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Clinton ESP: Mandatory Hearing

Docket Number: 52-007-ESP

Location: Decatur, Illinois

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SECY-02

1 UNITED STATES OF AMERICA

2 NUCLEAR REGULATORY COMMISSION

3

4 In the Matter of: ||

5 EXELON GENERATION COMPANY, LLC || No. 52-007-ESP

6 (Early Site Permit for ||

7 Clinton ESP Site) ||

8

9 MANDATORY HEARING FOR EARLY SITE PERMIT FOR

10 CLINTON ESP SITE

11

12

13 The above-captioned hearing was held

14 November 7, 2006, beginning at 9:00 a.m. at the

15 Decatur Conference Center, Decatur, Illinois.

16

17 BEFORE:

18 PAUL B. ABRAMSON - Chair

19 ANTHONY J. BARATTA - Administrative Law Judge

20 DAVID L. HETRICK - Administrative Law Judge

21

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23

24

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1 APPEARANCES:

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9 Appearing on behalf of Exelon Generation

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13 U. S. Nuclear Regulatory Commission

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21 Regulatory Commission

22

23

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25

1 I N D E X

2 WITNESS

3 Thomas P. Mundy..... 541

4 Eddie R. Grant..... 566

5 Robert Moody..... 582, 721

6 Jay Lee..... 594, 718

7 Kevin Apel..... 610

8 Robert B. Kennedy..... 631

9 Joelle Starefos..... 674

10 Goutam Bagchi..... 697

11 Clifford Munson..... 703

12 Brad Harvey..... 708

13 Tamar Cerafici..... 734

14 Jeff Gabor..... 774

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1 E X H I B I T S

2 Applicant's Exhibit No. 1 - Oral Presentation of
3 Thomas P. Mundy on Exelon Generation Company's
4 ESP Application -- page 543
5
6 Joint Exhibit No. 1 - NRC Staff & Applicant's
7 Joint Response to Request for Information on
8 Activities Permitted by the Early Site Permit
9 (ESP) -- page 545
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11 Applicant's Exhibit No. 2 - Oral Presentation
12 of Eddie R. Grant on Required Safety
13 Findings -- page 568
14
15 Staff Exhibit No. 1 - Clinton Early Site Permit
16 Hearing Safety Review -- Page 673
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18 Applicant's Exhibit No. 3 - Oral Presentation of
19 Tamar Jergensen Cerafici - page 737
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21
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24
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1 P-R-O-C-E-E-D-I-N-G-S

2 JUDGE ABRAMSON: This is the mandatory
3 hearing -- we'll discuss what that means in a few
4 moments, for Exelon Generation Company's
5 application for an early site permit for the
6 Clinton site. It's Nuclear Regulatory Commission
7 document No. 52-007-ESP.

8 This hearing will involve only the
9 applicant, Exelon Generation Company, and the
10 staff and the board, so let's introduce the
11 parties. Let's commence with the introduction
12 from the applicant.

13 Counsel, would you introduce yourself
14 and those who are with you, please?

15 MR. FRANTZ: My name is Steven Frantz.
16 I'm with the law firm of Morgan, Lewis & Bockius
17 in Washington D. C. I have two associates with
18 me here today.

19 On my right is Paul Bessette, and on
20 my left is Ray Kuyler.

21 JUDGE ABRAMSON: And you'll introduce
22 the experts as you present them?

23 MR. FRANTZ: That's correct.

24 JUDGE ABRAMSON: Counsel for the
25 staff, please?

1 MS. HODGDON: I'm Ann Hodgdon from the
2 NRC and here with me at the counsel table are my
3 associates, Tison Campbell and Patrick Moulding.
4 JUDGE ABRAMSON: And also the case for
5 you, you'll introduce your experts as they're
6 brought forth. Is that correct?
7 MS. HODGDON: Yes.
8 JUDGE ABRAMSON: Here in the panel for
9 the NRC Regulatory Commission's Atomic Safety and
10 Licensing Board on my left is Dr. Anthony
11 Baratta. Dr. Baratta is a technical judge and
12 Ph.D. scientist, and on my right is Dr. David
13 Hetrick, also a technical judge and Ph.D.
14 scientist, and I'm Dr. Abramson, and I'm both a
15 scientist and an attorney, and I'll be the chair
16 of the panel.
17 On my far right is Jered Lindsay who
18 is our law clerk in this matter, and Karen
19 Valloch is in the back. She's our administrative
20 assistant and has been managing all of this for
21 us.
22 And, Dr. Baratta, would you say
23 something about Andrew Welkie and the DDMS?
24 JUDGE BARATTA: Over on my right is
25 Andy Welkie. He's my case specialist, and we're

1 doing a unique exercise in order to support an
2 activity associated with the COLs we expect to be
3 coming in next year.
4 We're using a digital environment
5 called the DDMS which allows us to actually
6 record the proceeding digitally as well as have
7 access to the various documents, and we're
8 developing this system, a portable system, which
9 is what we have today, and we're experimenting
10 with it.
11 Would you like to add anything, Andy.
12 MR. WELKIE: No.
13 JUDGE ABRAMSON: So if you see what's
14 going on with our electronic system, don't be
15 surprised, and you can talk to Andy later about
16 any questions you might have about it.
17 As I mentioned before, this is a
18 mandatory hearing. It's the first of its kind
19 with respect to a nuclear power plant in more
20 than 20 years, and it's only the second of its
21 type in that 20 year period, the prior one being
22 with respect to the Louisiana Enrichment Services
23 facility called the National Enrichment Facility
24 which was conducted last year.
25 The Atomic Energy Act, Section 189(a)

1 of the Atomic Energy Act requires the commission
2 to conduct a public hearing with respect to any
3 license for a construction -- license application
4 for a construction permit, which this is.
5 However, that act was passed at a time
6 well prior to the existence of the Nuclear
7 Regulatory Commission. When there was one
8 central agency both promoting and developing
9 atomic energy it was the Atomic Energy
10 Commission.
11 The requirement at the time was
12 passed, because, at least according to the
13 legislative history, there had been a few
14 licenses issued and no public hearing whatsoever
15 to air in front of the public the process by
16 which the staff reviewed an application and the
17 applicants presented its materials to the federal
18 government.
19 Since then, of course as you all know,
20 there have been enormous changes in the way the
21 government handles nuclear power including the
22 separation of regulation from promotion.
23 When the commission was created it
24 took the job of regulating, and they take it
25 quite seriously. The commission's regulations

1 provide how the Atomic Safety and Licensing Board
2 is to perform this particular mandatory hearing.
3 This is a very different type of
4 hearing from anything else conducted before the
5 agency. It is not a litigative hearing. It is a
6 review of the staff's work.
7 We are charged with making five
8 findings, and those are two with respect to
9 safety: Whether the issuance of an ESP will be
10 inimical to the common defense and security or
11 the health and safety of the public, often
12 referred to as safety issue one.
13 The second one is whether taking into
14 consideration the site criteria set out in
15 10 CFR Part 100 a reactor or reactors having
16 characteristics that fall within the parameters
17 for the site can be constructed and operated
18 without undue risk to the health and safety of
19 the public. That's often referred to as safety
20 issue two.
21 Then the board is required to make
22 three NEPA-related findings. That's the National
23 Environmental Protection Act, and those are to
24 determine whether requirements of certain
25 sections of NEPA, that's 102(2)(a), (c), and (e)

1 and subpart A of 10 CFR Part 51 have been
2 complied with in a proceeding, so we're checking
3 to see whether the law has been properly compiled
4 with.
5 We are then to independently consider
6 the final balance among the conflicting factors
7 contained in the record of the proceeding -- the
8 key here is in the record of the proceeding --
9 with a view to determining the appropriate action
10 to be taken and finally then to make the
11 determination after considering reasonable
12 alternatives whether the ESP should be issued,
13 denied, or appropriately conditioned to protect
14 environmental values.
15 We have directed the parties to brief
16 us on what -- how the record supports those five
17 findings, and we've received briefs on those
18 matters. The parties will be testifying today as
19 to how the record supports those particular
20 findings.
21 We've received also a great deal of
22 guidance from the commission, being that these
23 are the first of these type to be held within
24 many decades, as to what our obligations are, and
25 the commission has been quite unequivocal.

1 With respect to safety issues we are
2 not to conduct a de novo review. That means
3 we're not supposed to look at it from scratch.
4 We are to give deference to the
5 staff's judgment. We aren't to probe, but we are
6 to focus on whether the staff's determinations
7 are well-founded in logic and in fact, and in our
8 effort to determine whether the staff's
9 determinations which are set out in two principal
10 documents that are now in the record, and those
11 are the Final Safety Evaluation Report and the
12 Final Environmental Impact Statement, those are
13 commonly referred to as the FSER and the FEIS.
14 We have prepared and issued more than
15 two hundred specific questions for the staff and
16 the applicant regarding the logic and facts
17 underlying their determinations as were set out
18 in the FSER and the FEIS, and we've received
19 written responses to those questions, and
20 generally they have -- those responses have
21 cleared up most of our questions.
22 We still have a few remaining, and
23 Judge Baratta was going to mention a few that
24 he's got, and I believe that Judge Hetrick has
25 one, so we'd like to just advise you now to

1 expect some questioning on a few other things.
2 Judge Baratta?
3 JUDGE BARATTA: I'm still a little bit
4 confused about some statements that appear in the
5 SER and EIS with regards to the source terms and
6 how that's properly found in the ABWR and the
7 AP1000. There seems to be an inconsistency
8 between the two areas.
9 Also with respect to the emergency
10 plan that's discussed in the EIS there's a task
11 force report 2005 Hurricane Season Lesson Learned
12 Final Report that seems to have been ignored by
13 the staff in assessing the plan, and I'm confused
14 as to why that is.
15 And then finally there are several
16 sections in the SER that the logic by which the
17 staff reached their decision is not at all clear,
18 and that deals with the commission's statement
19 that we have to make sure that the staff's
20 decision is well founded in fact and logic.
21 Those are the principal areas, and
22 then I have some other questions for the
23 applicant based on their testimony recently.
24 And I guess finally I'm still confused
25 about where some of the commitments for the COL

1 part document, because some of them do not seem
2 to be reflected in the COL action items that are
3 open items with respect to the future
4 application.
5 JUDGE ABRAMSON: Judge Hetrick, I
6 think that some of the questions you wanted to
7 ask you wanted to address are already set out in
8 our order. Is that right?
9 JUDGE HETRICK: Yes. The question
10 that arose in the FEIS, question No. 35, the
11 question was why does Table 513 include only
12 risks from internally initiated events, and the
13 response essentially says, If externally events
14 had been considered and had they doubled or
15 tripled the risk, the risk would still be well
16 within the safety goals.
17 And my question is how do you know
18 that? I understand this is from the FEIS, but I
19 mention it now, because people in the safety
20 part -- with the safety part of the hearing may
21 want to address it.
22 And the other question was for the
23 safety people. There's a statement, quote, the
24 NPHS has no safety function and is not required
25 for shutdown or accident mitigation. The

1 reference I have is the staff's brief and
2 response to the order of August 2nd at page 26.
3 My question I have specifically is
4 what do you mean by NPHS has no safety function?
5 JUDGE ABRAMSON: So those are
6 additional things we will -- we will expect to be
7 addressed, and if you can do in it the course of
8 your presentations, that would be helpful. If
9 not, we'll address them at the end of the
10 relevant sessions.
11 Now, I believe we set that the order
12 of events was that the applicant would first make
13 its presentation. Is that correct?
14 MR. FRANTZ: That's correct.
15 JUDGE ABRAMSON: Okay. Let's rock and
16 roll.
17 Applicant, you're on with respect to
18 safety issues.
19 MR. FRANTZ: Thank you, Judge
20 Abramson. I'd like to call Mr. Thomas Mundy to
21 the witness stand.
22 JUDGE ABRAMSON: Mr. Mundy, raise your
23 right hand, please.
24
25

1

2 THOMAS P. MUNDY

3 called as a witness, after having been first duly

4 sworn, was examined and testified as follows:

5

6 EXAMINATION CONDUCTED

7 BY: MR. FRANTZ

8

9 Q. Mr. Mundy, would you state your name

10 for the record?

11 A. Thomas P. Mundy.

12 Q. Who is your employer, and what is your

13 current position?

14 A. My employer is Exelon Generation

15 Company, and my position is Director of Project

16 Development.

17 Q. Do you have the following pre-File

18 testimony before you entitled Pre-File Testimony

19 of Thomas P. Mundy on Exelon Generation Company

20 ESP Application?

21 A. Yes, I do.

22 Q. Mr. Kuyler, would you give copies to

23 the court reporter? I believe the board already

24 has copies, and the NRC staff counsel has copies.

25 Mr. Mundy, was this testimony prepared

1 under your supervision and control?

2 A. Yes, it was.

3 Q. Does this include a statement of your

4 professional qualifications?

5 A. Yes.

6 Q. Do you have any additions,

7 corrections, or modifications that you would like

8 to make to your testimony?

9 A. No, none.

10 Q. Is the testimony true and correct?

11 A. Yes, it is.

12 Q. Do you adopt this written testimony as

13 your testimony in this proceeding?

14 A. Yes, I do.

15 Q. At this time I would ask that the

16 board accept the pre-file testimony into evidence

17 and incorporate it into the record as if read?

18 JUDGE ABRAMSON: Do we have any

19 objection? Any objections from staff counsel?

20 MS. HODGDON: No objection.

21 JUDGE ABRAMSON: It shall so be.

22

23

24

25

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of	)	Docket No. 52-007
EXELON GENERATION COMPANY, LLC	)	ASLBP No. 04-821-01-ESP
(Early Site Permit for the Clinton ESP Site)	)	October 17, 2006

PREFILED TESTIMONY OF THOMAS P. MUNDY ON EXELON GENERATION COMPANY'S ESP APPLICATION

I. INTRODUCTION

Q. Please state your name.

A. My name is Thomas P. Mundy.

Q. Who is your current employer and what is your current position?

A. My current employer is Exelon Generation Company, LLC (EGC or Exelon). My current position is Director, Project Development.

Q. Please describe your professional qualifications.

A. I have been employed by Exelon (and its predecessors) for more than ten years in various technical and management positions of increasing responsibility. I am currently Project Manager for NuStart Energy Development, which is a consortium of nuclear companies (including Exelon) that is developing two applications for combined licenses for nuclear power plants. Prior to my employment with Exelon, I was an attorney for three years and an engineer on various nuclear plants for six years. A copy of my professional qualifications is attached.

Q. On whose behalf are you testifying?

A. I am testifying on behalf of the Applicant, EGC.

Q. Please describe your involvement in the Early Site Permit (ESP) Application.

A. I have been Exelon's project manager for the ESP Application.

Q. Please describe your responsibilities with respect to the ESP Application?

A. As project manager for the ESP Application, the Application was prepared under my supervision and control. This includes revisions to the Application and responses to NRC requests for additional information.

Q. What is the purpose of your testimony?

A. The purpose of my testimony is to provide a brief description of the Applicant (EGC), and the contents of the Application, including the Plant Parameter Envelope (PPE). I will also discuss the preparation of the Application, including a description of the multi-disciplinary team responsible for development of the Application and some of the measures taken by EGC to help make the Application both complete and accurate. Finally, my testimony provides an overview of the proposed site for the EGC ESP facility and provides conclusions regarding the ESP Application.

II. BACKGROUND ON THE APPLICANT AND APPLICATION

A. Description of the Applicant

Q. Please describe the Applicant for the ESP.

A. The Applicant is EGC. EGC is a limited liability company formed to own, operate, and acquire nuclear and other electric generating assets, to engage in the sale of electrical energy, and to perform other business activities. EGC is also one of the nation's largest power producers and wholesale marketers and employs approximately 7,300 individuals.

EGC is a wholly-owned subsidiary of Exelon Ventures Company, LLC which, in turn, is wholly owned by Exelon Corporation. EGC is not a conventional regulated utility, but is a merchant generator. Illinois "deregulated" its retail electricity market with the Illinois Electric Service Customer Choice and Rate Relief Law of 1997, Public Act 90-0561 (1997). As a merchant generator, EGC sells power on the open wholesale market, without traditional considerations such as supplying a service area or satisfying a reserve margin objective. In other words, EGC does not need to supply the energy needs of any particular area.

Q. Do any foreign corporations or foreign governments own or control Exelon?

A. No. Neither EGC nor its parents, Exelon Ventures and Exelon Corporation, is owned, controlled or dominated by an alien, a foreign corporation, or a foreign government. Also, the directors and principal officers of EGC, Exelon Ventures, and Exelon Corporation are U.S. citizens.

Q. Does Exelon own and operate other nuclear generating stations?

A. Yes. Exelon Nuclear, a business unit within EGC, is responsible for the operation of EGC's ten nuclear stations with 17 nuclear reactors, representing approximately 17 percent of the U.S. nuclear industry's power capacity.

B. Description of the Application

Q. What is the purpose of the ESP Application?

A. The purpose of the 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. 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. However, an ESP does not authorize EGC to construct a nuclear plant. Under 10 C.F.R. § 50.10, EGC may not construct a nuclear power plant 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, co-located with the Clinton Power Station (CPS) facility.

Q. What is the duration of the ESP?

A. EGC requests an ESP with a permit duration of 20 years pursuant to 10 C.F.R. Part 52, Subpart A. 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). EGC has submitted a Site Redress Plan in support of that request.

Q. Did EGC identify any time-dependant site characteristics that would not support a 20-year ESP plus a 40-year operating license or COL?

A. No. EGC did not identify any time-dependant site characteristics that would not fully support a 20-year ESP plus a 40-year operating license or COL. Such site characteristics would normally involve issues such as locations of nearby industrial hazards, meteorology, and demography. 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 or a subsequent 40-year operating license or COL.

Q. Briefly describe the contents of the ESP Application.

A. The ESP application is composed of Administrative Information, the Site Safety Analysis Report (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 criteria for developing the ESP. The SSAR includes a description of the site, assessment of site characteristics affecting the plant design in the areas of meteorology, hydrology, geology, and seismology, 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 environmental 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 emergency plans. Finally, should EGC decide to 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.

Q. What is the most recent revision of the Application?

A. The most recent revision is Revision 4, which was submitted to the NRC on April 14, 2006. In response to the Licensing Board's order dated April 17, 2006, EGC provided copies of Revision 4 to the Application to each member of the Board.

Q. Is Revision 4 to the Application complete and accurate to the best of your knowledge, information, and belief?

A. Yes.

C. Plant Parameter Envelope (PPE)

Q. Is the Application based on a particular reactor design or designs?

A. No. The regulations in 10 C.F.R. Parts 52 and 100 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. 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. 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 or different reactor type. 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). These reactor designs formed the basis for the development of the PPE. 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.

Q. How were the design parameters selected?

A. Appropriate design parameters were identified for inclusion in the PPE through a systematic review of regulatory criteria and guidance, ESP application content requirements, experience with previous site suitability studies, and industry guidance documents. The 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. As applicable, the most limiting (maximum or minimum) bounding value was selected. 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. The EGC ESP plant parameter values are listed in Table 1.4-1 of the SSAR. This type of facility characterization is considered sufficient to assess the future use of the site from both a nuclear safety and environmental perspective.

Q. How will the PPE values be accounted for in an application for a CP or COL?

A. Under the PPE approach, any future design that is demonstrated to be bounded by the PPE will be 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. 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.

Q. What happens if the plant design at the COL stage deviates from the PPE?

A. It is possible that one or more characteristics 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).

Q. Has the NRC reviewed the PPE values?

A. Yes. 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. The NRC Staff also found EGC's PPE values to be reasonable and that some of the PPE values have been modified to include margin.

III. DESCRIPTION OF THE PROPOSED SITE

Q. Briefly describe the site for the proposed EGC ESP facility.

A. EGC selected a vacant parcel of land on the CPS property, near Clinton, Illinois as the location of the possible future EGC ESP facility. The CPS is a nuclear power plant owned and operated by AmerGen Energy Company, LLC (AmerGen). The ESP site is located approximately 700 feet south of the existing CPS. The EGC ESP site boundary is the same as the CPS property lines. 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. The total area encompassed by the site boundary is about 14,180 acres. Except for CPS, the former 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.

Q. Describe the relationship between EGC and AmerGen.

A. 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.

Q. Why did EGC select the CPS location?

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

Q. Will the CPS and the proposed EGC ESP facility share any systems?

A. 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. 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. Clinton Lake will be used as the normal source of makeup water for the cooling water system.

IV. PREPARATION OF THE APPLICATION

Q. Describe the organization responsible for the preparation of the Application.

A. While EGC is the Applicant for the ESP, the Application was prepared by an interdisciplinary team of qualified EGC project personnel and expert contractors with

expertise in all key areas of the application, including the Site Safety Analysis Report and Environmental Report.

