainty associated with the final design of gas-cooled reactors, and the potential technological changes to uranium fuel cycle activities, additional reviews would be required at the CP or COL stage if the applicant references a gas-cooled reactor design. *Id.* at 6-21.

39. Transportation of Radioactive Materials. Section 5.7 of the ER also addresses transportation of radioactive materials, and § 6.2 of the EIS analyzes transportation of unirradiated fuel, spent fuel, and wastes under normal operating and accident conditions. The analysis in the EIS accounts for the environmental effects of such transportation as contained in Table S-4 to 10 C.F.R. Part 51. The EIS adjusts the Table S-4 values to account for the difference in reactor output compared to the reference reactor. Because of conservative approaches and data used to calculate doses, the EIS concludes that the environmental impacts of transportation of fuel and radioactive wastes to and from advanced light-water reactor designs would be SMALL, and would be consistent with the risk associated with transportation of fuel and radioactive waste from current-generation reactors presented in Table S-4 of 10 C.F.R. Part 51. The Staff could not validate the impacts for gas-cooled reactors and this issue would remain open if a COL applicant references such a design. If an ACR-700 or IRIS design is selected, a transportation accident analysis would need to be performed. EIS at 6-42.

40. Decommissioning Impacts. At the ESP stage, an applicant need not provide information regarding the process of decommissioning. The Staff, however, reviewed NUREG-0586, "Generic Environmental Impact Statement on Decommissioning of Nuclear Facilities, Supplement 1, Regarding the Decommissioning of Nuclear Power Reactors" (2002), and stated that it expects that the impacts will be SMALL. This issue is not resolved and will need to be addressed in a COL application proceeding. EIS at 6-43.

Cumulative Impacts

41. Cumulative Impacts. The EIS considers the potential cumulative impacts of constructing and operating one or more nuclear power units at the ESP site, including land use, air quality, water use and quality, terrestrial and aquatic ecosystems, socioeconomics, historic and cultural resources, environmental justice, nonradiological health, radiological impacts of normal operation, fuel cycle, transportation, and decommissioning. Cumulative fuel cycle and transportation impacts for other than light-water reactor designs and decommissioning impacts remain unresolved because information is not available, and will need to be addressed at the COL stage. EIS at 7-11. For each impact area, the EIS concludes that the impacts would be generally SMALL, and additional mitigation would not be warranted. However, several areas have the potential for a MODERATE impact: (1) cumulative water use and quality impacts in dry years; (2) water intake structure impacts, if best available technology is not used; (3) aquatic environment impacts following dry years; (4) cumulative impacts of thermal discharge; (5) physical impacts to roads due to heavy truck traffic; and (6) aesthetic and recreational impacts in severe drought. *Id.* at 7-2 to -11. In these cases, mitigation measures may be warranted, such as derating or shutdown of the unit. *Id.* at 7-12.

Environmental Impacts of the Alternatives

42. No-Action Alternative. Section 9.1 of the ER considers the no-action alternative, and the same matter is analyzed in § 8.1 of the EIS. While the no-action alternative would avoid all of the environmental impacts associated with the ESP, it would accomplish none of the benefits intended by the ESP process, including (1) early resolution of siting issues prior to large investments of financial and human resources; (2) early resolution of environmental issues; (3) the ability to bank sites for future nuclear plant location; and (4) facilitation of future decisions on whether to build new plants. EIS at 8-2. The EIS concludes that, should the ESP be denied, all of EGC's remaining options to satisfy its objectives would have associated environmental impacts. EIS at 9-10.

43. Energy Alternatives. Section 9.2 of the ER discusses energy alternatives, and the same matter is analyzed in § 8.2 of the EIS. The EIS considers alternatives not requiring new generation, including energy conservation, purchased power, and extending the service life of existing plants. Based on the Commission's determination, the Staff concluded that conservation is not a reasonable alternative to base load generation.[28] EIS at 8-3. Service life extensions are also not reasonable alternatives, because they would not provide additional baseload generation capacity. *Id.* at 8-5. The EIS compares new nuclear generation to other types of new generating facilities, such as coal, natural gas, and a combination of alternatives. This comparison is summarized in EIS Table 8-4. Based on this comparison, the EIS concludes that none of the economically viable alternatives is environmentally preferable to a new nuclear unit at the ESP site. *Id.* at 8-24. The EIS also addresses the impact of purchased power, which depends on the type of generating technology used and whether new rights-of-way need to be purchased. *Id.* at

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[28] *See* CLI-05-29, 62 NRC at 808; LBP-04-17, 60 NRC 229, 245-46 (2004). Energy efficiency measures also pertain to the "need for power," and are deferred to the COL stage.