Q. What other parties were involved in the development of the Application?

A. CH2M Hill, under contract with EGC, served as the primary contractor for the development of the Application. The principal expert subcontractors who also assisted in the development of the information in the SSAR included: Parsons Power Group, Inc. (now doing business as Worley-Parsons), which provided engineering services in preparing the SSAR, and a number of subcontractors with expertise in geotechnical and seismic analyses. Also, Sargent & Lundy and Idaho National Engineering and Environmental Laboratory independently reviewed draft SSAR sections, and an independent board of review comprised of industry experts in the fields of seismology, probabilistic seismic hazards analysis, soil/structure interaction and soil properties, and structural engineering evaluated the implementation plan for the seismic hazards work, the interim results of the work, and the conclusions reached during the work.

Q. Please describe the qualifications of these contractors to perform these activities.

A. CH2M Hill is a company that provides full-service engineering, construction, and operation services for nuclear facilities, including more than two decades of managing nuclear facilities for the Department of Energy. CH2M Hill also provides a full range of services for new nuclear facility development, including siting, licensing, and design. Sargent & Lundy and Parsons (formerly Gilbert Commonwealth, and now doing business as Worley-Parsons) are large architect-engineers and constructors, that have previously helped to design and construct nuclear power plants in the United States, and who have been extensively involved in providing engineering services for operating nuclear power

plants. In summary, the contractors used to develop the ESP Application were highly experienced with siting and licensing of nuclear power plants and were well qualified to work on this project.

Q. Discuss the site investigation activities conducted by the Application team.

A. The Application team conducted extensive site investigation activities to support the ESP Application. EGC conducted a variety of surveys to support the ESP Application, including collection of extensive and detailed meteorological data from January 2000 to December 2002, geophysical surveys to determine soil and rock dynamic properties, transient population estimates, estimates of the capacity of public water and waste water facilities, and soil borings within the ESP facility site footprint. EGC also installed new test wells to measure current water table conditions, and performed topographical surveys to accurately identify the location of borings and groundwater monitoring wells.

Q. Did EGC also use previously existing data to support the ESP Application?

A. Yes. The ESP Application relied on various existing surveys and data collections. These included: (1) state agency surveys of groundwater quality, hydrologic conditions, water temperatures downstream of Clinton Lake, endangered or threatened species, and seismic conditions; (2) meteorological surveys and data from a variety of third party sources; (3) land use surveys by the U.S. Geological Survey; (4) an archaeological survey conducted in the early 1970s, prior to construction of CPS, and another more recent (2000) archaeological survey conducted prior to construction of a wastewater treatment plant in the vicinity; (5) data from soil borings taken for the original CPS facility; and (6) periodic surveys associated with the operation of CPS.

Q. How are these efforts documented?

A. EGC provided complete lists of references used to support the ESP Application in each chapter of the SSAR, ER, and Site Redress Plan, and in Appendix C of the EP.

Q. Did EGC implement any quality assurance measures during preparation of the Application?

A. Yes. While ESP holders and applicants are not required to implement quality assurance (QA) programs compliant with 10 C.F.R. Part 50 Appendix B, EGC nevertheless employed QA measures for ESP activities. CH2M HILL, the Applicant's primary contractor for developing the ESP application, provided QA for its ESP activities through the development of a project-specific QA program, as well as oversight of subcontractors that worked on various aspects of the application. Exelon implemented project specific procedures addressing the quality expectations and controls that would be applied in the development of the Application and Exelon's review and acceptance of the Application prepared by CH2M Hill. The QA measures used by the Applicant and its contractors helped 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. The NRC Staff also reviewed these measures and came to the same conclusion.

Q. Did EGC conduct any public outreach activities in support of its application?

A. Yes. Prior to submittal of the Application, EGC contacted members of the public from the surrounding community. Between August 21 and September 1, 2002, EGC representatives gathered input from residents who might be affected by the construction and operation of the proposed ESP facility. Exelon also established a Community Advisory Panel (CAP) in September of 2002. This Panel, comprised of a cross section of

Clinton community stakeholders, convenes about four times per year for the purpose of, among other things, providing a forum to learn about and exchange information regarding Exelon's Application. On May 19, 2003, representatives of the NRC Staff met with the CAP to present information on the NRC's role in the licensing of new reactor plants. Also, on March 20, 2003, the NRC's New Licensing Reactor Project Office (NRLPO) held a public outreach meeting in Clinton to provide information on opportunities for public involvement in the ESP process, and on December 18, 2003, the Staff held a public scoping meeting in Clinton. EGC representatives attended both of those meetings. On April 19, 2005, following the issuance of the draft Environmental Impact Statement (EIS), the NRC held another public meeting near the ESP site to describe the results of the environmental review, answer questions, and provide members of the public with information to assist them in submitting comments on the draft EIS. EGC representatives also attended that meeting.

Q. How did the EGC ESP organization support the NRC Staff's review of the Application?

A. In the course of the Staff's review, the EGC ESP organization responded to twelve separate safety and emergency planning-related requests for additional information (RAIs) that included approximately 110 subparts. EGC also responded to four RAIs with approximately fifty subparts related to environmental issues.

Q. Are there any remaining open items on the application?

A. No. There are no remaining open items or outstanding requests for information for any portion of the Application. However, there are 32 safety COL Action Items, six safety Permit Conditions, and one environmental Permit Condition. The Staff's environmental review was also predicated on certain assumptions that will need to be verified at the CP

or COL stage. Required future actions are documented in Appendix K to the final EIS ("Key Statements Made in the Environmental Report Considered in the NRC Staff's Final Review") and in Appendix A to the final Safety Evaluation Report (SER) ("Permit Conditions, COL Action Items, Site Characteristics, and Bounding Parameters").

Q. Please summarize the subjects addressed by the RAIs.

A. The topics addressed by the safety and emergency planning RAIs included quality assurance, meteorological data, emergency plan major features, meteorology, hydrology, security, seismology, geology, accidents, hazards, and evacuation time. Environmental RAIs addressed topics in the areas of ecology, cooling system and water-related impacts, radwaste management, transmission system, transportation of radioactive materials, ecological impacts, socioeconomic impacts, radiation exposure to construction workers, radiological impacts of normal operation, design basis accidents, severe accidents, alternative sites, and alternative energy sources.

Q. What other interactions did EGC have with the NRC Staff on the Application?

A. As I previously mentioned, in December of 2003, the Staff held a public scoping meeting in Clinton. This meeting was intended to provide members of the public with an opportunity to provide their comments on what environmental issues the NRC should consider during its review of the Application for the Clinton ESP site. In April of 2005, following the issuance of the draft EIS, the NRC held another public meeting near the ESP site to describe the results of the environmental review, answer questions, and provide members of the public with information to assist them in submitting comments on the draft EIS. Regarding specific interactions between Exelon and the Staff, Exelon announced its intentions to pursue an ESP on April 30, 2002, and subsequently met with

the NRC Staff at its headquarters on May 28, 2002. This meeting generally introduced Exelon's ESP project plan and timeline for the completion and submission of the Application. Subsequently, Exelon met with the NRC Staff at the ESP site on March 2, 2004 for the purpose of familiarizing the NRC's environmental staff and its contractors with the ESP property and the surrounding area. A similar visit was held on July 15, 2004 for the NRC nuclear safety staff in connection with their review of site hazards. During subsurface exploration fieldwork, EGC met with technical experts of the NRC Staff interested in witnessing the fieldwork and understanding the testing methodology being employed by EGC. On May 18 and 19, 2004, EGC met with NRC Staff geotechnical and seismic experts for the purpose of explaining EGC's approach to addressing the ground motion analysis pursuant to 10 C.F.R. Part 100. During these meetings, the NRC staff asked numerous questions regarding the ASCE 43-05 methodology basis, how this method was applied to the ESP site, how the performance-based methodology complies with 10 C.F.R. §100.23, and the specific data related to the application of the ASCE method to the ESP site. During the period in which the NRC was issuing RAIs pertaining to the Application, Exelon held several teleconferences with the NRC staff to discuss and understand the intent of the RAIs. Exelon also met with the NRC Staff on September 16, 2005 to discuss Exelon's performance-based seismic methodology; on September 17, 2005 to discuss major feature aspects of emergency planning information; and on September 27, 2005 to discuss Exelon's intended responses to open items contained in the draft SER. These meetings served to ensure that the information EGC provided to the NRC Staff was responsive to the issues addressed in the RAIs.

Q. What is your opinion regarding the review performed by the NRC Staff of the Application?

A. In my opinion, the reviews performed by the NRC Staff were probing and thorough. The NRC Staff systematically reviewed the Application using its review guidance. In many cases, the Staff issued RAIs to elicit additional information beyond that required by its review guidance, and it critically challenged EGC in the RAIs, in meetings, and during inspections to provide the basis for EGC's analyses and conclusions. Furthermore, in my opinion, the NRC Staff's Safety Evaluation Report and Environmental Impact Statement provide a comprehensive evaluation of the information provided in the Application, and provide more than sufficient information to support the findings needed for issuance of the ESP.

V. CONCLUSION

Q. What are your conclusions regarding the EGC ESP Application

A. The Application contains sufficient information to support the Board's required safety and environmental findings and issuance of the ESP. The safety and environmental review conducted by the NRC Staff has been adequate. The Clinton ESP site is a suitable location for a nuclear station of the general size and type bounded by the PPE. Therefore, the ESP should be issued subject to the terms and conditions specified in the SER and EIS.

Q. Does this complete your testimony?

A. Yes.

STATEMENT OF PROFESSIONAL QUALIFICATIONS OF THOMAS P. MUNDY

PROFESSIONAL EXPERIENCE

EXELON GENERATION COMPANY, LLC, Kennett Square, PA 1997-Present

Director, Project Development – Exelon Generation

Direct and manage various activities associated with Exelon's advanced nuclear reactor related projects. Areas of responsibility include: Exelon's participation in *NuStart Energy Development, LLC* activities, Exelon's Early Site Permit ("ESP") project, preparing, negotiating, and administering advanced plant funding agreements with the U.S. Department of Energy ("DOE") and EPRI, and representing Exelon on several advanced plant-related industry forums.

Director, Technical Support, Nuclear Acquisitions – Exelon Nuclear

Direct the due diligence and transition activities associated with the acquisition of nuclear generating assets including potential project identification, contribute to project viability analysis, manage due diligence, liaison between line organization and financial analysis group to ensure thorough financial analysis, present findings/recommendations to senior nuclear management. Assist in negotiation and preparation of asset purchase, interconnection, and other agreements, manage due diligence and transition budgets, manage closing/transition activities.

Merger Lead, UNICOM/PECO Energy Company Merger

Selected as 1 of 5 leads representing PECO in connection with the merger of its nuclear organization with that of Commonwealth Edison. Developed the overall integration methodology and accompanying tools, and managed the transition of several functional areas. Recipient of special corporate recognition for outstanding contribution to merger.

Director, Generation Support Group – Power Generation

With six direct reports and approximately 40 indirect reports, managed the delivery of central services for 4,500 MW_e fossil generation organization including business/finance, engineering, environmental, information technology, supply/procurement, and industrial safety.

Manager, Central Engineering and Projects – Power Generation

With 20 direct reports, managed the delivery of: strategic project management, engineering designer services, Energy Delivery interface, EPRI participation, retired fossil station asbestos remediation, chemistry and industrial safety consulting, centralized training; and all non-nuclear joint-owner activities.

Support Manager – Eddystone Generating Station, Power Generation

Supervised three direct reports and approximately 25 indirect reports in the functional areas of fuel handling, financial, technical services, and facilities.

Technical Services Supervisor – Eddystone Generating Station, Power Generation

Managed the station chemistry, industrial safety, environmental compliance, fire protection, and chemical control programs, and the system manager function associated with the wastewater treatment and demineralization plants. Contract administrator for the settling basin, specialty and bulk chemicals.

Senior Engineer – Engineering Services, Energy Delivery

Coordinated and administered the regional Event Investigation Program within the Distribution Company. Authored the Energy Delivery Event Investigation handbook and delivered associated training.

ENVIRONMENTAL CLAIMS ADMINISTRATORS INC., Exton, PA 1995-1997

Supervising Claims Counsel

Supervised Counsels' handling of engineer, architect and contractor professional and environmental liability insurance claims including coverage analysis; coordinating remediation strategies, retaining and coordinating counsel in litigation, client correspondence, and negotiating claim settlement.

PALMER BIEZUP & HENDERSON, Philadelphia, PA 1994-1995

Attorney

Associated with 20-attorney law firm with practice concentrating in admiralty and insurance defense litigation.

OTHER POSITIONS

Supervising Engineer – PECO ENERGY COMPANY
Limerick Generating Station, Limerick, PA 1988-1994

Engineer, Plant Analysis – GPU NUCLEAR CORPORATION
Oyster Creek Nuclear Generating Station, Forked River, NJ 1986-1988

Mechanical Test Engineer – NEWPORT NEWS SHIPBUILDING
Aircraft Carrier (Nuclear) Engineering, Newport News, VA 1982-1986

E-Plan Corporate Spokesperson, EXELON NUCLEAR 2000-Pres.

EDUCATION

Juris Doctor (cum laude), Temple University School of Law, Philadelphia, PA

Master of Engineering Administration, George Washington University, Washington, DC

B.S., Marine Engineering, U.S. Merchant Marine Academy, Kings Point, NY

PROFESSIONAL AFFILIATIONS

Licensed to practice law in Pennsylvania and New Jersey

Registered Patent Attorney; U.S. Patent and Trademark Office

1

2 MR. FRANTZ: Thank you. I would now

3 like to mark as Applicant's Exhibit 1 the

4 following set of slides entitled Oral

5 Presentations of Thomas P. Mundy on Exelon

6 Generation Company's ESP Application.

7 Mr. Kuyler is giving copies to the

8 board and the reporter and to the NRC staff.

9 BY MR. FRANTZ:

10 Q. Mr. Mundy, were these slides prepared

11 under your supervision and control?

12 A. Yes.

13 Q. Are these slides true and correct?

14 A. Yes, they are.

15 Q. Are the slides consistent with your

16 pre-file testimony?

17 A. Yes, they are.

18 Q. Do you have any additions,

19 corrections, or modifications that you would like

20 to make to these slides?

21 A. No, none.

22 Q. All right. I now ask that the board

23 accept into evidence Applicant's Exhibit 1.

24 JUDGE ABRAMSON: Has this been so

25 marked?

1 MR. FRANTZ: Yes, it has.

2 JUDGE ABRAMSON: Fine. It will be

3 admitted into the record as Applicant's

4 Exhibit 1.

5 BY MR. FRANTZ:

6 Q. Thank you.

7 Mr. Chairman, on April 14th, 2006,

8 Exelon submitted Revision 4 to its application

9 for the Clinton ESP. Copies of the application

10 have been previously provided to the board and

11 the response to the board's order dated April

12 17th, 2006.

13 Mr. Mundy, does Revision 4 to the

14 Exelon application for the Clinton ESP consist of

15 a transmittal letter, administrative information,

16 a Site Safety Analysis Report, an emergency plan,

17 and an environmental report, and a site redress

18 plan?

19 A. Yes, it does.

20 Q. Was Revision 4 to Exelon's application

21 for the Clinton ESP prepared under your

22 supervision and control?

23 A. Yes.

24 Q. Was Revision 4 to the application true

25 and correct to the best of your knowledge,

1 information, and belief?

2 A. Yes, it is.

3 MR. FRANTZ: Mr. Chairman, in

4 accordance with the board's directions during the

5 pre-hearing conference call on October 3, 2006,

6 we do not need to make copies of the application

7 to the reporter or to the board or the parties.

8 They already have copies.

9 Therefore, I would now request that

10 the board accept into evidence application

11 Revision 4 into evidence.

12 JUDGE ABRAMSON: It is accepted. It

13 is already in the record, thank you, because it's

14 been submitted into the record. It need not be

15 presented here into the record.

16 MR. FRANTZ: Thank you.

17 I would now like to mark the

18 following exhibit as Joint Exhibit No. 1 entitled

19 NRC Staff and Applicant's Joint Response to

20 Request For Information on Activities Permitted

21 by the Early Site Permit (ESP).

22 Mr. Kuyler if you could give copies to

23 the court reporter, the board, and the NRC staff.

24 BY MR. FRANTZ:

25 Q. In its order dated October 23, 2006,

1 the licensing board requested the parties to
2 present an exhibit that describes the scope of
3 activities that the applicant would be unable to
4 undertake and the task and information that the
5 applicant would not be required to undertake or
6 produced at a later date as a result of the grant
7 of the ESP.
8 Joint Exhibit 1 is intended to address
9 the board's order.
10 Mr. Mundy, was Joint Exhibit 1
11 prepared under your supervision and control?
12 A. Yes, it was.
13 Q. Was Joint Exhibit 1 also prepared in
14 collaboration with the NRC staff?
15 A. Yes.
16 Q. Will the NRC staff also be sponsoring
17 this joint exhibit?
18 A. Yes, they will be.
19 Q. Is Joint Exhibit 1 true and correct to
20 the best of your knowledge, information, and
21 belief?
22 A. Yes, it is.
23 Q. Mr. Chairman, I now request that the
24 board accept into evidence Joint Exhibit No. 1.
25 JUDGE ABRAMSON: Let's get some

1 confirmation from the staff.

2 Counsel, does the staff jointly

3 sponsor this exhibit.

4 MS. HODGDON: Yes, it does.

5 JUDGE ABRAMSON: And from the staff's

6 perspective is it true, correct, and accurate?

7 MS. HODGDON: It is.

8 JUDGE ABRAMSON: Thank you. Then it

9 is so admitted into the record. Thank you.

10 BY MR. FRANTZ:

11 Q. Thank you.

12 Mr. Mundy, will your oral presentation

13 also discuss this Joint Exhibit No. 1?

14 A. Yes, it will.

15 Q. Mr. Mundy, would you now proceed with

16 your oral presentation?

17 A. Yes, thank you.

18 Good morning. My name is Thomas

19 Mundy, Director of Project Development with

20 Exelon Generation Company. I'll be providing a

21 brief overview of Exelon's early site permit

22 application.

23 The purpose of my discussion this

24 morning will be to describe the applicant, Exelon

25 Generation Company, to identify the contents of

1 our early site permit application, to discuss how
2 the application was prepared, to provide an
3 overview of the proposed site, respond to the
4 board's request for information regarding
5 activities permitted under the early site permit,
6 and then finally present conclusions regarding
7 the early site permit application.
8 Regarding the applicant, Exelon
9 Generation Company, Exelon is not owned,
10 controlled, or dominated by any foreign entities.
11 Exelon owns and operates nuclear and other
12 electric generating assets and is responsible for
13 the operation of 17 nuclear reactors.
14 Finally, Exelon is one of the nation's
15 largest power producers and wholesale marketers.
16 The objectives of Exelon's early site
17 permit application is to resolve site-related
18 safety, environmental, and emergency preparedness
19 issues for the early site permit site. The ESP
20 would bank the site for possible future
21 construction of a nuclear plant. And Exelon did
22 not identify any time dependent site
23 characteristics that would not fully support the
24 early site permit, the duration of the early site
25 permit plus the duration of the combined license.

1 The ESP would not authorize
2 construction, however. Exelon may not construct
3 a nuclear power plant without a COL, and Exelon
4 requests, however, the approval for
5 preconstruction activities and has submitted a
6 site redress plan in support of that request.
7 With respect to the contents of
8 Exelon's ESP application the application was
9 prepared pursuant to 10 CFR Part 52. The
10 contents contain essentially five main parts:
11 administrative information --
12 JUDGE ABRAMSON: Excuse me. Before
13 you go on, would you just briefly describe for us
14 the types of preconstruction activities that
15 would be permissible?
16 THE WITNESS: I do intend to address
17 that later on in the slide near the end. I can
18 do that now.
19 JUDGE ABRAMSON: You can do it near
20 the end. That's fine.
21 THE WITNESS: Thank you.
22 Those five parts of the application
23 are the administrative information, the Site
24 Safety Analysis Report, the environmental report,
25 the emergency plan, and the site redress plan.

1 Exelon's application is based upon a
2 Plant Parameter Envelope. Part 52 does not
3 require an ESP applicant provide specific design
4 information, and in fact Exelon has not selected
5 a specific reactor type for the ESP site.
6 The application, therefore, is based
7 on a Plant Parameter Envelope that identifies a
8 set of bounding designed parameters that serve as
9 a surrogate for actual facility information.
10 In arriving at this Plant Parameter
11 Envelope Exelon utilized several reactor plant
12 designs to develop the PPE, and those designs are
13 listed in my -- they're on slide 6.
14 They consist of the advanced boiling
15 water reactor, the AP1000 reactor, pebble bed
16 modular reactor, the gas turbine modular helium
17 reactor, the advanced CANDU reactor, the
18 International Reactor Innovative and Secure, the
19 IRIS reactor, and, finally, the economic
20 simplified boiling water reactor, ESBWR.
21 The PPE is used to characterize the
22 functional or operational needs of the plant
23 relative to the site; also to characterize the
24 plant's impact on the site and surrounding
25 environments; and lastly to characterize the

1 site-imposed requirements on the plant itself.
2 The PPE values can be found in table
3 1.4-1 of Exelon's Site Safety Analysis Report.
4 Any future design ultimately to be
5 selected by Exelon referenced in its COL
6 application, referenced its early site permit
7 that is bounded by the PPE established in the ESP
8 will be suitable for the site, meaning that the
9 design will be no more demanding from the site
10 suitability and safety perspective than bounding
11 design parameters of the Plant Parameter
12 Envelope.
13 Further, the environmental impacts
14 will not be significantly greater than
15 environmental impacts evaluated in the early site
16 permit. However, if the design characteristics
17 of the selected design are not bounded by the
18 PPE, a variance may be needed under 10 CFR Part
19 52.39(b).
20 Lastly, the staff evaluated the PPE
21 and found those values to be reasonable.
22 Regarding the early site permit site,
23 the proposed site, the site is a vacant parcel of
24 land located near the Clinton Power Station.
25 Clinton Power Station is a nuclear power plant

1 owned and operated by an Exelon subsidiary,
2 AmerGen, and the site is located approximately
3 700 feet south of the Clinton Power Station.
4 The early site permit site boundary is
5 the same as the Clinton Power Station's property
6 lines, and the ESP site generally consists of the
7 Clinton Power Station, the Clinton Lake,
8 woodlands, pasture lands, cultivated farmland,
9 and recreational areas surrounding the site, and
10 except for the Clinton Power Station-related
11 facilities, there are no industrial or commercial
12 structures on the site.
13 Exelon selected the early site permit
14 site because it was already developed and
15 dedicated to nuclear use. In fact, the site had
16 originally been intended as a two unit, two units
17 for the current Clinton Power Station. Only one
18 was ultimately constructed. And there is
19 considerable site data that already exists from
20 the Clinton Power Station that can be used in the
21 development of the early site permit application.
22 The early site permit facility will,
23 however, essentially be independent of the
24 Clinton Power Station with a few minor
25 exceptions. Those are that the Clinton Power

1 Station ultimate heat sink may provide emergency
2 makeup water for the ESP facility, an ultimate
3 heat sink if one is needed.
4 There may be possible sharing of
5 non-safety related structures, such as warehouses
6 and training buildings and also support
7 facilities, such as a domestic water system and
8 the sewage treatment system. The existing
9 switchyard for the Clinton Power Station may be
10 expanded for the new facility.
11 And, finally, Clinton Lake will be
12 used as the normal makeup cooling water source
13 for the new facility.
14 Exelon's early site permit application
15 was prepared by Exelon personnel and expert
16 contractors. CH2M Hill served as Exelon's
17 primary contractor in the development of the
18 application, and CH2M Hill utilized a number of
19 principal subcontractors to support that
20 development, including Parsons Power Group who
21 provided engineering services for the Site Safety
22 Analysis Report; Testing Services Corporation --
23 excuse me, Testing Service Corporation, which
24 provided work associated with the geotechnical
25 activities; Geomatrix Consultants performed a

1 number of seismic and geological-related
2 activities; GRL Engineers performed standard
3 penetration test measurement work; Stratigraphics
4 performed cone penetrometer measurements also
5 related to the geotechnical work; the University
6 of Texas performed soil analysis; and lastly ERIN
7 Engineering provided severe accident analysis
8 evaluations.
9 In addition to the parties that
10 supported the preparation of the application
11 Exelon utilized a number of parties to
12 independently review the draft application prior
13 to it being provided to Exelon. Sargent & Lundy
14 and the Idaho National Engineering and
15 Environmental Lab independently reviewed draft
16 sections of the environmental report and the site
17 safety analysis sections.
18 Exelon also utilized an independent
19 board of review that examined the seismic work
20 scope analysis and the geotechnical work scope
21 analysis.
22 In preparing the application Exelon
23 conducted a variety of surveys, including the
24 collection of meteorological data from January
25 of 2000 to December of 2002, performed

1 geophysical surveys to determine soil and rock
2 properties, conducted surveys regarding transient
3 population estimates, estimates of the capacity
4 of public water and waste water facilities,
5 obtained soil borings within the early site
6 permit facility site footprint, and installed
7 test wells to measure current water table
8 conditions at the site.
9 In addition, the Exelon application
10 also relies on existing surveys and data
11 including state surveys of groundwater quality,
12 hydrologic conditions, water temperature,
13 endangered or threatened species, and seismic
14 conditions at the site.
15 Meteorological surveys and data from
16 third parties sources were used including from
17 the National Weather Service. Land use surveys
18 were obtained from the U. S. Geological Survey,
19 archaeological surveys that were conducted in the
20 early '70s for the licensing of Clinton Power
21 Station later in 2000 for some Clinton Power
22 Station-related modification work and then data
23 from soil borings taken from the original Clinton
24 Power Station facility, and then lastly periodic
25 surveys associated with the operation of the

1 Clinton Power Station itself.

2 With respect to the quality assurance

3 program associated with the development of the

4 early site permit application the ESP applicants

5 are not required by regulation to implement a

6 quality assurance program. Exelon, nonetheless,

7 employed QA measures for the preparation of its

8 ESP.

9 Exelon -- specifically Exelon

10 implemented project specific procedures that

11 outlined Exelon's expectations for the quality

12 assurance measures that will be taken in the

13 development of the application.

14 And then Exelon's principal

15 contractor, CH2M Hill, implemented project

16 specific QA instructions and the project specific

17 QA program that would then carry out Exelon's

18 expectations.

19 The NRC staff reviewed and approved

20 the program and the measures that Exelon put in

21 place for its QA program.

22 With respect to public outreach, in

23 2002 Exelon gathered input from residents living

24 in the area of the proposed Clinton ESP site, and

25 later in 2002 Exelon established a community

1 advisory panel.

2 This panel is comprised of a cross

3 section of Clinton community stakeholders and

4 convenes about four times a year for the purpose

5 of, among other things, providing a forum to

6 learn about and exchange information regarding

7 Exelon's ESP application.

8 In 2003 Exelon held a public outreach

9 meeting -- excuse me, the NRC held a public

10 outreach meeting in Clinton. Similarly in 2005

11 the NRC also held a public meeting on the draft

12 Environmental Impact Statement, and Exelon was a

13 participant at each of those NRC held meetings.

14 In support of the staff's review of

15 Exelon's early site permit application Exelon

16 responded to a number of requests for additional

17 information from the NRC. In fact, there was

18 approximately 110 safety and emergency planning

19 questions raised by the NRC and approximately 50

20 environmental-related questions that Exelon

21 responded to.

22 There are no remaining open items or

23 outstanding requests for additional information.

24 However, the staff has identified 32 COL action

25 items, six safety permit conditions, and one

1 environmental permit condition.

2 Exelon also supported the NRC staff's

3 review of the application. Exelon held an

4 introductory meeting with the NRC staff in 2002

5 to lay out Exelon's project organization and also

6 its schedule for the development of its early

7 site permit application.

8 Exelon met with the NRC environmental

9 staff in 2004 to familiarize it with the ESP site

10 and surrounding environments. Similarly, Exelon

11 met with the NRC staff -- safety staff in

12 connection with the review of the site.

13 Exelon also met with NRC technical

14 experts on field investigations and testing while

15 those activities were going on at the early site

16 permit site.

17 Further in 2004 Exelon met with NRC

18 geotechnical and seismic experts on Exelon's

19 ground motion analysis. Exelon also held several

20 teleconferences with the NRC staff to discuss the

21 staff's request for additional information to

22 ensure that Exelon was being responsive to those

23 questions.

24 Additionally, Exelon met several times

25 with the NRC staff in 2004 to discuss Exelon's

1 performance-based seismic methodology, major
2 features aspects of emergency planning
3 information, and Exelon's intended response to
4 the NRC's open items that existed at the time.
5 JUDGE BARATTA: Did you mean 2004 or
6 2005?
7 THE WITNESS: Excuse me, 2005, to
8 discuss those activities.
9 Regarding your question, Judge
10 Abramson with respect to the scope of activities
11 that a COL applicant could undertake, this is
12 also outlined in the joint exhibit that was
13 provided earlier.
14 AmerGen Clinton Power Station owner,
15 may undertake activities authorized by the
16 Clinton Power Station license, and that's
17 separate and apart from what a party can do that
18 holds the ESP or a COL applicant.
19 Separate from the early site permit a
20 COL applicant is permitted certain activities
21 that are specified in 10 CFR 50.10(c). Those
22 activities, for example, consist of procurement
23 of manufacturer components of the facility and
24 construction of buildings which may be used for
25 activities other than the operation of the

1 facility. Preconstruction monitoring activities
2 is also another activity that could be
3 accomplished.
4 And then also subject to the
5 prerequisites in the EIS, the early site permit
6 would permit a COL applicant to conduct a number
7 of activities including those that I have listed
8 there, and those are preparation of construction
9 including clearing, grading, and construction of
10 temporary access roads, installation of temporary
11 construction support facilities, excavation of
12 facilities, structures, construction of service
13 facilities, drilling, sampling, monitoring wells,
14 and other boring activities, construction of
15 non-safety related cooling towers, plant intake
16 structures, and fire protection equipment,
17 expansion of existing switchyard and transmission
18 system, modification of the existing discharge
19 flow.
20 And finally construction of other on
21 non-safety related structures, systems, and
22 components.
23 JUDGE ABRAMSON: How do those
24 activities relate to your site redress plan, if
25 at all?

1 THE WITNESS: Well, the site redress
2 plan ensures that if we do conduct any or all of
3 these activities and then we cease conduct of
4 those that we are restoring the site to a
5 permissible and acceptable condition.
6 That plan addresses, therefore, our
7 ability to do any of these things that are
8 generally outlined here and then redress the
9 facility if we do not complete those.
10 There is a number of information and
11 tasks that are not required from a COL applicant.
12 Under 10 CFR 52.39 and 52.79 a COL applicant need
13 not provide information or analysis submitted in
14 the ESP application.
15 However, there are some exceptions.
16 The applicant must address early site permitting
17 conditions that are outlined in the FSER,
18 Appendix A, and also in the EIS Section 4.3.1.
19 The applicant must also address
20 matters that were not fully resolved in the ESP
21 proceeding such as the COL action items in the
22 FSER, Appendix A, and the EIS, Appendix K.
23 The COL applicant also needs to review
24 the ESP application, the FSER, and the EIS to
25 identify any other matters not fully resolved

1 that need to be addressed.

2 JUDGE BARATTA: Could I interrupt you?

3 THE WITNESS: Yes, sir.

4 JUDGE BARATTA: One of the -- with

5 regards to that last statement, one of the

6 concerns that I have is that there are COL action

7 items in the FSER, Appendix A, and the EIS,

8 Appendix K, as you mentioned.

9 However, there appear to be other

10 items that are spread throughout the FSER and EIS

11 that require attention.

12 How would you envision Exelon doing

13 that 20 years from now?

14 THE WITNESS: It really goes to that

15 last statement that I just mentioned that a COL

16 applicant needs to review the ESP application,

17 the FSER, and EIS to identify any other things

18 that it needs to include with its COL

19 application, and the burden is on the COL

20 applicant in accordance with 10 CFR 50.9 to make

21 sure that we submit a true and complete and

22 accurate COL application, so it is our

23 responsibility to make sure that if there is

24 anything else that's within those documents that

25 need to be included within our COL application

1 that we review those and include them within it,
2 regardless of whether or not they're listed in
3 the staff's various appendices that are outlined
4 there.
5 As far as how we would actually
6 accomplish that, assuming that we utilize the
7 existing mechanisms that Exelon has in place for
8 our licensing protocol, we have procedural
9 programs that currently exist that ensure that we
10 conduct the necessary reviews and satisfy our
11 obligation under 50.9 of the regulations.
12 I'm assuming, again, that those same
13 practices or something equivalent to it would
14 exist in 20 years, let's say, for when we do
15 prepare a COL application and reference this ESP
16 in it.
17 JUDGE BARATTA: So you would see
18 essentially using the same approach that you use
19 now in your licensing of any of your facilities?
20 Is that based on what you're saying then?
21 THE WITNESS: That's correct.
22 JUDGE BARATTA: Thank you.
23 THE WITNESS: We also -- the
24 applicant -- one of the exceptions is that the
25 applicant would also need to deal with any

1 significant environmental issues not addressed in
2 the environmental report or the EIS, and those
3 include the need for power, design alternatives,
4 including severe accident mitigation, design
5 alternatives, and the cost benefit analysis.
6 These are aspects that were not included with our
7 application.
8 The applicant would also need to
9 demonstrate that the design of the facility falls
10 within the Plant Parameter Envelope established
11 by the application -- by the early site permit,
12 excuse me; also need to address any significant
13 new environmental issues or information, and,
14 finally, prepare and submit a complete and
15 integrated emergency plan incorporating the major
16 features that were identified in the early site
17 permit.
18 In conclusion, the application -- the
19 Exelon's early site permit application contains
20 sufficient information to support the board's
21 required findings. The safety and environmental
22 reviews by the NRC staff have been adequate.
23 Exelon's early site permit site is suitable for a
24 new nuclear plant bounded by the Plant Parameter
25 Envelope established in the ESP; and, finally,

1 the ESP should be issued subject to the terms and
2 conditions specified by the NRC staff.
3 That concludes my presentation.
4 JUDGE ABRAMSON: Any questions from
5 the panel?
6 Before we proceed I'm remiss for not
7 introducing you all to Dr. Kaye Lathrop who is
8 sitting in the back of the room who is a
9 technical judge on the panel, came to observe
10 this hearing.
11 Dr. Lathrop was associated with the
12 Los Alamos National Laboratory and the University
13 of California prior to joining the part-time
14 staff of the panel, and we're very pleased to
15 have him both on the panel and here today.
16 Counselor, next?
17 MR. FRANTZ: Thank you, Mr. Mundy.
18 You're excused.
19 I would now like to call Mr. Eddie
20 Grant to the witness stand.
21 JUDGE ABRAMSON: Mr. Grant, will you
22 state your name for the record?
23
24
25

1

2 THE WITNESS: Eddie R. Grant.

3

4 EDDIE R. GRANT

5 called as a witness, after having been first duly

6 sworn, was examined and testified as follows:

7

8 EXAMINATION CONDUCTED

9 BY: MR. FRANTZ

10

11 Q. Would you again state your full name

12 for the record, please?

13 A. Eddie R. Grant.

14 Q. And who is your current employer and

15 your current position?

16 A. I'm contracted through EXCEL Services

17 to Exelon Generation Company, and I am a member

18 of the Exelon licensing team in support of the

19 safety assessment.

20 Q. Do you have the following pre-file

21 testimony before you entitled Pre-File Testimony

22 of Eddie R. Grant on Required Safety Findings?

23 A. I do.

24 Q. And, Mr. Kuyler, if you would now give

25 copies to the court reporter. We have previously

1 filed copies with the board and with the NRC
2 staff.
3 Mr. Grant, was this testimony prepared
4 under your supervision and control?
5 A. It was.
6 Q. Does this testimony include a
7 statement of your professional qualifications?
8 A. It does.
9 Q. Do you have any additions,
10 modifications, or corrections that you would like
11 to make to your testimony?
12 A. No, sir.
13 Q. Is the testimony true and correct?
14 A. It is.
15 Q. And do you adopt this testimony as
16 your testimony in this proceeding?
17 A. Yes, I do.
18 Q. I would now ask the board to accept
19 into evidence the pre-file written testimony.
20 JUDGE ABRAMSON: So be it.
21
22
23
24
25

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of	)	Docket No. 52-007
EXELON GENERATION COMPANY, LLC	)	ASLBP No. 04-821-01-ESP
(Early Site Permit for the Clinton ESP Site)	)	October 17, 2006

PREFILED TESTIMONY OF EDDIE R. GRANT ON REQUIRED SAFETY FINDINGS

I. INTRODUCTION

Q. Please state your name.

A. My name is Eddie R Grant.

Q. Who is your current employer and what is your current position?

A. I am self-employed and contract with nuclear facilities to provide licensing and regulatory services. Since June 2002, I have been under contract with Exelon Generation Company, LLC (EGC or Exelon) to provide licensing and regulatory services with respect to the Clinton Early Site Permit (ESP) Application. In this role, I have acted as a member of the Exelon licensing team.

Q. Please describe your professional qualifications.

A. I have almost thirty years of experience related to licensing and regulatory affairs for nuclear facilities. This experience includes development of applications for licenses, permits, and license amendments under 10 C.F.R. Parts 50 and 52, and interaction with the NRC staff during their review of the applications and requests. I have provided direct

licensing and regulatory assistance to numerous nuclear facilities in the United States and Canada, and have been actively involved in Part 52 activities for the past four years. A copy of my professional qualifications is attached.

Q. On whose behalf are you testifying?

A. I am testifying on behalf of the Applicant, EGC.

Q. Please describe your involvement in the ESP Application.

A. I was responsible for supervising the preparation and revision of the safety portion of the Exelon Early Site Permit, and for resolving NRC requests for additional information and open items related to safety.

Q. What is the purpose of your testimony?

A. The purpose of my testimony is to provide a brief description of the Site Safety Analysis Report (SSAR) and Emergency Plan (EP), including a description of the applicable regulatory criteria. My testimony also describes how the Application and the NRC Staff's Safety Evaluation Report (SER), which documents the results of the Staff's review of the SSAR and EP, 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).

II. SITE SAFETY ANALYSIS REPORT

A. Purpose and Contents of the SSAR

Q. Briefly describe the SSAR.

A. The SSAR addresses the safety issues associated with the ESP Application in compliance with 10 C.F.R. Part 52, Subpart A (Early Site Permits). It includes a description of the site and an assessment of site characteristics affecting the design. 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 plant parameter envelope (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.

Q. Describe the regulatory criteria applicable to the SSAR.

A. 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 § 50.34.
- 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"

Q. Does the SSAR comply with these criteria?

A. Yes. The SSAR complies with the regulations and generally complies with the guidance listed above. However, as discussed later in this testimony, the SSAR does contain one

significant deviation from NRC Regulatory Guide 1.165 related to calculation of the safe shutdown earthquake.

B. NRC Review of the SSAR

Q. How did the EGC ESP organization support the NRC Staff's review of the Application?

A. In the course of the Staff's review, the EGC ESP organization responded to twelve separate safety and emergency planning-related requests for additional information (RAIs) that included approximately 110 subparts. Exelon held numerous public meetings with the Staff on safety topics, including meetings on seismic and quality assurance issues, and the NRC Staff conducted several site visits and inspections regarding field investigations, seismic issues, hydrology, security, site hazards, meteorology, emergency planning, and other issues.

Q. Briefly describe the results of the NRC review of the SSAR.

A. The results of the NRC Staff's review of the SSAR are documented in the SER. The SER delineates the scope of technical safety 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. The SER provides the required findings on the safety 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. 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.

Q. How did the Staff keep track of open items during its review?

During its review, the Staff confirmed that all open and confirmatory items from the draft SER (DSER) had been resolved or completed. 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 is expected to 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.

Q. Please provide your opinion regarding the review performed by the NRC Staff.

A. The Staff used its detailed guidance, provided in RS-002, to structure its review; the Staff asked numerous RAIs, visited the site, and held meetings to elicit more detailed information from EGC; and the Staff documented and tracked to closure the open items from its review. In my opinion, the review performed by the NRC Staff was systematic, comprehensive, and probing.

Q. Describe the review by the Advisory Committee on Reactor Safeguards (ACRS).

A. The ACRS reviewed the ESP application and the NRC Staff's 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 and supplemental DSER on September 8, 2005. The final SER documents the Staff's actions taken in response to the ACRS comments and recommendations. The ACRS ESP

subcommittee met again with the Applicant and the NRC Staff on March 8, 2006, and the full ACRS met to discuss the ESP FSER on March 9, 2006. In accordance with 10 C.F.R. § 52.23, the ACRS issued a letter on March 24, 2006 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 Clinton Power Station (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.

III. EMERGENCY PLAN

Q. What requirements apply to emergency planning in an ESP application?

A. As required by 10 C.F.R. § 52.17(b)(1) and (3), the ESP Application must: "identify physical characteristics unique to the proposed site . . . that could pose a significant impediment to the development of emergency plans," and describe "contacts and arrangements with local, state, and federal government agencies with emergency planning responsibilities." Under 10 C.F.R. § 52.17(b)(2), the Applicant may also 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. EGC elected to propose the major features of emergency plans for the EGC ESP facility, as permitted by 10 C.F.R. § 52.17(b).

Q. How was the emergency planning information in the ESP Application developed?

A. The existing Clinton Power Station is currently implementing an Emergency Plan previously approved by the NRC (with subsequent modifications in accordance with the applicable regulations, *i.e.*, 10 C.F.R. § 50.54(q)). The emergency planning information in the ESP Application is based upon the implemented CPS Emergency Plan.