8-4. The purchased power, however, would likely come from coal, natural gas, or nuclear generation facilities, and thus would not avoid the environmental impacts of these types of power generation. *Id.*

44. System Design Alternatives. Section 8.3 of the EIS considers plant design alternatives to the proposed heat dissipation systems. The EIS discusses the impact of wet cooling towers and briefly describes the impact. While wet cooling towers (mechanical or natural draft) would contribute to higher temperatures in Clinton Lake, no information was available on the impact of dry cooling towers, so this issue will be reviewed further at the COL stage. EIS at 8-25 to -26.

45. Evaluation of Alternative Sites. Section 9.3 of the ER and § 8.5 of the EIS evaluate in detail six other reactor sites as potential ESP site locations in the Region of Interest: Dresden, Braidwood, LaSalle County, Quad Cities, Byron, and Zion. Greenfield sites were considered not environmentally preferable to the proposed site, because the impact on any greenfield site would be greater than that on any site with an existing facility. EIS at 8-27. EGC eliminated three of the existing reactor sites (Byron, Quad Cities, and Dresden) as not having sufficient land for a new facility. *Id.* at 8-29. The environmental impacts of a new nuclear facility on each of the six sites were compared with the environmental impacts of the EGC ESP facility at the Clinton site. EGC chose the Clinton site as the preferred site, in part because no alternative sites offered environmental advantages over Clinton. ER at 9.3-26. The Staff reviewed EGC's findings, visited each site, and performed its own evaluation to determine whether an alternative site is "obviously superior" to the proposed site. The comparisons of the environmental impacts of construction and operation on the proposed site and alternative sites are summarized in EIS Tables 9-1 and 9-2. Based on the comparison of the proposed site with alternative sites in Section 9.1 of the EIS, the EIS concludes that while there are some differences in the

environmental impacts of construction and operation at the ESP site and the alternatives, none of the differences is sufficient to determine that any alternative site is environmentally preferable. EIS at 9-8 to -9. Thus, none of the alternative sites is obviously superior to the proposed site. *Id.* at 9-9.

Other Factors

46. Unavoidable Adverse Impacts. Section 10.1 of the ER discusses unavoidable adverse impacts, and this matter is analyzed in § 10.1 of the EIS. There would be no unavoidable adverse impacts from the granting of the ESP, but the construction and operation of a new nuclear power facility would result in some unavoidable impacts, including disturbed land, decrease in lake level during dry periods, increased use of local services, and radiation dose from construction and operation. *See* EIS Tables 10-1 and 10-2. Most of these impacts would be SMALL, but the impact of the cooling system on water in low water years would be MODERATE, but could be mitigated by the State of Illinois through its authority to regulate water use and quality. *Id.* at 10-4 to -6.

47. Irreversible and Irretrievable Commitments of Resources. Section 10.2 of the ER discusses irreversible and irretrievable commitments of resources, and this matter is analyzed in § 10.2 of the EIS. These include the commitment of construction materials such as concrete and steel, and of uranium during operation. The estimated use of construction materials that will take place during the CP or COL stage, and the uranium ore commitment is expected to be of small consequence in comparison to the availability of such resources. EIS at 10-8.

48. Relationship between Short-Term Uses and Long-Term Productivity of the Human Environment. EIS § 10.3 concludes that activities authorized by the ESP are unlikely to adversely affect the long-term productivity of the environment. A full assessment of the impact

of construction and operation of the proposed facility on long-term productivity will be performed at the CP or COL stage. EIS at 10-9, 10-11.

Required Environmental Determinations

49. Required Environmental Findings. Regardless of whether a proceeding is contested or uncontested, in accordance with the Notice of Hearing issued in this case, this Licensing Board is required to make the following "baseline" determinations regarding NEPA issues:

> (1) determine whether the requirements of NEPA sections 102(2)(A), (C), and (E) and 10 C.F.R. Part 51, Subpart A, have been complied with in the proceeding;
>
> (2) independently consider the final balance among conflicting factors contained in the record of proceeding with a view to determining the appropriate action to be taken; and
>
> (3) determine, after considering reasonable alternatives, whether a license should be issued, denied, or appropriately conditioned to protect environmental values.