Q. What were the results of the NRC Staff's review of the emergency planning information?

A. The results of the NRC Staff review of the emergency planning information are documented in Section 13 of the SER. The Staff made the required findings on whether the Application 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. The Staff also determined that the emergency planning information provides an acceptable description of contacts and arrangements made with Federal, State, and Local governmental agencies with emergency response planning responsibilities. Finally, the Staff determined whether the emergency planning information 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.

Q. What do the Application and SER say with respect to whether there are any significant impediments to the development of emergency plans?

A. The Application provides information demonstrating that no physical characteristics unique to the proposed ESP site could pose a significant impediment to the development

of emergency plans. The 1993 evacuation time estimate (ETE) for the CPS plume exposure pathway served as the basis for the ESP ETE. 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, and the Application demonstrates that no physical characteristics unique to the ESP site could pose a significant impediment to the development of emergency plans. This 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.

Q. Does the Application describe contacts and arrangements with Federal, state, and local agencies?

A. Yes. Appendix A of the emergency planning information provides a description of contacts and arrangements made with Federal, State, and Local governmental agencies with emergency response planning responsibilities. The SER states that this information is consistent with NRC guidelines and meets the requirements of 10 C.F.R. § 52.17(b)(3).

Q. What information does the Application contain regarding major features for emergency plans for the proposed facility?

A. The Application describes major features for Assignment of Responsibility (Organization Control), Onsite Emergency Organizations, Emergency Response Support and Services, Emergency Classification System, Notification Methods and Procedures, Emergency Communications, Public Education and Information, Emergency Facilities and Equipment, Accident Assessment, Protective Response, Radiological Exposure Control, Medical and Public Health Support, Radiological Emergency Response Training, and

Responsibility for the Planning Effort: Development, Periodic Review, and Distribution of Emergency Plans. With one exception, the SER concludes that the major features are adequately addressed and consistent with NRC guidance and regulatory requirements. Compliance with each major feature is described in the table 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.
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.
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.
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.
E	Notification Methods and	Section 5.1 of the EP describes the mutually agreeable

	Procedures	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.
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.
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.
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. 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.

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.
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.
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.
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.
P	Responsibility for the Planning Effort: Development, Periodic Review, and Distribution of Emergency Plans	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 states that proposed Major Feature P is acceptable and consistent with the guidance in RS-002 and Supplement 2.

Q. Do you have an opinion as to whether the Applicant's emergency planning information satisfies the requirements of 10 C.F.R. § 52.17(b)?

A. Yes. The Applicant's emergency planning 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.

IV. SAFETY ISSUES

Q. Briefly describe the safety issues that must be addressed under 10 C.F.R. § 52.17 and Part 100, and the Staff's review standard, RS-002.

A. The SSAR must address 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.

A. Geography and Demography

Q. Please summarize the information in the SSAR and SER regarding site location and description.

A. 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. 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.

Q. Please summarize the information in the SSAR and SER regarding exclusion area authority and control.

A. 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. AmerGen has the authority to control activities within the exclusion area. In an emergency, EGC and local law enforcement will control access to the exclusion area via this township road. 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. 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. The AmerGen Management Committee has authorized AmerGen's officers to negotiate an

Exclusion Area Agreement with EGC. 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. The SER identifies Permit Conditions and a COL Action Item to ensure this occurs at the COL stage.

Q. Please summarize the information in the SSAR and SER regarding population distribution.

A. 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. 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. 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. 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). 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.

B. Nearby Industrial, Transportation, and Military Facilities

Q. Please summarize the information in the SSAR and SER regarding potential man-made hazards at the proposed site.

A. 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. The closest military installation is 23 miles from the ESP site and there are no missile sites within 50 miles of the ESP site. SSAR 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. 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. 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. The area around the ESP site is not heavily industrialized, and CPS is the largest industrial facility in the vicinity. 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. 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. 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.

Q. Please summarize the information in the SSAR and SER regarding evaluation of potential accidents.

A. 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. § 100.20(b), and 10 C.F.R. § 100.21(e). 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.

C. Meteorology

Q. Please summarize the information in the SSAR and SER regarding regional climatology.

A. 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 characteristics 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. 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).

Q. Please summarize the information in the SSAR and SER regarding local meteorology.

A. 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. After the COL Action Item 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).

Q. Please summarize the information in the SSAR and SER regarding the onsite meteorological measurements program.

A. 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, 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.

Q. Please summarize the information in the SSAR and SER regarding short-term diffusion estimates.

A. 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.

Q. Please summarize the information in the SSAR and SER regarding long-term diffusion estimates.

A. 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. When the COL Action Item 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.

D. Hydrologic Engineering

Q. Please summarize the information in the SSAR and SER regarding hydrologic description.

A. 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. The ultimate heat sink (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 are taken into account, the SER concludes that SSAR § 2.4.1 conforms to RS-002 § 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).

Q. Please summarize the information in the SSAR and SER regarding floods.

A. 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. (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. 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. When the COL Action Items 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).

Q. Please summarize the information in the SSAR and SER regarding probable maximum flood on streams and rivers.

A. 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. The Staff performed an independent analysis to verify the Applicant's PMF analysis. 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, quantity, and period of time in which the historical data has been accumulated. 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).

Q. Please summarize the information in the SSAR and SER regarding potential dam failures.

A. 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. 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. 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.

Q. Please summarize the information in the SSAR and SER regarding probable maximum surge and seiche flooding.

A. 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. 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. 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). 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). The SER also concludes that the SSAR conforms to General Design Criteria (GDC) 2 in Appendix A to 10 C.F.R. Part 50, insofar as the flooding analysis defines design bases for seismically induced surge and seiche.

Q. Please summarize the information in the SSAR and SER regarding probable maximum tsunami flooding.

A. 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. 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. 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. 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.

Q. Please summarize the information in the SSAR and SER regarding ice effects.

A. 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. The Staff performed an independent estimation of maximum ice thickness and proposed a maximum ice thickness of 27 inches as a site characteristic. When the COL Action Items 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. 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).

Q. Please summarize the information in the SSAR and SER regarding cooling water canals and reservoirs.

A. 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. A new intake structure will be added to supply water to the EGC ESP facility. 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. When the COL Action Items 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 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. 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).

Q. Please summarize the information in the SSAR and SER regarding channel diversions.

A. 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. 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. The Staff's independent review and research confirmed that there is no historical evidence of major channel diversion in the area. 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. 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. The SER concludes that SSAR § 2.4.9 conforms to 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).

Q. Please summarize the information in the SSAR and SER regarding flooding protection requirements.

A. 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. 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. The Staff independently estimated the maximum water surface elevation at the site for the design basis, and accepted the Applicant's calculations. 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. 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.

Q. Please summarize the information in the SSAR and SER regarding low water considerations.

A. 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. Both minimum lake levels are well above the minimum CPS lake level of 677 feet above sea level. 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. When the COL Action Item 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).

Q. Please summarize the information in the SSAR and SER regarding accidental releases of liquid effluents to ground and surface waters.

A. 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 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).

Q. Please summarize the information in the SSAR and SER regarding ground water.

A. 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. When the COL Action Items and Permit Condition 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).

E. Geology, Seismology, and Geotechnical Engineering

Q. Please summarize the information in the SSAR and SER regarding site and regional geology.

A. 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. 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. 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. 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.

Q. Please summarize the information in the SSAR and SER regarding vibratory ground motions.

A. 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. It also contains evaluations that address the inherent uncertainties in the

determination of the SSE response spectrum through the use of a probabilistic seismic hazards analysis (PSHA). 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." 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. 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. 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. 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.

Q. Please summarize the information in the SSAR and SER regarding surface faulting.

A. 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. 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. 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.

Q. Please summarize the information in the SSAR and SER regarding stability of subsurface materials and foundations.

A. 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.

Q. Please summarize the information in the SSAR and SER regarding stability of slopes.

A. 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 a COL Action Item, 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.

Q. Please summarize the information in the SSAR and SER regarding embankments and dams.

A. 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 waves. The SER's conclusions regarding dam failures, seiche flooding, and slope stability are discussed above.

F. Radiological Effluents

Q. Please summarize the information in the SSAR and SER regarding gaseous effluents.

A. 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. 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.

Q. Please summarize the information in the SSAR and SER regarding liquid effluents.

A. 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 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.

Q. Please summarize the information in the SSAR and SER regarding solid waste.

A. 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. 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.

Q. What are the NRC's conclusions regarding gaseous and liquid effluents and solid waste?

A. 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 as low as reasonably achievable (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.

G. Thermal Discharges

Q. Please summarize the information in the SSAR and SER regarding normal plant heat sink.

A. 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. 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 UHS are acceptable and should not lead to frequent plant shutdown or frequent use of the UHS.

Q. Please summarize the information in the SSAR and SER regarding the ultimate heat sink.

A. 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. The safety class supply of makeup water for the cooling tower basins is provided from Clinton Lake. 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).

H. Radiological Consequences of Accidents

Q. What are the regulatory requirements regarding radiological consequences of accidents at the proposed site?

A. 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.

Q. Please summarize the information in the SSAR and SER regarding the selection of postulated accidents.

A. 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. 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. 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).

Q. Please summarize the information in the SSAR and SER regarding source terms.

A. 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. 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.

Q. Please summarize the information in the SSAR and SER regarding postulated accidents and accident dose consequences.

A. 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. 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. 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.

I. Security

Q. Please summarize the information in the SSAR and SER regarding security.

A. 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. 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.

V. CONFORMANCE WITH NRC REGULATIONS

Q. What is the primary regulation governing the content of the SSAR?

A. The primary regulation governing the content of the SSAR is 10 C.F.R. § 52.17(a)(1).

Q. In your opinion, does the SSAR comply with 10 C.F.R. § 52.17(a)(1)?

A. Yes. As shown in the following table, the SSAR complies with each of the requirements in that section.

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
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
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	• Emergency Plan information • 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
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
The boundaries of the site	1.2.1, 2.1.1
The proposed general location of each facility on the site	1.2, 2.1.1

The anticipated maximum levels of radiological and thermal effluents each facility will produce	3.1, 3.2
The type of cooling systems, intakes, and outflows that may be associated with each facility	3.2
The seismic, meteorological, hydrologic, and geologic characteristics of the proposed site	2.3, 2.4, 2.5
The location and description of any nearby industrial, military, or transportation facilities and routes	2.2
The existing and projected future population profile of the area surrounding the site	2.1.3

Q. In your opinion, does the SSAR comply with the non-seismic site criteria in 10 C.F.R. § 100.21?

A. Yes. 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
Population Center Distance	3.4.1.2
Site Atmospheric Dispersion Characteristics and Dispersion Parameters	3.4.1.3
Site Characteristics – Meteorology, Geology, Seismology, and Hydrology	3.4.1.4
Potential Off-Site Hazards	3.4.1.5
Site Characteristics – Security Plans	3.4.1.6
Site Characteristics – Emergency Plans	3.4.1.7
Population Density	3.4.1.8

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.

Q. In your opinion, does the SSAR comply with the geologic and seismic site criteria in 10 C.F.R. § 100.23?

A. Yes. As shown in the following table, 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

VI. REQUIRED SAFETY FINDINGS

Q. Do you have an opinion on whether the issuance of an ESP would not be inimical to the common defense and security or to the health and safety of the public?

A. Yes. 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, 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 the EP information complies with the requirements in 10 C.F.R. § 52.17(b). 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. For these reasons the issuance of the ESP for the Clinton site will also not be inimical to the common defense and security.

Q. Do you have an opinion on 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?

A. Yes. The EGC ESP site characteristics comply with the requirements of 10 C.F.R. § 52.17 and 10 C.F.R. Part 100. 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.

Q. Do you have any concluding remarks?

A. Yes. For the reasons I have discussed, 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.

Q. Does this conclude your testimony?

A. Yes.

STATEMENT OF PROFESSIONAL QUALIFICATIONS
OF EDDIE R. GRANT

Education

University of Oklahoma, B.S. Nuclear Engineering (1978)

Current Position

Self-employed as Contractor, Licensing and Regulatory Services

- Dec 2005 – current, NuStart Energy, LLC – Part 52 COL Activities
  - Providing licensing expertise and coordination of preparation and reviews of an application for a Part 52 Combined License (COL) for the Bellefonte project.
  - Representing NuStart on NEI COL Task Force and NEI Seismic Issues Task Force.
- Jun 2002 – current, Exelon Generation Company – Part 52 Activities
  - Providing licensing expertise and coordination of preparation and reviews of an application for a Part 52 Early Site Permit.
  - Representing Exelon on NEI Early Site Permit Task Force, NEI Combined Operating License Task Force, NEI Seismic Issues Task Force and an NEI (proposed Part 53) New Regulatory Framework Task Force.
- Jan 2003, Louisiana Energy Services - Uranium Enrichment Facility
  - Providing licensing expertise during final review of an application for a license for a uranium enrichment facility originally proposed for a location in Hartsville, TN.
- Jan 2002 – Feb 2002, Entergy Nuclear Northeast - J. A. FitzPatrick
  - Providing support of engineering activities with focus on coordinating reviews of proposed Improved Technical Specifications for final submittal and certification, including closure of remaining open issues and supporting closure of final review comments.
- May 2000 – Dec 2001, Nebraska Public Power District - Cooper Nuclear Station
  - Providing general support of Nuclear Licensing and Safety Manager activities with focus on mentoring of permanent Licensing Staff personnel.
  - Providing staff augmentation and performing general licensing activities as assigned, including drafting and reviewing License Amendment Requests, Licensee Event Reports, responses to Inspection Report findings, and other correspondence, reviewing procedure revisions, and conducting a general assessment of Nuclear Licensing and Safety activities and processes.
- Sept 1999 - April 2000, ComEd - LaSalle County Station
  - Site Lead utility position in team developing the conversion of dual unit LaSalle County Station Technical Specifications to the BWR/6 Improved Standard Technical Specifications (NUREG-1434), including adoption of 24-month cycle surveillance requirements.

- Feb 1998 - Sept 1999, Ontario Hydro/OPG - Regulatory Affairs Department
  - Participant in team establishing initial corporate regulatory oversight group during restructuring and recovery efforts for the nuclear program of twenty CANDU reactors. Activities included preparing policies, standards, programs, and procedures for interface with the Canadian regulatory agency, while supporting the sites and corporate offices day-to-day regulatory needs (including a Darlington Generating Station license renewal application), and mentoring permanent staff in licensing and nuclear safety oversight activities.

- Jan 1998 - Feb 1998, ComEd - Quad Cities Nuclear Plant
  - Participant in team preparing submittals and responses to fire protection issues to allow restart of both Quad Cities units.

- Oct 1997 - Jan 1998, Consumers Power Co. - Palisades Nuclear Plant
  - Participant in team finalizing submittal of conversion of Palisades custom Technical Specifications to the Westinghouse Improved Standard Technical Specifications (NUREG-1431).

- Aug 1995 - Oct 1997, Arkansas Power and Light Co. - Arkansas Nuclear One
  - Lead participant in team preparing the conversion of ANO-1 custom Technical Specifications to the Babcock and Wilcox Improved Standard Technical Specifications (NUREG-1430). The team also prepared to convert ANO-2 standard Technical Specifications to the Combustion Engineering Improved Standard Technical Specifications (NUREG-1432).

- Feb 1994 - Aug 1995, Commonwealth Edison Co. - Zion Station
  - Prepared lead-plant conversion of Zion current Technical Specifications to the Westinghouse Improved Standard Technical Specifications (NUREG-1431).
  - Coordinated development, reviews, comment disposition, and NRC negotiations in a Near Term Operating License (NTOL)-like project conversion.

- Oct 1993 - Jan 1994, Gulf States Utilities Co. - River Bend Station (RBS)
  - Established program for review and identification of Cost Beneficial Licensing Actions (CBLAs) at RBS. Identified and began internal development of several high priority CBLAs.
  - Prepared internal Nuclear Licensing policies for review and approval by Nuclear Licensing management.

- Jan 1993 - Oct 1993, BWR6 Improved Technical Specification Conversion Project
  - Prepared lead-plant conversion of Grand Gulf Nuclear Station (GGNS) current Technical Specifications to the BWR6 Improved Standard Technical Specifications (NUREG-1434). Contributed to development and comment disposition for all four BWR6 plant conversions. All four of these have been implemented (GGNS, RBS, Clinton and Perry).

- Jan 1992 - Jan 1993, Commonwealth Edison Co. - Dresden Station
  - Prepared and coordinated internal reviews for complete conversion of Dresden (two units) and Quad Cities (two units) custom Technical Specifications to the BWR4 Standard Technical Specification format and content, as applicable. These were approved by NRC and have been implemented at both stations. Prepared and coordinated reviews for Operating License Amendment Requests, Regulation Exemptions, and Waivers of Compliance. Provided 2-day training course on Waivers of Compliance from the regulatory perspective. Reviewed proposed revisions of the technical specifications and provided interpretations where such revisions where unnecessary.

- May 1990 - Dec 1991, Baltimore Gas and Electric Co. - Calvert Cliffs
  - Prepared and coordinated reviews for Operating License Amendment Requests, Regulation Exemptions, and Quality Assurance Program revisions.
  - Reviewed proposed revisions of the technical specifications and provided interpretations where such revisions were unnecessary.
  - Provided initial input and review support for thorough revision of procedures for revision of the operating license, including the technical specifications.

- Feb 1990 - May 1990, Arkansas Power and Light Co. - Arkansas Nuclear One
  - Review and preparation of proposed revisions for various licensing procedures, including license amendments, interpretations, exemption requests, Part 21 evaluations, justifications for continued operation (licensing bases compliance), unreviewed safety questions, unreviewed environmental questions, and environmental impact reviews.
  - Conducted comparison of technical specifications, surveillance requirements with initiating procedures and performance procedures.

- Feb 1988 - Feb 1990, Philadelphia Electric Co. - Limerick Generating Station
  - Responsible for coordination of activities associated with resolution of issues related to obtaining an operating license from the Nuclear Regulatory Commission for Limerick Unit 2. Major aspects of the position include direct interface with the NRC's Office of Nuclear Reactor Regulation to resolve open Safety Evaluation Report issues, coordinate ACRS activities, and support the Nuclear QA Department's resolution of NRC Regional issues.
  - Upon issuance of the Limerick Unit 2 Operating License, responsibilities were supplemented to include operating plant support activities, such as Licensee Event Report preparation and review, License Amendment preparation and review, and review of operating events for regulatory compliance.

Affiliations

- American Nuclear Society (ANS), 1978-present, National Life Member
- ANS, Bylaws and Rules Committee Member, 1986-2000
- ANS, Bylaws and Rules Committee Chair, 1989-1991

1

2 BY MR. FRANTZ:

3 Q. I would now like to mark as

4 Applicant's Exhibit 2 the following slides

5 entitled Oral Presentation of Eddie R. Grant on

6 Required Safety Findings. Mr. Kuyler will

7 distribute copies to the court reporter, the

8 board, and the parties.

9 Mr. Grant, were these slides prepared

10 under your supervision and control?

11 A. They were.

12 Q. Are these slides true and correct?

13 A. They are.

14 Q. And are these slides consistent with

15 your pre-file written testimony?

16 A. Yes, they are.

17 Q. Do you have any additions, corrections

18 or modifications that you would like to make to

19 your slides?

20 A. None.

21 MR. FRANTZ: I now ask that the board

22 accept Applicant's Exhibit 2 into evidence.

23 JUDGE ABRAMSON: Has this been so

24 marked?

25 MR. FRANTZ: Yes. Yes, it is.

1 JUDGE ABRAMSON: So accepted.

2 BY MR. FRANTZ:

3 Q. Mr. Grant, would you now proceed with

4 your oral testimony?

5 A. Yes. Thank you.

6 Again, my name is Eddie Grant. As a

7 member of the Exelon licensing team I have -- was

8 tasked with the coordination of the safety

9 assessment portion of the Exelon early site

10 permit.

11 My purpose here today is to describe

12 the applicable regulatory criteria to provide a

13 brief description of the safety portion of the

14 ESP application. This includes the Site Safety

15 Analysis Report, or SSAR, the emergency plan, and

16 I will also describe the NRC staff's Safety

17 Evaluation Report and conclusions.

18 I would also like to describe how the

19 application and the SER support the required

20 safety findings that you previously mentioned,

21 and in fact as stated there are two required

22 safety findings.

23 The first is that the issuance of the

24 ESP will not be inimical to the common defense

25 and security or to the health and safety of the

1 public, and the second as you indicated is that
2 taking into consideration the site criteria
3 contained in 10 CFR Part 100 a reactor, or
4 reactors, having characteristics that fall within
5 the parameters for the site can be constructed
6 and operated without undue risk to the public.
7 JUDGE BARATTA: Could I interrupt you
8 for a moment?
9 THE WITNESS: Certainly.
10 JUDGE BARATTA: I have some questions
11 with regards to that aspect based on your
12 pre-file testimony.
13 THE WITNESS: Yes, sir.
14 JUDGE BARATTA: I can hold them to the
15 end and ask them then or ask them as you go
16 along. Do you intend in your presentation to
17 discuss a little bit of that?
18 THE WITNESS: I believe some of your
19 questions will be addressed in the presentation,
20 but certainly if we do not, then --
21 JUDGE BARATTA: I'll hold them to the
22 end then. I'll let you go ahead and make your
23 presentation and see whether they get answered
24 then.
25 THE WITNESS: Thank you.

1 JUDGE BARATTA: Thank you.

2 THE WITNESS: In order to address the
3 safety findings I'd like to cover the site safety
4 analysis purpose and the content.

5 In particular the purpose of the SSAR
6 is to address the safety issues associated with
7 the ESP application, and in this respect the SSAR
8 includes a description of the site and an
9 assessment of the site characteristics. The SSAR
10 contains the following sections, essentially
11 three chapters. The first would two are very
12 much like you're used to seeing in a Final Safety
13 Analysis Report for a typical full operating
14 license application.

15 They include an introduction and
16 description of the proposed facility, and this
17 chapter includes an overview of the site and the
18 possible reactor types and, as indicated by
19 Mr. Mundy, includes the Plant Parameter Envelope
20 table that was used as a surrogate.

21 Again, it has Chapter 2 which
22 addresses the site characteristics, and this is a
23 typical section, again addresses all of the
24 ologies, meteorology, hydrology, all of those
25 types of things.

1 And then we have a Chapter 3, and this
2 one is a little bit different. It's more
3 specific to the early site permit in that 52.17
4 requires some specific things that don't -- that
5 are normally scattered throughout the other
6 chapters within an operating license application.
7 These are things like effluents,
8 thermal discharges, radiological consequences of
9 accidents, and we also have a specific section in
10 Chapter 3 that addresses the various siting
11 criteria of Part 100 to show how that they were
12 met.
13 The applicable regulatory criteria for
14 an early site permit, in particular 52.17,
15 describes the contents or the required contents
16 for an early site permit application. It also
17 then refers back to 10 CFR Part 50 and primarily
18 to 50.34 which is where the regulations describe
19 the requirements for contents of a Final Safety
20 Analysis Report for your typical operating
21 license. Now, not all of 50.34 is applicable for
22 an early site permit but only just a few specific
23 items.
24 Subpart B of 10 CFR Part 100 provides
25 the reactor siting criteria for new plants, and

in order to consolidate their review and do it in a standardized manner the staff has developed a review standard, RS-002, for processing ESP applications, and this is based on a couple of previous documents that were used in the past, again, standard review plans or NUREG-0800 and also NUREG-1555 for the environmental.

The SSAR complies with these regulations and generally complies with the guidance documents. The SSAR does contain one significant deviation from the NRC regulatory guidance, and this is Regulatory Guide 1.165, and that's related to the calculation of the safe shutdown earthquake, which we'll cover in some more detail a little bit later.

The NRC staff reviewed the SSAR and, as indicated by Mr. Mundy, the staff asked numerous RAIs. They visited the site on several occasions and held numerous meetings to elicit more detailed information from Exelon.

The NRC Staff Safety Review is documented in their Safety Evaluation Report, or SER, and the NRC staff conducted their review in accordance with the previously mentioned guidance document, RS-002.

1 The ACRS, or Advisory Committee on
2 Reactor Safeguards, has also reviewed the ESP
3 application and the SER, and the ACRS concluded
4 that the ESP application and the SER showed that
5 the site is acceptable for nuclear power plants
6 that meet the Plant Parameter Envelope.
7 JUDGE ABRAMSON: Can you point us to a
8 reference where they made that specific
9 conclusion, please?
10 THE WITNESS: Yes, sir. They had a
11 letter dated March 24th of 2006, and I believe
12 it's included as one of the appendices for the
13 FSER.
14 JUDGE ABRAMSON: Thank you.
15 THE WITNESS: These NRC reviews were
16 performed by NRC. They again were systematic,
17 done in accordance with detailed guidance
18 documents. They were comprehensive and included
19 a number of site visits, and they were probing as
20 evidenced by numerous RAIs and the number of
21 meetings to attain additional clarifications.
22 With that, I'd like to turn to some of
23 the specifics in the application starting with
24 the emergency planning information.
25 10 CFR 52.17(b) requires that an ESP

1 application identify any significant impediment
2 to the development of the emergency plans and
3 also describe the contacts and arrangements with
4 the local, state, and federal government agencies
5 that have emergency planning responsibilities.
6 10 CFR 52.17(b) subparagraph 2 also
7 allows that an ESP application might propose
8 major features of emergency plans, and Exelon did
9 elect to propose these major features.
10 At the COL time frame the applicant
11 then will need to build upon those major features
12 of emergency planning and provide a complete and
13 integrated emergency plan.
14 The Clinton Power Station has an
15 existing emergency plan for the operating plant,
16 and the emergency planning information for the
17 ESP application is based upon that implemented
18 Clinton Power Station emergency plan. The
19 results of the NRC staff review of the emergency
20 planning information are included in the SER,
21 Section 13.
22 That review included an evaluation of
23 any significant impediment to the emergency
24 plans, and key to this evaluation is the
25 evacuation time estimate that was provided for

1 the Clinton Power Station.

2 The NRC staff's review of this

3 information as documented in their SER concludes

4 that the application adequately evaluates these

5 evacuation times and that there are no physical

6 characteristics unique to the ESP site that could

7 pose a significant impediment to the development

8 of the emergency plans.

9 JUDGE BARATTA: Is this a point where

10 I can interrupt you?

11 THE WITNESS: Yes, sir.

12 JUDGE BARATTA: I found it rather

13 interesting that some of the other -- at least

14 one other major utility had made significant

15 revisions to their plan as a result of the

16 lessons learned from the last year's hurricane

17 season, particularly that of Katrina, and I

18 didn't see any mention of that in any of the

19 documents that I reviewed which of course are

20 primarily the staff's documents.

21 Has Exelon looked at what energy did

22 or looked at the task force report that the NRC

23 staff prepared to see if any of the major

24 features would be impacted?

25 THE WITNESS: We have looked at some

1 of those documents. Of course Katrina was a
2 major natural disaster which impacted a large
3 area, and of course as you well know impacted the
4 major infrastructure for almost all of the
5 response capabilities of the area.
6 Now, our emergency plan, on the other
7 hand, is very specific to an event that would
8 occur at the station, and therefore we have not
9 identified as many or much that we could learn
10 specifically from the Katrina event that we could
11 apply to our specific plan.
12 I would state, however, that there are
13 some areas where things are being implemented,
14 not so much because of Katrina but from other
15 lessons learned in the past that would be
16 applicable to the problems that were identified
17 in Katrina, but these are more on the state level
18 where there were, for instance, problems with the
19 communication structures where they didn't quite
20 match up, and some of those efforts are underway
21 today to fix those problems and deal with those
22 tasks.
23 JUDGE BARATTA: There appear to be two
24 areas that may impact you: One is your contact
25 communications and that they learned that because

1 of the impact on cell and land lines they had to
2 use satellite communications extensively.
3 The other one concerned the impact on
4 off site facilities that you rely on -- or would
5 rely on primarily for evacuation and emergency
6 response which were impacted.
7 It seemed as though the general
8 lesson, and I don't quite understand why this
9 wouldn't be applicable is to have additional
10 backup capabilities communications and evacuation
11 so that some of the estimates that you based your
12 evacuation plan on based on, I forget the name of
13 the program that was used, might not be valid,
14 because they relied on or had only one method of
15 evacuation.
16 THE WITNESS: Yes, sir. Again, I
17 would go back to the difference between the major
18 natural disaster that wipes out a large thing --
19 a large area and the infrastructure which would
20 impact the communications capabilities and the
21 evacuation capabilities.
22 We would not -- we are not required to
23 evaluate both an event at our facility for which
24 our emergency planning information is dedicated
25 and a simultaneous major natural disaster of the

1 type that you're referring to, so for an event
2 where we would implement our emergency plan, we
3 would not expect to have these problems with
4 communications that are related to losses due to
5 a major natural disaster or to the evacuation
6 capabilities due to the losses due to a major
7 natural disaster.
8 JUDGE BARATTA: Okay.
9 JUDGE ABRAMSON: Let me make sure I
10 understand what we're about here and try to bring
11 this back.
12 You've been focusing on the emergency
13 plan for the existing site, I assume, for the
14 existing plant, and what you're doing with that
15 plan. Do I correctly understand from slide --
16 what seems to be slide 7 and from your testimony
17 that what is the normal requirement for an ESP is
18 that you identify significant impediments to the
19 development of a plan not the elements of the
20 plan itself, and that you've described the
21 contacts with the governmental agency for
22 emergency planning, those are the basic
23 requirements?
24 THE WITNESS: Yes, sir, they are.
25 JUDGE ABRAMSON: And that you elected

1 in addition to propose what might be viewed as
2 sort of an overview of your plan, i.e., what are
3 the major features of your plan but not the
4 details of your plan, that those details are
5 reserved for development at the COL stage? Is
6 that a correct understanding?
7 THE WITNESS: That is correct.
8 JUDGE ABRAMSON: Thank you.
9 JUDGE BARATTA: That doesn't quite
10 agree with what I saw in there, because you got
11 fairly specific in some parts, and it seemed to
12 me that it wasn't as black and white as you just
13 presented it. Let's put it that way.
14 THE WITNESS: Well, yes, sir. Good
15 observation. The regulations are now black and
16 white.
17 At the time we were developing the
18 application a clear definition of what was
19 required for major features and how that would be
20 reviewed was not well established, and through
21 quite a bit of effort between the industry and
22 the Nuclear Regulatory Commission reviewers that
23 is now much better established in our
24 understanding of how NUREG-0654, supplement 2,
25 which identifies the planning standards which are

1 now equated with the major features is much
2 clearer.
3 We did at the time provide a great
4 deal of detail that probably would not have been
5 included had we understood exactly how the major
6 features were going to be reviewed and dealt
7 with, so you're correct. There is considerable
8 amount of detail there that may not be necessary
9 for a major features plan.
10 JUDGE ABRAMSON: Perhaps we should ask
11 the staff then at this point what level of
12 approval is the staff giving? Is it giving the
13 approval for the general ideas of the major
14 features or is it giving approval for the level
15 of detail that's incorporated in the application?
16 MS. HODGDON: Do you want staff
17 counsel to address that, or would you prefer the
18 witness who will address that later?
19 JUDGE ABRAMSON: We can do it either
20 way, but I think now is the appropriate time if
21 you think it's best for the witness to address
22 that. We're happy to have you swear in the
23 witness and have him or her address it.
24 MS. HODGDON: The staff calls Robert
25 Moody who is the staff's expert that will be

1 offered on emergency planning.

2 JUDGE ABRAMSON: Mr. Moody, would you

3 raise your right hand?

4

5 ROBERT MOODY

6 called as a witness, after having been first duly

7 sworn, testified as follows:

8

9 JUDGE ABRAMSON: Sit down, please, and

10 proceed.

11 Mr. Moody, the question that we've

12 posed for the staff is we have in front of us

13 information that advises us that the requirements

14 for the ESP are that the applicant provide sort

15 of an overview, an outline -- discuss what the

16 major features of its emergency plan will be and

17 then flesh that out at the time of the COL, but

18 we are also faced with the fact that the

19 application contains a great deal more detail

20 than simple overview of major features. What

21 level of approval is the staff giving at this

22 point or would the staff propose to give at this

23 point?

24 THE WITNESS: The -- our review is

25 documented in the Safety Evaluation Report, and,

1 yes, it does contain quite a bit of detail. We
2 applied the guidance in supplement 2 as Mr. Grant
3 has referenced. It also allows the submittal and
4 our review of quite a depth of detail.
5 Therefore, as you will see in our
6 Safety Evaluation Report, we did review that
7 detail and we did find those descriptions to be
8 acceptable with one exception, and that related
9 to two of the emergency facilities.
10 JUDGE BARATTA: I guess then what
11 you're saying is that you have, and this is what
12 I got from reading the SER, correct me if I'm
13 misinterpreting what you're saying, is that
14 basically you have found the site suitable from
15 an emergency planning standard with the exception
16 of any characteristics that might impact those
17 two facilities? Is that a summary of what you
18 found?
19 THE WITNESS: As Mr. -- I hope this
20 answers your question, but as Mr. Grant had
21 stated for us to -- an emergency preparedness
22 area approve an early site permit there are
23 basically two things that they must address: One
24 is significant impediments to the development of
25 the emergency plans and then contacts and

1 arrangements with federal, local, and state
2 agencies with responsibilities for emergency
3 preparedness. With those two -- addressing those
4 two areas would allow an acceptable manner --
5 would allow us to approve the issuance of an
6 early site permit.
7 The major features is an option that
8 Exelon chose to exercise for this application.
9 JUDGE BARATTA: So you're then
10 approving those major features too?
11 THE WITNESS: Yes. Yes, we are with
12 the exception of the one related to emergency
13 facilities.
14 JUDGE BARATTA: Okay. So you're going
15 beyond then what Mr. Grant thought he had
16 approval for?
17 THE WITNESS: I don't mean to be
18 disrespectful, but I believe we're speaking at
19 the same level.
20 JUDGE ABRAMSON: What we're trying to
21 understand is the level of detail of acceptance
22 of the description of major features, and you're
23 telling us that look at the SER. What we said
24 there is what we approve. Is that right?
25 THE WITNESS: Yes, sir. It is quite

1 detailed. As Mr. Grant alluded to, we have a
2 much better understanding of major features after
3 we have been through the first three ESP
4 applications, and we have -- collectively I think
5 we have a better understanding of exactly what
6 major feature option entails.
7 JUDGE ABRAMSON: Were you also
8 accurate in the discussion between Mr. Grant and
9 the board a few minutes ago that the -- at the
10 COL stage this still needs to be fleshed out into
11 a full plan and that the major features
12 descriptions will still need considerable
13 expansion? Is that accurate?
14 THE WITNESS: That's correct.
15 JUDGE BARATTA: Since you asked that
16 question.
17 Okay. Now, a complete integrated
18 emergency plan will be required at the COL stage.
19 Is that what you're saying?
20 THE WITNESS: Yes, sir.
21 JUDGE BARATTA: Okay. Where does it
22 say that in the SER?
23 THE WITNESS: In the summary of each
24 major features discussion we allude to the need
25 for the applicant to submit a complete and

1 integrated plan at the COL stage.

2 JUDGE BARATTA: It's not listed then

3 as a COL action item?

4 JUDGE ABRAMSON: Wait a minute.

5 Excuse me, Judge Baratta. Allude to or expressly

6 state?

7 THE WITNESS: Expressly state, and the

8 reason for that is the regulations also require

9 it at the COL stage.

10 JUDGE BARATTA: You're relying then on

11 the --

12 THE WITNESS: On the regulations.

13 JUDGE BARATTA: All right. Fine.

14 Thank you.

15 JUDGE ABRAMSON: Thank you. Let's get

16 back on track.

17 MR. FRANTZ: Just for the record, I

18 believe those regulations are in 10 CFR 52.79(d).

19 THE WITNESS: That is correct.

20 JUDGE BARATTA: Was that D, as in dog,

21 or B, as in boy?

22 MR. FRANTZ: D, as in dog.

23 JUDGE BARATTA: Thank you.

24 CONTINUED EXAMINATION OF

25 EDDIE GRANT

1

2 THE WITNESS: All right. As I pick up
3 again on slide 9, in addition that evaluation of
4 the significant impediments as we just discussed
5 the application also does provide the description
6 of contacts and arrangements with the federal,
7 state, and local government agencies, and the SER
8 concludes that this information is consistent
9 with the NRC guidelines and meets 10 CFR 52.17
10 requirements.
11 As we just discussed, the application
12 describes a number of major features with regard
13 to the emergency planning. These are listed here
14 on the slide. One of those, about halfway down,
15 is emergency facilities and equipment, and, as
16 indicated by Mr. Moody, the SER concludes that
17 the major features are acceptable, that they are
18 adequately addressed, and that they are
19 consistent with the NRC guidance and regulatory
20 requirements with the exception of that item
21 which is item H in the emergency planning
22 standards of NUREG-0654 sub 2 and in particular
23 with regard to the technical support center and
24 the operations support center, and these will
25 again be required to be addressed at the COL

1 stage.

2 So the conclusions with regard to

3 emergency planning then are that the emergency

4 planning information satisfies 10 CFR 52.17(b)

5 and that there are no significant impediments to

6 development of emergency plans for the ESP

7 facility and that the contacts and arrangements

8 with the government agencies with emergency

9 planning responsibilities were made as required.

10 The application as indicated

11 previously provides sufficient information on 13

12 major features of the emergency plan. There were

13 14 listed on the slide, and as we indicated one

14 of them is not quite there.

15 With that, I'd like to turn to the

16 Site Safety Analysis Report. It has, again as

17 previously indicated three chapters. Chapter one

18 provides the overall description and information.

19 Chapter 2 is where a good portion of the details

20 are provided and particularly with regard to the

21 site characteristics.

22 Section 2.1 discusses geography and

23 demography, and SSAR Section 2.1.1 provides

24 information regarding the site location and the

25 boundary.

1 A couple of facts here are that the
2 site and the environments, as indicated by
3 Mr. Mundy, include woodlands, pasture land,
4 cultivated farmland, recreational areas and the
5 man made Clinton Lake.
6 Staff's review of the information in
7 2.1.1 concludes that the SSAR is sufficient to
8 meet the siting criteria in Part 100
9 and the application content requirements of
10 52.17.
11 SSAR Section 2.1.2 provides
12 information regarding the exclusion area. A few
13 facts here, again as indicated previously,
14 AmerGen owns the site and has authority to
15 control the activities within the exclusion area.
16 However, during an ESP facility emergency Exelon
17 and local law enforcement will control access to
18 the exclusion area.
19 The AmerGen management committee has
20 authorized the AmerGen's officers to negotiate
21 with -- to negotiate an exclusion area agreement
22 with Exelon to be able to provide that capability
23 such that Exelon will have full control of the
24 exclusion area for the ESP facility should an
25 event occur.