See Commission's Notice of Hearing for Clinton ESP Proceeding, 68 Fed. Reg. 69,426, 69,427 (Dec. 12, 2003); Order (Aug. 2, 2006), at 5.

50. Compliance With Section 102(2)(A) of NEPA. NEPA Section 102(2)(A) requires federal agencies to "utilize a systematic, interdisciplinary approach which will insure the integrated use of the natural and social sciences and the environmental design arts in planning and in decision-making which may have an impact on man's environment." 42 U.S.C. § 4332(2)(A). The NRC Staff utilized a systematic, interdisciplinary approach integrating their use of the natural and social sciences in their decision-making regarding environmental impacts as required under NEPA. As shown below in Table 1, EGC's ER strictly followed the format in NUREG-1555 (NRC's Environmental Standard Review Plan), and the NRC's EIS closely parallels NUREG-1555, thereby ensuring both a systematic and interdisciplinary approach. Furthermore, the Staff

utilized the expertise of professional scientists, engineers, and social scientists, *see* EIS Appendix A, and logically documented its conclusions.

Table 1
Comparison against NUREG-1555

NUREG-1555	ER Section	EIS Section
1.0 Introduction to the Environmental Impact Statement	1	1.0
1.1 The Proposed Project	1.1	1.2
1.2 Status of Reviews, Approvals, and Consultations	1.2	1.5 and Appendix I
2.0 Environmental Description	2	2.0
2.1 Station Location	2.1	2.1
2.2 Land	2.2	2.2
2.2.1 The Site and Vicinity	2.2.1	2.2.1
2.2.2 Transmission Corridors and Offsite Areas	2.2.2	2.2.2
2.2.3 The Region	2.2.3	2.2.3
2.3 Water	2.3	2.6
2.3.1 Hydrology	2.3.1	2.6.1
2.3.2 Water Use	2.3.2	2.6.2
2.3.3 Water Quality	2.3.3	2.6.3
2.4 Ecology	2.4	2.7
2.4.1 Terrestrial Ecology	2.4.1	2.7.1
2.4.2 Aquatic Ecology	2.4.2	2.7.2
2.5 Socioeconomics	2.5	2.8
2.5.1 Demography	2.5.1	2.8.1
2.5.2 Community Characteristics	2.5.2	2.8.2
2.5.3 Historic Properties	2.5.3	2.9
2.5.4 Environmental Justice	2.5.4	2.10
2.6 Geology	2.6	2.4
2.7 Meteorology and Air Quality	2.7	2.3
2.8 Related Federal Project Activities	2.8	2.11
3.0 Plant Description	3	3.0
3.1 External Appearance and Plant Layout	3.1	3.1
3.2 Reactor Power Conversion System	3.2	N/A – reactor design not yet selected
3.3 Plant Water Use	3.3	3.2.1
3.3.1 Water Consumption	3.3.1	3.2.1.1
3.3.2 Water Treatment	3.3.2	3.2.1.2
3.4 Cooling System	3.4	3.2.2

3.4.1 Description and Operational Modes	3.4.1	3.2.2.1
3.4.2 Component Descriptions	3.4.2	3.2.2.2
3.5 Radioactive Waste Management System	3.5	3.2.3
3.6 Nonradioactive Waste Systems	3.6	3.2.4
3.6.1 Effluents Containing Chemicals or Biocides	3.6.1	3.2.4.1
3.6.2 Sanitary System Effluents	3.6.2	3.2.4.2
3.6.3 Other Effluents	3.6.3	3.2.4.3
3.7 Power Transmission System	3.7	3.3
3.8 Transportation of Radioactive Materials	3.8	6.2
4.0 Environmental Impacts of Construction	4	4.0
4.1 Land-Use Impacts	4.1	4.1
4.1.1 The Site and Vicinity	4.1.1	4.1.1
4.1.2 Transmission Corridors and Offsite Areas	4.1.2	4.1.2
4.1.3 Historic Properties	4.1.3	4.6
4.2 Water-Related Impacts	4.2	4.3
4.2.1 Hydrologic Alterations	4.2.1	4.3.1
4.2.2 Water-Use Impacts	4.2.2	4.3.2
4.3 Ecological Impacts	4.3	4.4
4.3.1 Terrestrial Ecosystems	4.3.1	4.4.1
4.3.2 Aquatic Ecosystems	4.3.2	4.4.2
4.4 Socioeconomic Impacts	4.4	4.5
4.4.1 Physical Impacts	4.4.1	4.5.1
4.4.2 Social and Economic Impacts	4.4.2	4.5.3
4.4.3 Environmental Justice Impacts	4.4.3	4.7
4.5 Radiation Exposure to Construction Workers	4.5	4.9
4.6 Measures and Controls to Limit Adverse Impacts During Construction	4.6	4.10
5.0 Environmental Impacts of Station Operation	5	5.0
5.1 Land-Use Impacts	5.1	5.1
5.1.1 The Site and Vicinity	5.1.1	5.1.1
5.1.2 Transmission Corridors and Offsite Areas	5.1.2	5.1.2
5.1.3 Historic Properties	5.1.3	5.6
5.2 Water-Related Impacts	5.2	5.3
5.2.1 Hydrologic Alterations and Plant Water Supply	5.2.1	5.3.1

5.2.2 Water-Use Impacts	5.2.2	5.3.2
5.3 Cooling System Impacts	5.3	No separate section. Covered under various subsections as indicated below
5.3.1 Intake System	5.3.1	5.4.2.1
5.3.1.1 Hydrodynamic Descriptions and Physical Impacts	5.3.1.1	Covered in section above
5.3.1.2 Aquatic Ecosystems	5.3.1.2	Covered in section above
5.3.2 Discharge System	5.3.2	5.4.2.2
5.3.2.1 Thermal Description and Physical Impacts	5.3.2.1	Covered in section above
5.3.2.2 Aquatic Ecosystems	5.3.2.2	Covered in section above
5.3.3 Heat-Discharge System	5.3.3	No separate section. Covered under various subsections as indicated below
5.3.3.1 Heat Dissipation to the Atmosphere	5.3.3.1	5.2.1
5.3.3.2 Terrestrial Ecosystems	5.3.3.2	5.4.1.1
5.3.4 Impacts to Members of the Public	5.3.4	5.4.1.2, 5.8.1, 5.8.2
5.4 Radiological Impacts of Normal Operation	5.4	5.9
5.4.1 Exposure Pathways	5.4.1	5.9.1
5.4.2 Radiation Doses to Members of the Public	5.4.2	5.9.2
5.4.3 Impacts to Members of the Public	5.4.3	5.9.3
5.4.4 Impacts to Biota Other than Members of the Public	5.4.4	5.9.5
5.5 Environmental Impacts of Waste	5.5	No separate section. Covered under various subsections as indicated below
5.5.1 Nonradioactive-Waste-System Impacts	5.5.1	None; but see Section 3.6
5.5.2 Mixed Waste Impacts	5.5.2	Addressed in 6.1.1.6
5.6 Transmission System Impacts	5.6	No separate section. Covered under various subsections as indicated below and Section 5.2.3
5.6.1 Terrestrial Ecosystems	5.6.1	5.4.1.4, 5.4.1.5
5.6.2 Aquatic Ecosystems	5.6.2	5.4.1.6