1 Again, the SER identifies the NRC
2 staff's review and indicates that a permit
3 condition will be included to ensure that indeed
4 this authority is provided at the COL stage.
5 This slide shows the exclusion area
6 boundary. It's about 1,025 meters radius circle
7 around the center portion of the facility itself.
8 Section 213 of the SER provides other
9 additional demographic information including the
10 exclusion area and the little population zones.
11 Some specific facts here: No member
12 of the public lives within the exclusion area,
13 that circle that we just saw in the previous
14 slide. Clinton is the nearest city of any size,
15 has a population of just over seven thousand and
16 is approximately six miles west of the site.
17 The closest population center as
18 identified by Part 100, is Decatur, here where we
19 are today, and it has a population near 81,000,
20 and it's approximately 22 miles south/southwest
21 of the site, and the 22 miles is well in excess
22 of the minimum distance of 3.3 miles that would
23 be calculated in accordance with Part 100 for a
24 low population zone -- or, I'm sorry, for a
25 closest population center, and that is based on

1 the low population zone with a multiplier of one
2 and one-third. That's how we come up with the
3 3.3 miles.
4 The SER concludes that the SSAR
5 provides an acceptable description of current and
6 projected population densities in and around the
7 site, and it concludes that it properly specified
8 the low population zone and the population center
9 distance and that the SSAR supplies data that
10 meets the content requirements of 52.17 and the
11 siting criteria in Part 100.
12 JUDGE BARATTA: I was a little
13 confused by the SER discussion and now your
14 testimony with respect to population projections
15 between 2000 and 2060. Did you base it on the
16 Illinois State University study, or was it based
17 upon a projection using census data from 2000 and
18 a later census?
19 THE WITNESS: It was based on the
20 Illinois State University study.
21 JUDGE BARATTA: Okay. Could you
22 briefly describe that study?
23 THE WITNESS: Yes, sir. Illinois
24 State University conducted a census population
25 projection based on 1990 census data. They

1 projected for the years 2000, for the years 2010,
2 and for the year 2020.
3 We then took the projections for 2010
4 and 2020 and used a linear analysis to project
5 those out to use our projections or to obtain our
6 projections for 2030, 40, 50, and 60.
7 We also used, however -- we did not
8 use their 2000 census data or projections,
9 because we had actual data for that, so we used
10 actual data for the year 2000.
11 We did not, however, use that year
12 2000 data for projections, because there were no
13 projections available at the time we were
14 preparing the application that were based on that
15 data.
16 JUDGE ABRAMSON: Let me understand
17 this. The 1990 university study had a projection
18 for the year 2000. Is that correct?
19 THE WITNESS: That is correct.
20 JUDGE ABRAMSON: And you had data for
21 the year 2000 by the time you did your analysis?
22 THE WITNESS: Yes, sir, we did.
23 JUDGE ABRAMSON: Did you look at the
24 University of Illinois projection for 2000 and
25 compare it to the actual data for 2000 and did

1 you make any adjustments to your projections
2 going forward based on that comparison?
3 THE WITNESS: We have looked at those
4 projections for the year 2000 and compared those
5 to the year 2000 actual census data. We found
6 that they were within approximately one-half
7 percent, so they were quite good projections,
8 actually. It gave us a great deal of faith in
9 the projections that we were making based on the
10 2010 and 2020 projections from the Illinois State
11 University.
12 JUDGE BARATTA: Those projections or
13 that study was it done on small geographic areas
14 or was it like for a state or county or what
15 level of detail was that?
16 THE WITNESS: I believe the Illinois
17 State University projections were done on a
18 county basis for the entire state.
19 JUDGE BARATTA: Okay. And when you
20 made your comparison were you able to do it on a
21 county by county basis?
22 THE WITNESS: Yes, sir.
23 JUDGE BARATTA: And you found that --
24 what was the highest deviation? Do you remember?
25 THE WITNESS: I do not have that data,

1 no, sir. The half percent projection is I
2 believe the areas -- I better check that before I
3 respond to that.
4 JUDGE BARATTA: Okay. If you could,
5 we'll allow you to answer it later today.
6 THE WITNESS: All right.
7 JUDGE BARATTA: Judge Abramson was
8 suggesting that I follow up with a question to
9 the staff along the same lines, so is this -- is
10 this an appropriate witness for that?
11 MS. HODGDON: Yes. Yes, he is.
12 JUDGE ABRAMSON: Okay. Well --
13 MS. HODGDON: Well, he does part of
14 that, but Jay Lee will answer the question.
15 JUDGE ABRAMSON: Mr. Lee, stand and
16 raise your right hand. State your full name,
17 please.
18 THE WITNESS: Jay Lee.
19
20 JAY LEE
21 called as a witness, after having been first duly
22 sworn, testified as follows:
23
24 JUDGE BARATTA: One of the --
25 following up on this question of the population

1 estimates, in the SER there was a discussion of
2 the methods used, and I thought at that time
3 there was a mention that a study by Illinois
4 State University was ongoing. It had not been
5 completed.
6 Are you referring to the same study
7 that we just heard about or maybe there is an
8 ongoing study that Illinois does?
9 THE WITNESS: Basically the applicant
10 assumed that the rate of the population change
11 would remain essentially constant between year
12 2010 to 2060 and that they used the population
13 projection for 2010 and 2020 for each county
14 provided by state -- Illinois State University.
15 Based on this data provided by
16 Illinois State University the applicant can
17 assume that the expected population change rate
18 for the full ten increments between year 2010 to
19 2060 would be similar to the estimated population
20 change rate between 2010 and 2020.
21 Now, staff we did not see the Illinois
22 State University data. We relied on applicant's
23 information. However, the staff compare the
24 applicant population data by comparing it against
25 Census Bureau internet data.

1 The staff found that the Census Bureau
2 has projected a population growth nationally
3 through 2050 and state-wide -- state of Illinois
4 through 2030.
5 Staff further found that
6 applicant's projection for the state of Illinois
7 through 2030 are consistent with the Census
8 Bureau projection. Therefore, staff's review was
9 primarily based on Census Bureau internet data
10 not the Illinois State University data.
11 Does that answer your question?
12 JUDGE BARATTA: Yes, I think it does.
13 So what -- you have high confidence in their
14 estimates, because their estimates produced on a
15 state-wide basis a number that's consistent with
16 what you obtained from the U. S. census data?
17 THE WITNESS: Yes.
18 JUDGE BARATTA: Okay. Thank you.
19 JUDGE ABRAMSON: I'm not sure yet.
20 Let me think about this for a couple of seconds,
21 because I'm not sure I understand. I want to
22 make sure that we have this absolutely right.
23 The staff is charged -- we are charged
24 with reviewing the staff's conclusions to make
25 sure that we understand the logic of the staff's

1 conclusion, so do I understand correctly that
2 what the staff has done is look at the
3 applicant's projections and compared those
4 projections with projections made by the Census
5 Bureau?
6 MR. LEE: Correct.
7 JUDGE ABRAMSON: And would you
8 describe your conclusions about those two
9 projections and how that led you to conclude that
10 the -- that the applicant's projections were
11 reasonable?
12 MR. LEE: The Census Bureau
13 projection, which is done through year 2030, is
14 consistent, within an error of a few percent, to
15 the projection provided by applicant which was
16 based on Illinois State University data, so we
17 were based on year 2030 from the -- through the
18 2050 for the nationwide.
19 JUDGE ABRAMSON: I understand the
20 mechanics. I'm trying to understand how you
21 reached the conclusion, what logic leads you to
22 the conclusion that the applicant's projection is
23 reasonable? Just explain to me the logic in very
24 simple terms.
25 MR. LEE: Okay. It is strictly based

1 on the data we found in the Census Bureau
2 projection. We didn't do our own NRC projection
3 or we didn't go out and take any data for the
4 population. We solely relied on the Census
5 Bureau data.
6 JUDGE ABRAMSON: Counselor, am I
7 asking such a difficult question to answer? I
8 want him to explain to me the logic -- I
9 understand he looked at Census Bureau data. I
10 understand that he found the Census Bureau data
11 was consistent with the U of I data.
12 What I'm asking is how does he make
13 the next step to get comfortable that the
14 University of Illinois data -- or that the
15 projections of the applicant are reasonable? Am
16 I asking such a difficult question?
17 MS. HODGDON: I'm not sure that he has
18 said, but I believe that -- he didn't say that he
19 made a comparison, but I'm not going to coach the
20 witness.
21 JUDGE ABRAMSON: Okay. Well, let me
22 ask it one more time. We have to find out
23 whether your conclusion is logical, and for us to
24 find that out we have to understand your logic,
25 and you're not telling me your logic. You're

1 telling me you base something on something.
2 Give me a step A, therefore, B,
3 therefore C, therefore the applicant's
4 projections are reasonable or the applicant's
5 projections are unreasonable, but walk me through
6 it step by step what's your logic?
7 THE WITNESS: The applicant stated
8 that their data is based on the Illinois State
9 University data which was done for 2010 and 2020,
10 so what the staff did was we compared that
11 number, that data provided by Illinois State
12 University to the U. S. Census Bureau's number.
13 We concluded that those two datas were
14 consistent. Therefore, applicant's number are
15 acceptable and...
16 JUDGE BARATTA: I guess what prompted
17 this whole thing is that the write-up in the SER,
18 I'm referring to Section 2.1.3.1, says nothing
19 about the Illinois data even though that's
20 described as technical information in the
21 application, and what I just heard is that that
22 was in the Site Safety Analysis Report that was
23 provided as part of the application. Is that
24 correct?
25 MR. GRANT: Yes, sir, there is data

1 there from the Illinois State University.

2 JUDGE BARATTA: And you explained the

3 methodology there?

4 MR. GRANT: The methodology of the

5 Illinois State University.

6 JUDGE BARATTA: Of how you used the

7 Illinois State University data to come up with a

8 projected estimate. Right?

9 MR. GRANT: Yes, sir. We took their

10 projections for 2010 and 2020 and looked at the

11 percentage increase there and assumed that that

12 same percentage increase would apply over the

13 continuing decades.

14 JUDGE BARATTA: This is, in fact,

15 explained in the Site Safety Analysis Report

16 prepared by Exelon?

17 MR. GRANT: Yes, sir.

18 JUDGE BARATTA: Because I -- there's a

19 disconnect between what I'm reading on page 2-7

20 and what you're telling me, which I think I

21 understand what you're telling me, but I need to

22 get that from the discussion here. Nor -- on

23 page 2-9 it says the staff prepared and verified

24 the applicant's population data against U. S.

25 Census Bureau internet data.

1 Well, you didn't quite do that. What
2 it sounds like you did was you used a piece of
3 the applicant's population data, namely the
4 projection for the entire state as opposed to the
5 accounting?
6 MR. LEE: Correct.
7 JUDGE BARATTA: That's where we're
8 having problems understanding what you did and
9 how you drew the conclusion, and, frankly, I find
10 that throughout this SER that the staff does not
11 clearly explain what they've done, and this is an
12 example of it.
13 It is quite clear now that what is
14 written here is not consistent with -- or does
15 not adequately explain what was done, and I think
16 that's my biggest concern is how does the record
17 support that?
18 JUDGE ABRAMSON: That's what we're
19 trying to do. We're trying to clarify the
20 record.
21 The concern we have is that we cannot
22 tell from the SER how the staff reached its
23 conclusion, and what we're trying to understand
24 from you, Mr. Lee, is what logic led you to this
25 conclusion, because our charge is just to

1 understand your logic and see whether the
2 conclusion is supported by your logic and the
3 facts.
4 And we are now hearing that you did
5 more than is described in the SER and more than
6 was described in our questions.
7 This has been the generic issue we've
8 been struggling with and which led us to have to
9 ask more than two hundred inquiries of staff
10 regarding how it got where it got.
11 Dr. Baratta, are we -- have we pursued
12 this as far as we can go, do you think?
13 JUDGE BARATTA: I think so. Yeah.
14 JUDGE ABRAMSON: We understand the
15 logic at this point?
16 Let me restate the logic and make sure
17 that I've got this right. The staff looked at
18 the applicant's numbers and compared them to
19 numbers that the staff got from the Census Bureau
20 on a state-wide basis. Is that correct?
21 MR. LEE: Yes.
22 JUDGE ABRAMSON: And on the basis of
23 that comparison concluded that the applicant's
24 projections for the time frame that it had looked
25 at Census Bureau data which was 2020 and 2030.

1 Is that correct?

2 MR. LEE: Yes, 2030.

3 JUDGE ABRAMSON: 2030. And concluded

4 that those numbers were close enough that it was

5 comfortable that taking the projection out to

6 2050 by the applicant was reasonable. Is that

7 correct?

8 MR. LEE: Yes.

9 JUDGE BARATTA: Okay. I just did a

10 search on the document to see if, in fact, that's

11 in there, and it's not in there, so...

12 JUDGE ABRAMSON: Thank you. At least

13 we have this part clarified in the record. Now,

14 this is the kind of thing we've been struggling

15 with now for many months.

16 Thank you. You're back on.

17

18 CONTINUED TESTIMONY OF EDDIE GRANT

19

20 THE WITNESS: I might add that I

21 believe the SER does refer to 2003 census

22 information or projection that was provided

23 there. Perhaps that's the reference that you're

24 looking for.

25 With that -- one quick slide here that

1 shows you the -- both the exclusion area boundary
2 which is the smaller circle that is a solid
3 circle around the site. The dotted circle is the
4 exclusion area boundary for the existing Clinton
5 Power Station, and the larger circle is the two
6 and a half mile low population zone just to give
7 you some perspective.
8 With that I'd like to move to Section
9 2.2 of the SSAR. It describes the nearby
10 industrial transportation and military
11 facilities. There is also a little bit of
12 information in Section 2.1, but primarily 2.2
13 provides information regarding the potential man
14 made hazards in the site vicinity.
15 And, again, some specific facts out of
16 that section, there is a rail line that passes
17 approximately one mile north of the proposed
18 facility. The closest military installation is
19 approximately 23 miles from the ESP site. There
20 are no missile sites within 50 miles of the ESP
21 site, and there is one pipeline that traverses
22 the exclusion area within one mile south of the
23 ESP site. This pipeline transports low
24 volatility gasoline and diesel fuel.
25 There is an unlikely possibility that

1 the owner might want to transport propane or some
2 other higher volatility fuel, and the pipeline
3 will then be -- or that potential to transport
4 other fuel would then be identified to us.
5 We have an agreement with the owner,
6 and he would work with us such that we would
7 either provide some type of appropriate
8 mitigating measures or even the possibility that
9 we would relocate the pipeline, if necessary.
10 The CPS --
11 JUDGE ABRAMSON: Excuse me. Do you
12 have a written agreement with the pipeline?
13 THE WITNESS: We do, yes, sir.
14 JUDGE ABRAMSON: The staff has seen
15 that written agreement and examined it?
16 THE WITNESS: They have, sir. In
17 fact, it was provided in the current Clinton
18 Power Station FSAR.
19 The Clinton Power Station is the
20 largest industrial facility in the vicinity. I'm
21 sorry. I think I misspoke there. That agreement
22 is not provided in the FSAR, but it is discussed
23 and described there. The actual document does
24 not exist in the FSAR.
25 JUDGE ABRAMSON: But the staff has

1 seen it and reviewed it?

2 THE WITNESS: The actual document?

3 JUDGE ABRAMSON: Yes.

4 THE WITNESS: That, I'm not sure of.

5 I don't believe we provided that actual document.

6 Again, we've made a description and identified to

7 them that we do have that, and they have looked

8 at that and been satisfied that our commitment to

9 them is sufficient.

10 The Clinton Power Station is the

11 largest industrial facility in the vicinity, and

12 as we indicated earlier it's approximately 700

13 feet away.

14 We also looked at air service. Dewitt

15 County has no passenger air service or public

16 airports but does have three small private grass

17 air strips that are within six miles of the site.

18 The SER documents, the NRC's review of

19 this, and it concludes that the SSAR adequately

20 identifies these hazards, that the aircraft

21 hazards pose no undue risk to the health and

22 safety of the public, and that the site is

23 acceptable from a perspective of these aircraft

24 hazards.

25 Section 2.2.3 of the SSAR provides

1 information regarding hazardous materials or
2 activities in the vicinity of the ESP site.
3 Again, the NRC's review concludes that
4 the site is acceptable with regard to potential
5 accidents that could affect a nuclear power
6 facility. However, at the COL stage the
7 applicant will need to perform a control room
8 analysis of hazards from toxic chemical accidents
9 on the railroad line.
10 We could not do that at the ESP stage,
11 because you need to know the details of both the
12 location of the control room intakes and also
13 some details for the control room ventilation
14 system. Since we've not chosen a design yet, we
15 don't have those details.
16 JUDGE BARATTA: Is that a COL action
17 item then?
18 THE WITNESS: It is, yes, sir. Let me
19 check on that. I believe it is, but let me check
20 and get back to you.
21 JUDGE BARATTA: I would appreciate
22 that. Thank you.
23 THE WITNESS: Section 2.3 is
24 meteorology. Section 231 provides information
25 concerning the regional climatology and

1 meteorology, and these are things such as the
2 averages and extremes of the climatic conditions
3 and the information regarding tornados.
4 The SER concludes that indeed the
5 proposed design-basis tornado wind speed of three
6 hundred miles per hour is acceptable and that the
7 SSAR considers the most severe regional weather
8 phenomena and site characteristics and that these
9 meet the requirements of Part 100.
10 Section 2.3.2 provides information
11 concerning the local meteorological air quality
12 and topographical characteristics. The SER
13 states that the SSAR identifies the most severe
14 weather phenomena in the site and the surrounding
15 area, and it concludes that the meteorological
16 air quality and topographical characteristics of
17 the site meet the requirements again of Part 100.
18 SSAR Section 2.3.3 provides
19 information regarding the on site meteorological
20 measurements program. The SER again concludes
21 that the SSAR provides data adequate to represent
22 the on site meteorological conditions as required
23 by Part 100.
24 SSAR Section 2.3.4 provides
25 information regarding the short-term diffusion

1 estimates, and the SER concludes from their
2 review that the short-term diffusion and
3 atmospheric dispersion estimates are adequately
4 conservative and appropriate and in accordance
5 with Part 100 siting criteria.
6 SSAR Section 2.3.5 then provides
7 information regarding the long-term diffusion
8 estimates for effluents to the atmosphere. Here
9 again, the SER concludes that the SSAR complies
10 with the siting requirements of Part 100.
11 With that, I turn to Section 2.4 which
12 discusses the hydrology in the area. In
13 particular Section 2.4.1 provides information
14 regarding some details on this hydrology.
15 JUDGE ABRAMSON: Before we go into
16 that, why don't we take a ten minute break, and
17 we'll come back. The hydrology section is a
18 little bit longer.
19 Let's take ten. Let's keep up to ten.
20 I have 10:34. Let's be back by 10:45.
21 (At this point a short recess was
22 taken.)
23 JUDGE ABRAMSON: All right. Let's go
24 back on the record. I apologize. The board got
25 carried away in its internal discussion, so ten

1 minutes turned into 17.

2 MR. FRANTZ: Judge Abramson, we have

3 another expert here in the audience that may be

4 able to provide more information in response to

5 on Judge Baratta's question on emergency

6 planning, so if you would like, we would be happy

7 to call that person to the stand now.

8 JUDGE ABRAMSON: Let's do that and

9 pick it up.

10 MR. FRANTZ: I would like to call

11 Kevin Apel to the witness stand, please.

12 JUDGE ABRAMSON: State your full name.

13 Raise your right hand. State your full name.

14 THE WITNESS: Kevin B. Apel.

15

16 KEVIN APEL

17 called as a witness, after having been first duly

18 sworn, was examined and testified as follows:

19

20 EXAMINATION CONDUCTED

21 BY: MR. FRANTZ

22

23 Q. Mr. Apel, would you state your full

24 name for the record?

25 A. Kevin B. Apel.

1 Q. And would you state your position?
2 A. Exelon Nuclear Emergency Preparedness
3 Off Site Programs.
4 Q. Mr. Apel, Judge Baratta asked a
5 question about the satellite communication
6 capability off site. Would you describe the
7 capabilities that currently exist at Clinton
8 Power Station?
9 A. Within Exelon nuclear Clinton Power
10 Station along with the other stations in the
11 corporate we have a satellite system that is
12 two-fold. It is both a radio frequency satellite
13 and then also a telephone satellite system, so we
14 can use either mode of that.
15 That is the state of Illinois also has
16 a satellite capability system the same with both
17 the radio side and the cell phone side. They
18 implemented theirs after Y2K. Exelon implemented
19 ours following the World Trade Center events.
20 Our systems during our break would
21 exercise the shear we integrated to -- for the
22 break injection pathway exercise to demonstrate
23 during the exercise, but we do utilize it for our
24 field teams and communications that we need
25 within Exelon at the emergency centers,

1 specifically the technical support center.

2 JUDGE BARATTA: Thank you. That helps

3 a lot, because that was one of the deficiencies

4 that we cited in that report.

5 BY MR. FRANTZ:

6 Q. Judge Baratta also asked a question

7 regarding backup support in case the local

8 emergency responders are not able or are

9 incapable of responding.

10 Can you describe what capability

11 exists in that area?

12 A. Within the state of Illinois and

13 emergency plans and in our demonstrations that we

14 have the state of Illinois has many different

15 redundancies that have been built into the

16 emergency plans that we demonstrate.

17 At the stations within Exelon we have

18 the capability to have backups within our TSEs

19 for the sites, but also the state has

20 capabilities for their county emergency operation

21 centers. Clinton station has four applicable

22 counties: Dewitt County, Macon, McLean, and

23 Piatt. All four have emergency centers.

24 Exelon sends a liaison, one of our

25 station people from the site to Dewitt County

1 which is the primary base of interaction, so we
2 have a communication link there.
3 The state of Illinois also sends
4 liaisons to that facility.
5 The state emergency operations center
6 is in Springfield, Illinois, and they also deploy
7 field teams and unified area command which is an
8 extension of the state emergency operation center
9 that is near the site. That is deployed for the
10 Clinton station, so if there was a fact where we
11 had to move back or take into respect other
12 aspects of a large scale event like you're
13 saying, the unified area command is a resource
14 that we also have besides having the state of
15 Illinois emergency operation center.
16 The state of Illinois has two
17 emergency centers. Their primary which is a new
18 facility has been put into place here recently
19 and a backup down there in Springfield. They
20 also have what they call a radiological emergency
21 assessment center. That center is tied into our
22 stations, to Clinton station to give data from
23 the station directly there for their technical
24 expertise on their particular site to be able to
25 evaluate the event.