5.6.3 Impacts to Members of the Public	5.6.3	5.8.3, 5.8.4
5.7 Uranium Fuel Cycle Impacts	5.7	6.1
5.8 Socioeconomic Impacts	5.8	5.5
5.8.1 Physical Impacts of Station Operation	5.8.1	5.5.1
5.8.2 Social and Economic Impacts of Station Operation	5.8.2	5.5.3
5.8.3 Environmental Justice Impacts	5.8.3	5.7
5.9 Decommissioning	5.9	6.3
5.10 Measures and Controls to Limit Adverse Impacts During Operation	5.10	5.11
6.0 Environmental Measurements and Monitoring Programs	6	No separate section. Covered under various subsections as indicated below
6.1 Thermal Monitoring	6.1	2.6.3.3
6.2 Radiological Monitoring	6.2	5.9.6
6.3 Hydrological Monitoring	6.3	2.6.1.3
6.4 Meteorological Monitoring	6.4	2.3.3
6.5 Ecological Monitoring	6.5	No separate section. Covered under various subsections as indicated below
6.5.1 Terrestrial Ecology and Land Use	6.5.1	2.7.1.3
6.5.2 Aquatic Ecology	6.5.2	2.7.2.3
6.6 Chemical Monitoring	6.6	2.6.3.4
6.7 Summary of Monitoring Programs	6.7	No separate section. Covered under various subsections as indicated above
7.0 Environmental Impacts of Postulated Accidents Involving Radioactive Materials	7	5.10
7.1 Design Basis Accidents	7.1	5.10.1
7.2 Severe Accidents	7.2	5.10.2
7.3 Severe Accident Mitigation Alternatives	7.3	N/A – addressed by design certification
7.4 Transportation Accidents	7.4	6.2.1.2, 6.2.2.2
8.0 Need for Power	8	N/A – deferred until COL proceeding
8.1 Description of Power System	N/A – deferred until COL proceeding	N/A – deferred until COL proceeding

8.2 Power Demand	N/A – deferred until COL proceeding	N/A – deferred until COL proceeding
8.2.1 Power and Energy Requirements	N/A – deferred until COL proceeding	N/A – deferred until COL proceeding
8.2.2 Factors Affecting Growth of Demand	N/A – deferred until COL proceeding	N/A – deferred until COL proceeding
8.3 Power Supply	N/A – deferred until COL proceeding	N/A – deferred until COL proceeding
8.4 Assessment of Need for Power	N/A – deferred until COL proceeding	N/A – deferred until COL proceeding
9.0 Alternatives to the Proposed Action	9	8.0
9.1 No-Action Alternative	9.1	8.1
9.2 Energy Alternatives	9.2	8.2
9.2.1 Alternatives Not Requiring New Generating Capacity	9.2.1	8.2.1
9.2.2 Alternatives Requiring New Generating Capacity	9.2.2	8.2.2, 8.2.3
9.2.3 Assessment of Alternative Energy Sources and Systems	9.2.3	8.2.4
9.3 Alternative Sites	9.3	8.5, 9.0
9.4 Alternative Plant and Transmission Systems	9.4	8.3
9.4.1 Heat Dissipation Systems	N/A – This pertains to system design that will be addressed at the COL stage	8.3.1 – 8.3.3
9.4.2 Circulating Water Systems	N/A – This pertains to system design that will be addressed at the COL stage	N/A – This pertains to system design that will be addressed at the COL stage
9.4.3 Transmission Systems	N/A – It is anticipated that the existing transmission corridor will be used and upgraded as necessary. The routing, construction, and operation will be determined by the system operator.	N/A – It is anticipated that the existing transmission corridor will be used and upgraded as necessary. The routing, construction, and operation will be determined by the system operator. See, e.g., Sections 2.2.2, 3.3, 4.1.2, 4.4.1.1
10.0 Environmental Consequences of the Proposed Action	10	10.0

10.1 Unavoidable Adverse Environmental Impacts	10.1	10.1
10.2 Irreversible and Irretrievable Commitments of Resources	10.2	10.2
10.3 Relationship Between Short Term Uses and Long Term Productivity of the Human Environment	10.3	10.3
10.4 Benefit-Cost Balance	10.4	N/A - deferred until COL proceeding
10.4.1 Benefits	N/A - deferred until COL proceeding	N/A - deferred until COL proceeding
10.4.2 Costs	N/A - deferred until COL proceeding	N/A - deferred until COL proceeding
10.4.3 Summary	N/A - deferred until COL proceeding	N/A - deferred until COL proceeding

51. Compliance with NEPA Section 102(2)(C). Section 102(2)(C) of NEPA requires a Federal agency to address in its environmental impact statement: (1) the environmental impact of the proposed action; (2) any adverse impacts which cannot be avoided should the proposal be implemented; (3) alternatives to the proposed action; (4) the relationship between local short-term uses of man's environment and the maintenance and enhancement of long-term productivity; and (5) any irreversible and irretrievable commitment of resources which would be involved in the proposed action should it be implemented. *See* 42 U.S.C. § 4332(2)(C). As shown in Table 2, the final EIS addresses each of these five requirements in Section 102(2)(C).