1 Likewise, it has a redundant system
2 also in Springfield.
3 JUDGE BARATTA: Thank you for your
4 clarification. That did not come through in the
5 evaluation that was done. I appreciate your
6 clarifying that.
7 MR. FRANTZ: Thank you, Mr. Apel.
8 You're excused.
9 JUDGE ABRAMSON: Mr. Grant, you're
10 back on hydrology.
11 CONTINUED TESTIMONY OF EDDIE GRANT
12 BY MR. FRANTZ:
13 Q. Mr. Grant, again, before we begin I
14 believe before we broke there was a question
15 about whether there was any COL action items
16 pertaining to the design of the control room for
17 toxic gases from the rail line.
18 Were you able to look at that over the
19 break?
20 A. I did have a chance to look at that
21 and indeed there is no action item on that.
22 There was a related action item to control room
23 with regard to radiological, but that is not
24 specific to this toxic chemical.
25 I would, however, say that I would

1 also believe that there is not a need for an
2 action item on that specific topic, and the
3 reason for that is that that is purely related to
4 the design of the plant that will be chosen and
5 described at the time of the COL.
6 The regulations clearly require that
7 we describe, fully describe that plant design and
8 identify how the local hazards would be dealt
9 with, and so that's already covered by regulation
10 and would not necessarily -- would not be
11 necessary to cover that again with an action
12 item. It would be redundant.
13 JUDGE BARATTA: Our concern on this
14 point is really that you said you're banking this
15 site, which means that you're not going to build
16 tomorrow. You could, but in all likelihood it's
17 going to be sometime in the future, and our
18 concern is that when we're all dead and buried,
19 who is going to be around to remember, oh, yeah,
20 there was -- it wasn't a COL action item, but it
21 was an item that needs to be addressed and to get
22 that all documented, because it's just a matter
23 of making sure that anything that's identified
24 now is clearly spelled out for the future when
25 presumably you might build.

1 That's really why I'm asking a lot of
2 these questions related to that.
3 And, I don't know, I haven't had a
4 chance to caucus with our fellow judges, but
5 maybe it might be worthwhile at some point having
6 a brief description of how your current
7 procedures allow you to identify those types of
8 things. We heard earlier that you would rely on
9 something somewhat of your current procedures,
10 which again you do this every day, so...
11 THE WITNESS: Well, yes and no. We do
12 provide information every day. We don't,
13 however, put together a COL application every
14 day.
15 We are -- we, not Exelon, but we the
16 industry are certainly in the process of
17 preparing some COL applications even today, and
18 really it's a taskable mission.
19 If you take a look at 52.79, it says
20 that if you have a COL application, you need to
21 provide the following information. It then goes
22 on to say that, however, if you reference an ESP
23 or a design certification, for that matter, that
24 you need not repeat the information that was
25 provided there. You can simply reference it.

1 We would, however, need to go through
2 and identify that for this particular piece of
3 information for the early site permit it was
4 approved, and therefore we don't need to discuss
5 that any further, but there is a piece of
6 information that, as you indicated, has not been
7 fully addressed and therefore additional
8 information is also needed in the COL
9 application.
10 And that is a matter of sitting down
11 and going through almost on a page-by-page basis
12 for both the ESP application documents and also
13 of course the NRC staff documents, and that will
14 include not only the FSER on the safety side but
15 also the permit itself which may contain certain
16 items that we would need to look into, so, again,
17 it's a detailed review, and in a simple fashion
18 it's a page-by-page review to see what's there
19 and what's approved.
20 JUDGE BARATTA: That may be the
21 answer. Okay.
22 THE WITNESS: I think that's probably
23 about all we can tell you at this point not
24 having delved into that preparation in detail as
25 yet. It's a future task.

1 JUDGE BARATTA: Thank you.

2 MR. FRANTZ: Proceed, Mr. Grant.

3 THE WITNESS: With that, let's go back

4 to hydrology which is Section 2.4 of the SSAR.

5 Subsection 1 of 2.4 provides some details on

6 hydrology, and in particular some facts there are

7 that the ESP facility would use the Clinton Lake

8 as a source of normal cooling water and that the

9 ultimate heat sink would consist of a mechanical

10 draft cooling towers if one is necessary --

11 If an ultimate heat sink is

12 necessary -- a water cooled ultimate heat sink is

13 necessary.

14 The ultimate heat sink pump for the

15 Clinton Power Station would supply the makeup

16 water then for this ESP water cooled ultimate

17 heat sink for that 30 day time frame that is

18 identified in the guidance documents.

19 The NRC's review as documented in the

20 SER concludes that the SSAR conforms to the

21 guidance of RS-002 and meets the application

22 content criteria 52.17(a) and the siting criteria

23 Part 100.

24 Subsection 2.42 provides information

25 regarding the potential for flooding, and again a

1 couple of facts: The safety-related structures
2 at the ESP facility would be above the maximum
3 flood level by a number of feet, or in one case
4 there might be a structure that would be down at
5 the lake level, a pump intake structure, and, if
6 so, it would -- and it is required to be safety
7 related -- if it is required to be safety related
8 it would be designed to withstand the effects of
9 the inundation from the flooding.
10 The SER states that the SSAR
11 appropriately considers the most severe flooding
12 that has been historically reported for the site
13 and the surrounding area, and it concludes that
14 the SSAR conforms to the guidance in RS-002 and
15 meets the application contents requirements of
16 52.17 and the siting criteria Part 100.
17 SSAR Section 2.4.3 provides
18 information regarding the probable maximum flood,
19 or PMF, on the streams and rivers. Clearly the
20 stream and river for this site is the Clinton
21 Lake. PMF analysis for Clinton Lake were
22 performed in accordance with NRC Regulatory Guide
23 1.59, and again the staff states that the SSAR
24 considers the most severe natural phenomena that
25 have been historically reported for the site and

1 the surrounding area and concludes that the site
2 meets the application content criteria and the
3 Part 100 siting criteria.
4 Section 2.4.4 provides information
5 regarding the potential for dam failures, and an
6 example here again is that there are no dams
7 upstream or downstream of the Clinton Lake that
8 would affect the ESP site safety-related
9 facilities or the cooling water supply if they
10 were to fail. The loss of the Clinton dam or the
11 Clinton Lake would not result in a loss of water
12 for the ultimate heat sink pond as it's a
13 submerged structure with its own berms that keep
14 it from being lost in that situation.
15 The NRC staff's SER states that the
16 SSAR considers the most severe natural phenomena
17 that have been historically reported for the site
18 and the surrounding area and concludes that the
19 site meets the Part 52 application content
20 criteria and the Part 100 siting criteria.
21 Section 2.4.5 -- and I've gotten
22 behind on my slides, my apologies -- Section
23 2.4.5 provides information on surge and seiche
24 flooding. An example here is that the SSAR
25 conservatively estimates that the maximum storm

1 surge would be approximately three-tenths of a
2 foot. The SER again states that the
3 seismically-induced flooding analysis reflects
4 the most severe seismic event historically
5 reported for the site and the surrounding areas
6 and concludes that the SSAR meets the Part 52
7 criteria and the Part 100 criteria.
8 SSAR Section 2.4.6 provides
9 information regarding the probably maximum
10 tsunami flooding. Landslide-induced tsunamis on
11 Clinton Lake were reviewed and determined to not
12 pose a threat to the site, and again the SER
13 states that the SSAR has considered the most
14 severe natural phenomena that has been
15 historically reported for the site and the
16 surrounding area and concludes that the SSAR
17 meets the criteria of 52.17 and Part 100.
18 SSAR Section 2.4.7 provides
19 information regarding ice effects on Clinton
20 Lake. The SSAR evaluates the effects of ice
21 jams. It also estimates the average thickness of
22 an ice sheet that could form on Clinton Lake, and
23 it evaluates the effects of such an ice sheet.
24 The SER concludes that the SSAR
25 considers the most severe natural phenomena that

1 have been historically reported for site and
2 surrounding area and concludes that it meets the
3 criteria for Part 52.17 and Part 100.
4 SSAR Section 2.4.8 provides
5 information on cooling water canals and
6 reservoirs at the site. For example, the ESP
7 facility would use Clinton Lake as a source of
8 cooling water as we previously discussed; also
9 indicates that there would be no changes
10 necessary to Clinton dam that forms the lake;
11 also indicates that a new intake structure will
12 be added to supply water for the ESP facility.
13 In review of this information the SER
14 concludes that the SSAR considers the most severe
15 natural phenomena that have been historically
16 reported for the site and for the surrounding
17 area and concludes that the SSAR meets the
18 criteria for Part 52 and Part 100.
19 It looks like there's a typo on that
20 slide -- well, I'm sorry. I have the wrong
21 slide.
22 Section 2.4.9 provides information
23 regarding channel diversion. Again an example
24 here is that there's no evidence of channel
25 diversion in the area or on a creek upstream of

1 the dam. The SER -- I'm sorry, in landslides
2 leading to a diversion of the stream flow from
3 the -- into Clinton Lake are not possible.
4 The SER states that even if a channel
5 migration were to stop all flow into the Clinton
6 Lake, however, it would not adversely affect the
7 safety to ESP facility or adversely affect the
8 capability of the safely shutdown.
9 The SER concludes that the SSAR
10 considers the most severe natural phenomena that
11 have been historically reported for the site and
12 the surrounding area and concludes that the SSAR
13 meets Part 52 and Part 100 criteria.
14 Section 2.4.10 provides information
15 regarding flood protection in particular for
16 safety-related structures. For example, grade
17 level at the ESP facility is approximately 735
18 feet above mean sea level. This is approximately
19 25 feet above the PMF still water level and
20 approximately 19 feet above that water level if
21 you add the maximum wave run-up that would be
22 considered.
23 The intake structure, as I indicated
24 before, will be designed with appropriate flood
25 protection if it is required to be safety

1 related, and the staff's review of this
2 information as documented in their SER found that
3 the SSAR considers the most severe natural
4 phenomenon that have been historically reported
5 for the site and the surrounding area and
6 concludes that the SSAR conforms to the standard
7 review plan and meets the 10 CFR 52.17
8 application content criteria and siting criteria
9 Part 100.
10 Section 2.4.11 provides information
11 regarding low water considerations. For example,
12 the SSAR estimates that the lake water levels
13 during droughts at 685 feet and at 681.4 feet
14 above sea level for the 50 year and the one
15 hundred year droughts respectively.
16 It also -- these indicate that these
17 estimates are well above the minimum Clinton
18 Power Station lake level of 677 feet above mean
19 sea level.
20 Again, the NRC staff's review as
21 documented in the SER states that the SSAR
22 considers the most severe natural phenomena that
23 have been historically reported for the site and
24 the surrounding areas and concludes that the SSAR
25 conforms to the guidance in RS-002 and meets the

criteria of Part 52 and Part 100.

Section 2.4.12 and a small piece of 2.4.13 provide information on accidental releases of liquid effluents. The SER again in review of this material concludes that the SSAR conforms to the guidance of RS-002 and meets the criteria of Part 52 and Part 100. The rest of 2.4.13 provides information regarding groundwater for the site. A key point here is that groundwater will not be used for plant operations.

Again, the NRC staff's review concludes that the SSAR conforms to the RS-002 guidance and meets the requirements of Part 52 and Part 100, and that concludes the portion on hydrology, and with that we'll turn to Section 2.5 which discusses geology, seismology, and geotechnical engineering.

Subsection 2.5.1 provides information regarding the regional and site geology, and, again, the staff's SER here concludes that the SSAR provides a thorough characterization of the geology and seismology of the site as required by Part 100. The SER concludes that no capable tectonic sources exist in the site areas that have potential to cause near-term surface fault

1 displacement.

2 It also concludes that the SSAR

3 appropriately characterizes the seismic sources

4 significant to determining the safe shutdown

5 earthquake; and finally it concludes that the

6 site is acceptable from a geological and

7 seismological standpoint and meets the siting

8 criteria for geology, seismology, and

9 geotechnical engineering in Part 100.23.

10 SSAR Section 2.5.2 provides a

11 description of geological, seismological, and

12 engineering characteristics of the site. The

13 SSAR addresses the inherent uncertainties of the

14 safe shutdown earthquake through probabilistic

15 seismic hazards analysis as identified in this

16 Part 100 or identified in Part 100.

17 The PSHA, the Probablisitc Seismic

18 Hazards Analysis, follows the guidance of

19 Regulatory Guide 1.165. However, when using that

20 information then to develop the SSE, there is an

21 exception to 1.165.

22 The reg guide establishes an annual

23 reference hazard probability of a median one

24 times ten to the minus fifth.

25 Based upon this reference hazard

1 probability is based upon a probability of
2 exceeding the safe shutdown earthquake for 29 of
3 the existing nuclear power plants in the central
4 and eastern United States
5 using mid '80's data.
6 The concern with this reference
7 probability is that it is subject to change with
8 new data for each of these central and eastern
9 United States sites, because it's based on the
10 probability of exceedance of an SSE at that site.
11 If that changes at that site due to new data,
12 then that reference probability would change.
13 Exelon thus looked for another way and
14 identified an ASCE/SEI standard 43-05. This
15 standard establishes a uniformed
16 performance-based procedures for determining the
17 SSE. We then utilized this standard in order to
18 keep these structures, systems, and components
19 within their elastic limits at a mean annual
20 target performance frequency of one times ten to
21 the minus fifth.
22 For plants using this methodology,
23 ASCE/SEI 43-05 --
24 JUDGE BARATTA: Could I stop you for a
25 second?

1 THE WITNESS: Certainly.

2 JUDGE BARATTA: I thought the criteria

3 was no significant inelastic deformation that you

4 used.

5 THE WITNESS: Yes, sir. That is a

6 criteria that is used in the methodology. The

7 frequency for the onset of significant inelastic

8 deformation rather than failure, and that

9 provides a significant conservativism.

10 JUDGE BARATTA: But you're saying that

11 that equates to that it will keep the components

12 in their elastic --

13 JUDGE ABRAMSON: Actually, it sounds

14 like you're making it tighter. Right?

15 THE WITNESS: That's correct. Rather

16 than a failure mechanism here, we're looking at

17 something that is the onset of inelastic

18 deformation.

19 JUDGE BARATTA: Your criteria would

20 not allow any inelastic deformation. Is that

21 correct?

22 THE WITNESS: Any is a very

23 restrictive term. I would have to check with

24 my --

25 JUDGE BARATTA: I got the

1 impression -- I do feel your criteria is
2 conservative. I just wanted clarification.
3 Maybe I got the misconception in reading it that
4 you would allow some localized inelastic
5 deformation which usually is not -- we're not
6 talking about, you know, catastrophic failure of
7 the structures, systems, and component, but what
8 you just said was that not that. You said that
9 it would stay inelastic.
10 THE WITNESS: The term is the onset of
11 inelastic deformation, so I believe that you're
12 correct, that there would be none allowed.
13 JUDGE BARATTA: Thank you. I just
14 wanted to clarify that.
15 THE WITNESS: For plants using this
16 methodology, the seismic core damage frequency
17 would be less than the mean seismic core damage
18 frequency for the existing nuclear power plant,
19 so, again, there is an increase in safety.
20 The SER in review of this information
21 concludes that the performance-based approach is
22 an advance over the reference probability
23 methodology that's identified in reg 1.165.
24 The SER also concludes that the SSE
25 adequately represents regional and local seismic

1 hazards and accurately includes the effects of
2 ESP subsurface properties.
3 The SER finally concludes that the
4 proposed ESP site is acceptable from a geological
5 and seismological standpoint and meets 10 CFR
6 Part 100.23 criteria.
7 JUDGE BARATTA: Before you go on the
8 next section could you explain in your own words
9 why you chose I believe it was a value of data of
10 .4 in the seismic fragility distribution?
11 THE WITNESS: I'm afraid that's beyond
12 my capabilities. I would have to ask for help on
13 that.
14 JUDGE BARATTA: That was the one point
15 that wasn't clear in reading the response. I was
16 wondering is there anybody here that could help
17 with that?
18 MR. FRANTZ: Yes. We do have one
19 expert here. I'd like to call Robert Kennedy to
20 the stand.
21 JUDGE ABRAMSON: State your full
22 name -- raise your right hand and state your full
23 name.
24 THE WITNESS: Robert B. Kennedy.
25

1

2 ROBERT B. KENNEDY

3 called as a witness, after having been first duly

4 sworn and testified as follows:

5

6 EXAMINATION CONDUCTED

7 BY: MR. FRANTZ

8

9 Q. Mr. Kennedy, would you state your

10 current position?

11 A. I'm a consultant employed on this

12 project by Exelon.

13 Q. Could you respond to Dr. Baratta's

14 question, please?

15 A. Yes, I can. The question dealt with

16 the selection of beta which describes the

17 variability of the fragility of the structures,

18 systems, and components.

19 We did not -- ASCE 43-05 the basis

20 does not assume a beta of .4. It assumes that

21 the beta will lie in the range of .3 to .6.

22 The basis for that range is the

23 fragility estimates that have been done as part

24 of seismic PRAs on a very large number of

25 structures, systems, and components of

1 operating -- or existing nuclear power plants.

2 Now, what the emphasis was that we did

3 not -- typically you'll get your -- with the

4 lower betas you'll get your higher risk estimate,

5 and we did not want to have risk numbers exceed

6 the target goal by more than about ten percent at

7 beta of .3.

8 We deemphasize the beta of .6, because

9 we would get very much lower numbers for that,

10 and so the basic ASCE numbers come reaching the

11 performance goal typically at betas between .3

12 and .4, so if a beta of .4 you'll tend to be

13 slightly conservative in the ASCE 43-05 approach.

14 Beta of .3 you would tend to be slightly

15 unconservative but not give risk space by more

16 than about ten percent.

17 JUDGE BARATTA: Could you explain

18 that? I must have somehow in going through that

19 I got it reversed. I thought the beta of .3 led

20 to a more conservative --

21 THE WITNESS: Why that is confusing,

22 sir, is that the ASCE 43-05 approach is aimed at

23 achieving a certain margin which is called the

24 HCLPF, high confidence low probability of failure

25 seismic margin, a conservative seismic margin

1 aimed at about a one percent chance of not being
2 exceeded.
3 So that -- and when you convolve the
4 fragility curves with the seismic hazard curves,
5 the risk numbers come out from the fragility
6 range from about the one percent point to about
7 the 70 percent point on the fragility curve, so
8 if NRC design criteria, Standard Review Plan
9 criteria or ASCE 43-05 criteria are aimed at
10 achieving this conservative HCLPF seismic margin,
11 the bigger the beta, the further the median is
12 above the one percent point.
13 For beta of .3, the median is twice
14 the one percent point. For a beta of .4, it's
15 two and a half times. 3.2 times for a beta of
16 .5, and approximately four for a beta of .6.
17 So the region over which -- the region
18 of the fragility curve that dominates the
19 hazard estimate -- the risk estimate is really
20 from the one percent point to something somewhat
21 above the median point, and the bigger the beta,
22 the higher these other points are above this
23 HCLPF point, so the low beta tends to give the
24 highest estimated risk numbers.
25 JUDGE BARATTA: Okay. The .3 then

1 would have been the one that would suggest a
2 higher number than .4. Is that correct?
3 THE WITNESS: The .3 gives a --
4 typically gives a risk number slightly higher
5 than the .4, and the ASCE 43-05 criteria was
6 aimed at a .3 not missing the risk goal by more
7 than about ten percent in risk space. In risk
8 space.
9 JUDGE BARATTA: In other words, they
10 allow -- the .3 would in fact exceed the goal but
11 not by more than --
12 THE WITNESS: By up to ten percent.
13 Most fragility estimates are closer to the .4.
14 The .3 tends to represent a relatively extreme
15 lower bound on what this variability might be
16 just like the .6 tends to represent an extreme
17 upper bound on what the variability might be.
18 The ASCE 43-05 committee decided,
19 therefore, that we would aim at a number such
20 that we would be slightly conservative if beta
21 was .4 and slightly unconservative if beta was .3
22 but concentrated on making sure we were not
23 significantly unconservative at a beta of .3.
24 JUDGE BARATTA: I understand.
25 MR. FRANTZ: Dr. Kennedy, while I

1 still have you on the stand, there was a question
2 regarding the -- whether there would be any
3 inelastic deformation. Could you explain the
4 relationship between the onset of the significant
5 inelastic deformation and the elastic permit?
6 MR. KENNEDY: Yes. Here the issue is
7 when we design or evaluate a structure we
8 typically use linear elastic methods assuming the
9 structure were basically in its overall --
10 structure, system, or component will basically
11 behave elastically.
12 That doesn't mean there can't be local
13 small levels of inelastic behavior. The words
14 frequency of onset of significant inelastic
15 deformation are meant to mean that you don't go
16 beyond this overall elastic behavior, and so the
17 words have tended to be used in the literature
18 interchangeably between onset of significant
19 inelastic behavior and essentially elastic
20 behavior, and it really boils down to that the
21 overall structure system component behavior needs
22 to remain basically linear, but there can be
23 localized inelasticity.
24 JUDGE BARATTA: That's what I got from
25 the description, and that's what confused me when

1 I heard before that you -- it would not affect
2 its function.
3 THE WITNESS: That's right.
4 JUDGE BARATTA: And, therefore, it was
5 acceptable. Thank you.
6 JUDGE ABRAMSON: It's substantially
7 below the kind of inelastic behavior that would
8 actually affect the function of the structures,
9 systems, and components, so there is additional
10 margin in that definition.
11 JUDGE BARATTA: Thank you.
12 MR. FRANTZ: Thank you, Dr. Kennedy.
13
14 CONTINUED TESTIMONY OF EDDIE GRANT
15
16 THE WITNESS: With that, I'd like to
17 pick up with Section 2.5.3 of the SSAR which
18 provides information on potential for surface
19 faulting and tectonic deformation.
20 Here the staff reviewed this
21 information, and the SER concludes that there is
22 no capable tectonic sources -- that there are no
23 capable tectonic sources that exist in the site
24 vicinity that would cause surface deformation,
25 and again concludes that the site is suitable

1 from the perspective of tectonic surface
2 deformation and meets the Part 100 siting
3 criteria.
4 SSAR Section 2.5.4 provides
5 information regarding subsurface profile of the
6 soil and the rock underlying the site. And,
7 again, this SER has reviewed this material and
8 agrees with the SSAR site characteristics and
9 their values.
10 That concludes Chapter 2 which covers
11 the site characteristics.
12 With that, I'd like to turn to
13 Chapter 3 which is essentially some miscellaneous
14 topics. Section 3.1 is radiological effluents.
15 Subsections 3.11 and 3.12 provide information
16 regarding the control, collection, processing,
17 storage, and disposal of radioactive gases and
18 liquids during plant operation.
19 Some key points here are that the
20 release of radioactive effluents is controlled
21 and monitored. That the system will typically be
22 operated to minimize the release of the
23 radioactivity, and that the SSAR includes a
24 bounding assessment to demonstrate the capability
25 of compliance with 10 CFR Parts 20 and Appendix I

1 Part 50.

2 Section 3.13 provides information on

3 solid radioactive waste. Here some statements

4 are that the shipments of solid radioactive waste

5 material will be made periodically between the

6 ESP site and the waste disposal facility. Should

7 we ever have an appropriate fuel facility, we'll

8 be able to cover that, but in the meantime the

9 low level waste would still go on, and this low

10 level waste would be packaged and shipped in

11 accordance with the applicable regulations in

12 Part 71 and 49 CFR Part 173.

13 The overall conclusion of this section

14 is that the SSAR provides reasonable assurance

15 that Exelon would control, monitor, and maintain

16 radioactive gases and liquid effluents and solid

17 wastes within the regulatory limits and that the

18 effluents would be maintained at lower levels in

19 accordance with Appendix I to 10 CFR Part 50.