Table 2
Comparison of EIS against NEPA Section 102(C)

NEPA Section 102(C)	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 should the proposal be implemented	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 which would be involved in the proposed action should it be implemented	10.2 – Irreversible and Irretrievable Commitments of Resources

Section 102(2)(C) also requires that an agency "consult with and obtain the comments of any Federal agency which has jurisdiction by law or special expertise with respect to any environmental impact involved." 42 U.S.C. § 4332(2)(C). The Staff has complied with this requirement. *See* EIS Appendix B.

52. Compliance with NEPA Section 102(2)(E). Section 102(2)(E) of NEPA requires a Federal agency to "study, develop, and describe appropriate alternatives to the recommended courses of action in any proposal which involves unresolved conflicts concerning alternative uses of available resources." 42 U.S.C. § 4332(2)(E). The EIS considers the no action alternative, energy alternatives, plant design alternatives, and alternative sites. *See* EIS Chapter 8. The EIS satisfies the requirements under NEPA with respect to consideration of alternatives.

53. Compliance with Subpart A to Part 51. Subpart A to Part 51 contains a number of requirements related to an EIS for a construction permit (and by implication, for an ESP). In particular, Part 51 includes several procedural requirements related to the EIS: (1) issuance of a notice of intent to prepare an EIS (§ 51.116); (2) scoping (§§ 51.28 and 51.29), (3) notice and distribution of a draft EIS for public comments (§§ 51.73, 51.74, and 51.117), (4) responding to

public comments (§ 51.91), (5) notice and distribution of the final EIS (§§ 51.93 and 51.118), and (6) public availability of EIS (§ 51.120). Additionally, 10 CFR §§ 51.70, 51.71, and 51.75 and Appendix A to Part 51 have a number of substantive requirements for an EIS. The most specific criteria are contained in Appendix A, which in general encompass the more general criteria in §§ 51.70, 51.71, and 51.75. The following 12 criteria are contained in Appendix A, supplemented by some additional criteria from Sections 50.71 and 50.75: (1) Cover sheet, (2) Summary, (3) Table of Contents, (4) Purpose of and Need for Action, (5) Alternatives including the proposed action, (6) Affected Environment, (7) Environmental Consequences and Mitigating Actions, including assessment of aquatic impacts and radiological impacts (including the radiological impacts from the fuel cycle as provided in Table S-3 in Part 51), (8) List of Preparers, (9) List of Agencies, Organizations and Persons to Whom Copies of the Statement are Sent, (10) Substantive Comments Received and NRC Staff Responses, including analysis of major points of view (11) Index, (12) Appendices, (13) Status of compliance, and (14) Recommendations.[29] As shown below in Tables 3 and 4, these requirements have been satisfied.

Table 3
Comparison of EIS against Procedural Requirements in Part 51

Part 51 Procedural Requirement	Conformance to Requirement
(1) issuance of a notice of intent to prepare an EIS (§ 51.116)	68 Fed. Reg. 66,130 (November 25, 2003)
(2) scoping (§§ 51.28 and 51.29)	EIS Appendix D
(3) 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)
(4) responding to public comments (§ 51.91)	EIS Appendix E
(5) notice and distribution of the final EIS (§§ 51.93 and 51.118)	71 Fed. Reg. 42,884 (July 28, 2006)

[29] 10 CFR § 50.71(d) and (e) require in general that draft EISs include an analysis of the benefits of the proposed action, and a cost-benefit analysis. This general requirement is superseded by the more specific requirement in 10 CFR § 52.18, which permits analysis of the benefits to be deferred from the ESP stage to the COL stage.

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/

Table 4
Comparison of EIS against Substantive Requirements in Part 51

Substantive Requirement	Conformance to Requirement
(1) Cover sheet	EIS, pp. i – iii; 71 Fed. Reg. 42,884 (July 28, 2006)
(2) Summary	EIS Executive Summary
(3) Table of Contents	EIS, pp. v – xix
(4) Purpose of and Need for Action	EIS Section 1.3
(5) Alternatives including the proposed action	EIS Sections 8 and 9
(6) Affected Environment	EIS Section 2
(7) 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.
(8) List of Preparers	EIS Appendix A
(9) List of Agencies, Organizations and Persons to Whom Copies of the Statement are Sent	EIS Appendix B
(10) Substantive Comments Received and NRC Staff Responses	EIS Appendix E
(11) Index	*See* Table of Contents
(12) Appendices	EIS Volume 2
(13) Status of compliance	EIS Section 1.5 and Appendix F
(14) Recommendations	EIS Section 10.5

D. Conclusion on Environmental Findings 1 through 3

54. Environmental Finding 1. The previous four paragraphs demonstrate that the EIS complies with the requirements of NEPA sections 102(2)(A), (C), and (E) and 10 C.F.R. Part 51, Subpart A.

55. Environmental Finding 2. As discussed above with respect to the impacts of the EGC ESP facility, the impacts would be SMALL, with the exception of some temporary impacts that could

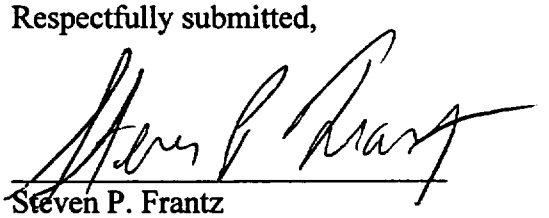
be MODERATE and could be mitigated. Therefore, a balance among the factors contained in the record of the proceeding demonstrates that the ESP site is suitable from an environmental standpoint for the EGC ESP facility, and ESP should be issued as proposed in the EIS in order to preserve the option of using the site for eventual construction and operation of the EGC ESP facility. The need for power from the EGC ESP facility will be determined at the COL stage, and a final cost-benefit balance will performed at that time.

56. Environmental Finding 3. As discussed above, a range of alternatives have been considered, including the no-action alternative, alternative energy sources, alternative sites, and alternative facility designs. The no-action alternative is not preferable because it would not accomplish the benefits of the ESP (including banking the site for future possible use); there are no reasonable alternative energy sources that are environmentally preferable; there are no obviously superior sites; and the due consideration has been given to design alternatives to reduce the impact of heat dissipation. Therefore, all reasonable alternatives have been considered, the ESP does not need any additional conditions to protect environmental values, and the ESP should be issued as recommended in the EIS.

57. Summary. For the foregoing reasons, the NEPA review conducted by the NRC Staff has been adequate; the ER and EIS contain sufficient information to support the Environmental Findings and issuance of the ESP; the Clinton ESP site is a suitable location for a nuclear station

of the general size and type bounded by the PPE; and the ESP should be issued subject to the terms and conditions specified in the EIS.

Respectfully submitted,



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UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of	)	**Docket No. 52-007-ESP**
EXELON GENERATION COMPANY, LLC	)	**ASLBP No. 04-821-01-ESP**
(Early Site Permit for the Clinton ESP Site)	)	**September 14, 2006**

NOTICE OF APPEARANCE OF RAPHAEL P. KUYLER

The undersigned, being an attorney at law in good standing admitted to practice before the courts of Maryland, hereby enters his appearance in the above-captioned matter as counsel on behalf of Applicant, Exelon Generation Company, LLC, 200 Exelon Way, KSA3-E, Kennett Square, PA, 19348.

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CERTIFICATE OF SERVICE

I hereby certify that copies of Exelon Generation Company, LLC's Brief in Response to the Board's August 2, 2006 Order Regarding Safety and Environmental Findings and Notice of Appearance of Raphael P. Kuyler in the above captioned proceeding have been served as shown below by deposit in the United States mail, first class, this 14th day of September, 2006. Additional service has also been made this same day by electronic mail as shown below.

Office of the Secretary* U.S. Nuclear Regulatory Commission Attn: Rulemakings and Adjudication Staff Washington, DC 20555-0001 email: hearingdocket@nrc.gov	Office of Commission Appellate Adjudication U.S. Nuclear Regulatory Commission Washington, DC 20555-0001
Dr. Paul B. Abramson Atomic Safety and Licensing Board Panel U.S. Nuclear Regulatory Commission Washington, DC 20555-0001 email: pba@nrc.gov	Dr. Anthony J. Baratta Atomic Safety and Licensing Board Panel U.S. Nuclear Regulatory Commission Washington, DC 20555-0001 email: ajb5@nrc.gov
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Raphael P. Kuyler

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