20 Section 3.2 looks at thermal

21 discharges, and Section 3.2.1 and 3.2.2 talk

22 about the heat sinks that are available. 3.2.1

23 provides information on the normal heat sink.

24 And here is a few normal -- statements with

25 regard to those that they makeup water from the

1 normal heat sink would be withdrawn from Clinton
2 Lake.
3 The SER states that the normal heat
4 sink is likely to be able to perform its function
5 consistent with the maximum thermal discharge
6 assumed in the PDE, and the SER states that the
7 normal heat sink operation should not lead to
8 frequent plant shutdown or frequent use of the
9 ultimate heat sink.
10 I believe this is also a place where
11 it indicates that the normal heat sink has no
12 safety function that you questioned earlier, and
13 what we're really getting to there is that it has
14 no credited safety function when we're talking
15 about accident analysis in Chapter 15, and that's
16 partly because it would assume that it would --
17 it would typically require electric power, and
18 the power provided to that would not be
19 safety-related power, so we presumed that that
20 normal heat sink is not available, and in order
21 to take its place so that we do have a heat sink
22 during an accident situation we provide an
23 ultimate heat sink which is essentially another
24 set of towers that is provided with
25 safety-related power and is credited during the

1 accident analysis, and that is not to say,
2 however, that we would not use that normal heat
3 sink if it were available and there were power to
4 the necessary components.
5 JUDGE HETRICK: My question may have
6 to do with terminology. What is the normal heat
7 sink? Is it a body of water, or does it include
8 plant equipment, cooling towers, and so on?
9 THE WITNESS: It is indeed cooling
10 towers. We've not finalized a design for the
11 cooling towers, but we did look at both the
12 natural draft cooling towers and also some
13 mechanical draft cooling towers, but those would
14 typically be the normal heat sink that we would
15 be looking at.
16 The ultimate heat sink then is also
17 mechanical draft cooling towers, again, if we
18 need one. There are some designs that we looked
19 at that do not require a water cooled ultimate
20 heat sink.
21 JUDGE HETRICK: I think the point that
22 caused a question to be asked here was that the
23 normal heat sink I believe is considered to be
24 available during a shutdown, during a minor
25 accident, such as a slow loss of coolants, and

1 one presumably can manipulate that during such a
2 situation, and therefore it has a safety
3 significance.
4 THE WITNESS: Every component in that
5 sense has a safety significance within the plant.
6 Certainly, as I indicated, if it's available, we
7 will use it for shutdown or for an accident
8 event, and we would try to utilize the
9 capabilities of that piece of equipment whether
10 it's a normal heat sink or any other component.
11 JUDGE HETRICK: It was therefore
12 rather confusing to see a statement that it has
13 no safety significance.
14 THE WITNESS: Yes, sir, I understand
15 that.
16 JUDGE ABRAMSON: I think perhaps the
17 key here is that they took no credit for it.
18 THE WITNESS: Exactly. It's a matter
19 -- and the attempted differentiation there was
20 what are we crediting when we do our Chapter 15
21 safety analysis, and we do not credit the normal
22 heat sink for that.
23 JUDGE BARATTA: I'm still confused by
24 that. If I look at turbine trip you -- usually a
25 lot of plants have steam dumps. You dump to the

1 condenser. The condenser has to be cooled.
2 Where does it cool from?
3 THE WITNESS: From the heat sink.
4 Again, if the normal heat sink is available, it
5 would be cooled there, but if it's not --
6 JUDGE BARATTA: But your assumption in
7 a doing a chapter -- a typical transient analysis
8 I've never seen anybody say, well, anything other
9 than the heat sink doing in that type of analysis
10 for that type of event. And that's one of the
11 Chapter 15 requirements that -- isn't it that you
12 normally do?
13 THE WITNESS: The turbine trip? Yes,
14 sir. Not all of them have the steam dump
15 capabilities, and I'm not familiar with too many
16 of those designs.
17 The designs that we're looking at I
18 would have to go back and look at the accident
19 analyses for those.
20 JUDGE BARATTA: It just seems to me a
21 lot of those -- that happens to be one I'm more
22 familiar with, but I think in almost any of the
23 non-LOCA accident analyses the condenser is
24 frequently assumed to be available for cool down
25 purposes, and I don't understand how then --

1 that's not a safety system or --

2 JUDGE ABRAMSON: I guess the question,

3 Tony, is can they cool the condenser from the

4 UHS as well as from the --

5 THE WITNESS: No, it's typically

6 provided only to cool safety-related equipment

7 which would be pumps and condensers of those

8 type, but not -- not the turbine, main condenser.

9 I would have to look at the designs to

10 understand how that the particular transient

11 works, but it would not be for the ultimate heat

12 sink if the normal heat sink is available, it

13 would provide that cooling. If it's not, I

14 presume there would be reliefs.

15 JUDGE BARATTA: I mean you can go

16 through the scenario, say, okay, it's not

17 available. Therefore, now you're getting into

18 your extra safeguards and safety features.

19 Then you progress to that point and

20 provide cool down that way, so in that regards

21 it's not necessary. Okay?

22 But I was just curious as to what your

23 interpretation was.

24 Thank you.

25 THE WITNESS: As I indicated, Section

1 3.2.2 provides information on this ultimate heat
2 sink. There are some possible reactor designs
3 that we looked at that would require water cooled
4 ultimate heat sink for safety-related cooling
5 functions.
6 The ultimate heat sink function would
7 then be provided by a safety-related cooling
8 towers and in particular for ours we looked at
9 mechanical draft cooling towers.
10 Makeup water for these cooling towers
11 would be provided from the Clinton Power Station
12 ultimate heat sink which is the submerged bermed
13 area within the lake.
14 The SER concludes that the SSAR
15 provides the necessary information and meets the
16 criteria for application content 52.17 and the
17 siting criteria Part 100.
18 This figure might help a little bit,
19 although it's kind of hard to see from this
20 distance, but if we look here, this is the
21 existing Clinton Power Station. There's a hole
22 where Unit 2 was going to be provided.
23 The area that we're looking at for
24 providing the ESP facility is out here, seven
25 hundred feet to the south, and the normal cooling

1 tower area would be out here even further away.
2 The ultimate heat sink then would be in a small
3 area just to this edge of the ESP facility.
4 Over here -- just to finish out the
5 figure, over here on the other side is where the
6 switchyard is that we would expand to go with
7 this facility as well.
8 I'd like to turn now to Section 3.3
9 which discusses the radiological consequences of
10 accidents and the requirements thereof which are
11 stated in 52.17(a) and again there is a reference
12 back to 50-34, and these require evaluation of
13 the postulated fission product releases.
14 The requirements there for
15 capabilities are that an individual located at
16 the exclusion area boundary previously
17 identified, and this person would be there for
18 the worst two hours of the event and would not
19 receive a dose in excess of 25 rem TEDE during an
20 accident.
21 Another criteria is that an individual
22 located at the low population zone, the two and a
23 half mile circle that we looked at earlier, would
24 not receive a dose in excess of 25 rem during the
25 duration of the accident.

1 Section 3.3 provides the information
2 on the consequences of the postulated accidents.
3 The analysis covers a spectrum of design-basis
4 accidents and reactor types. The methodology is
5 that we provided a bounding accident dose
6 analysis, and to do this we utilized the PPE
7 source terms derived primarily from the ABWR and
8 the AP1000. The analysis uses site specific
9 chi/Qs or those atmospheric dispersion factors
10 that we discussed earlier in 2.3.4 and 2.3.5. It
11 also utilizes the proposed distances to the EAB
12 and the LPZ, and the SER calculates that these
13 are adequate.
14 JUDGE BARATTA: Could you -- I'm
15 getting hung up on this bounding, because it's
16 actually -- seems like it's used in two different
17 ways in the SER and the EIS. Could you explain
18 what it means to you?
19 THE WITNESS: I'm on the safety
20 assessment side, so I'm not that familiar with
21 how the EIS has used bounding values.
22 JUDGE BARATTA: That's fine.
23 THE WITNESS: For the SAR the bounding
24 values are again from a dose analysis point of
25 view the requirements are as indicated in the

1 previous slide that a person at a certain
2 boundary not receive more than a certain dose, so
3 we took the information that was provided from
4 the designs that we have available to us,
5 attempted to identify the worst case events,
6 those that would provide the worst dose or the
7 highest dose at those boundaries.
8 JUDGE BARATTA: Those two appear to be
9 the AP1000 and the ABWR, or were there other
10 designs that you had that information available
11 from?
12 THE WITNESS: We had that information
13 available from all of the designs that we had
14 indicated earlier that we used in developing the
15 PPE. Primarily they were the ABWR and the
16 AP1000.
17 I believe looking back in our section
18 that you might find maybe one event that was
19 actually from the CANDU reactor, the ACR700 and
20 another event that perhaps was evaluated using
21 the ESBWR information, but for the most part they
22 were the ABWR and the AP1000.
23 JUDGE ABRAMSON: So your PPE is not
24 strictly based on the ABWR an the AP1000? There
25 are a couple of cases where the PPE picks up

1 bounds from other plants. Is that correct?

2 THE WITNESS: We evaluated -- when we

3 were looking at the bounding accident dose

4 analyses we looked at specific events, and we

5 used the criteria or the information available

6 from the specific reactor types that we had.

7 When we developed the PPE we actually

8 did something somewhat different. We looked at

9 all of the various isotopes for the source terms

10 and developed a source term that was a bounding

11 source term within the PPE. We did not, however,

12 use that bounding source term when we did our

13 accident analyses to come up with these bounding

14 accident dose analysis. It was just too

15 restrictive.

16 We knew that eventually we would use

17 one or another of these particular designs, so

18 what we attempted to do was show that we could

19 meet the criteria of Part 100 and 50.34 by

20 utilizing those design accident analyses and our

21 own site specific chi/Qs show that we would still

22 be within the dose consequence analysis limits.

23 Again, we looked at the various

24 accident analyses for all of the various plants.

25 We attempted to pick out what we could determine

1 to be those bounding accident analysis.

2 For instance, if you look at a steam

3 generator tube rupture, we looked at steam

4 generators tube ruptures for all the plants that

5 had steam generators and said this plant looks

6 like it has the worst dose consequence analysis

7 for steam generator tube ruptures, so that's the

8 one we utilized to show that we could meet the

9 dose consequence limits.

10 When we looked at a loss of coolant

11 accident, it may have been a different reactor,

12 because we would look at the loss of coolant

13 accidents for each of the various reactor types

14 and look at the dose consequences for each one of

15 those and say it looks like this one provides the

16 worst dose consequence analysis for a loss of

17 coolant accident, so we would put that one in for

18 an accident analysis, the LOCA, so that's why

19 some are the ABWR. Some are the AP1000. One is

20 the CANDU. One is an ESBWR.

21 Each time we looked to see which one

22 would provide dose consequences that are closest

23 to the limits to show that in each case no matter

24 what reactor design we used, we would be under

25 those dose consequence analysis limits.

1 JUDGE BARATTA: So it would be
2 incorrect then to say that the -- you -- the
3 design-basis accident analyzed in the AP1000 and
4 ABWR design certification documents are expected
5 to bound the design-basis accidents for other
6 reactors being considered?
7 THE WITNESS: Again, it would bound
8 them for certain accidents.
9 JUDGE ABRAMSON: Not for all.
10 THE WITNESS: But not for all, no,
11 sir, that would be incorrect. If I made that
12 statement, then, yes, I believe I've made that
13 incorrectly.
14 JUDGE BARATTA: Somebody else made it.
15 We'll get to them later.
16 Just for my own edification, I'm not
17 that familiar with gas cooled reactors. When you
18 did the loss of coolant accident, you didn't
19 conclude that the loss of coolant in the gas
20 cooled would be more severe, because that would
21 be a dry release?
22 THE WITNESS: I don't remember the
23 details. I would have to look to see which one
24 we evaluated.
25 To the best of my recollection, which

1 may be faulty, I believe the loss of coolant
2 accident evaluation was based on the ACR700, but
3 I would have to go back and look to be certain.
4 JUDGE BARATTA: I was just surprised
5 at that. That's all.
6 THE WITNESS: Understandably so.
7 JUDGE HETRICK: With regard to
8 accident analysis would this be an appropriate
9 point for me to ask your opinion about externally
10 versus internally initiated events being used in
11 accident analysis?
12 THE WITNESS: Actually, sir, I believe
13 that the reference there is to a severe accident
14 analysis, and that's not actually on the safety
15 assessment side of the evaluation. That's an
16 environmental evaluation, so, no, not really it
17 wouldn't be an appropriate time. More
18 appropriate would be tomorrow.
19 JUDGE HETRICK: Thank you.
20 THE WITNESS: I believe the final
21 point here is that the SER concludes that the
22 proposed ESP site is suitable for power reactors
23 with source terms bounded by the ABWR and the
24 AP1000.
25 JUDGE ABRAMSON: Let me ask you about

1 that. That's exactly where we're going.

2 What you've just described to us is

3 that you found some source terms from other

4 plants were a little bit larger for certain

5 accidents. Is that right? A couple of accidents

6 you developed, if you will, a set of bounds that

7 were larger than the bounds that would be created

8 by the -- if you only had looked at the AP1000

9 and the ABWR. Is that right?

10 THE WITNESS: I hesitate, mostly

11 because we did not put as much emphasis on the

12 source term itself as we did with regard to what

13 to what dose do we see at the boundaries, and

14 certainly we did look at the various different

15 types of reactors and of course they each have

16 their own source term.

17 But there are also different -- other

18 things as 50-34 indicates you have to look at how

19 the structures, systems, and components impact

20 those, and that's one of the reasons we were

21 trying to move away from that and use these

22 example analyses as bounding information on how

23 we would meet 50-34 and the dose consequences.

24 JUDGE ABRAMSON: So your safety

25 analysis reaches the conclusion -- you looked

1 at -- you tried to establish the worst case dose
2 at the boundaries?
3 THE WITNESS: Yes, sir.
4 JUDGE ABRAMSON: And you found that
5 for a couple of situations, a couple of
6 particular accidents the worst case dose at the
7 boundary came from analysis of a plant other than
8 the AP1000 and the ABWR. Is that correct?
9 THE WITNESS: I believe that's
10 correct, yes, sir.
11 JUDGE ABRAMSON: And, therefore, had
12 you used for the worst case dose at the boundary
13 the numbers for the ABWR or the AP1000, they
14 would have been lower numbers. Is that correct?
15 THE WITNESS: Possibly.
16 JUDGE ABRAMSON: Had they been higher,
17 would you not have used them?
18 THE WITNESS: Well, yes, sir, but the
19 reason I hesitate there is that not all of the
20 dose analyses are different -- let me back up.
21 Not all of the various accident
22 scenarios would result in the same dose
23 consequences, and therefore it may very well be
24 that the actual worst case dose consequence is
25 either an ABWR or an AP1000.

1 The LOCA, for instance, might not be
2 the worst case. It is -- again, I need to go
3 back and check this, but if it is from the
4 ACR700, it may very well -- dose consequences may
5 very well be bounded by another accident that is
6 an AP1000 or an ABWR.
7 JUDGE ABRAMSON: Apples and oranges.
8 THE WITNESS: With regard to the
9 accident scenarios, yes, sir, but with regard to
10 the actual dose consequences, no. There is only
11 one limit, and therefore we are concerned with
12 showing that indeed we can meet that limit
13 regardless of the accident, and so we looked at
14 all of the accidents and made sure that we could
15 meet those.
16 JUDGE ABRAMSON: And for the isolated
17 instances where you looked at accidents from
18 other plants other than the AP1000 and ABWR, did
19 those particular accidents lead to dose
20 consequences that were the largest or were they
21 numbers that were below dose consequences for
22 other accident scenarios for the AP1000 or the
23 ABWR?
24 I'm trying to figure out what's really
25 driving this.

1 THE WITNESS: Yes, sir. I think I
2 understand the question, and, again, for a
3 particular accident we did look at each of the
4 various designs and tried to pick out that
5 particular design that provided the largest dose
6 consequences.
7 JUDGE ABRAMSON: I understand that.
8 THE WITNESS: For a particular
9 accident scenario. However, it may be that
10 overall the closest we come to an accident dose
11 consequence analysis limit is not that particular
12 accident. It might be a different one.
13 JUDGE ABRAMSON: I understand. I'm
14 asking you is that or is that not the case? I
15 don't want to hear it may be. Is it or is it
16 not?
17 And if you can't tell us now, then can
18 you find out and tell us later today?
19 What we want to know is this quite
20 clearly: We want to understand whether the dose
21 consequences are bounded by the dose consequences
22 from an AP1000 and ABWR or whether those isolated
23 instances where you looked at accident scenarios
24 from plants other than those two designs in those
25 isolated scenarios did those dose consequences

1 turn out to be higher than the worst case dose
2 consequence from an ABWR or an AP1000? I think
3 that's a question you can answer. Maybe not
4 instantly, but you have the information. Is that
5 right?
6 THE WITNESS: It is a question that we
7 can answer and we will gladly look into that and
8 get back to you.
9 JUDGE ABRAMSON: Thank you. That will
10 help us address whether what we see in the FSER
11 is accurate.
12 THE WITNESS: Yes, sir.
13 All right. I'm moving away from
14 radiological consequences of accidents. We'll
15 look at security for a moment. SSAR Section
16 3.4.16 provides some information on the site
17 characteristics pertaining to the development of
18 security plans.
19 Here again the NRC looked at the
20 information that was provided and concludes in
21 their SER that the owner controlled area is
22 sufficiently large to provide adequate distances
23 between the vital areas and the probable location
24 of a security boundary.
25 The SER also concludes that Clinton

1 Power Station has a security program and that
2 there are no impediments to development of an
3 adequate security plan for the ESP facility that
4 would sit right next door.
5 It also indicates that there is
6 sufficient distance available to satisfy the
7 criteria of 10 CFR 73.55 and the revised
8 design-basis threat.
9 This slide shows a chart that
10 indicates the different criteria and provisions
11 of Section 52.17(a). I have mentioned that many
12 times in going through the various sections.
13 This lists those out on the left side, and on the
14 right side identifies the application section
15 where that specific criteria or provision is
16 addressed.
17 For instance, the shortest one there
18 is the boundaries of the site, and that's
19 addressed in the SSAR Section 1.2.1 and in 2.1.1.
20 All of these have been addressed previously in
21 the various slides and sections that we've
22 already discussed.
23 The next slide is a similar chart that
24 identifies the non-seismic siting criteria from
25 Part 100 and Section 100.21 and again on the

1 right side identifies the application content
2 section that addresses that particular criteria.
3 One more slide of this type is the
4 seismic provisions of Part 100.23. Again on the
5 left the particular provisions and on the right
6 the SSAR sections where those have been addressed
7 and discussed.
8 All of this information together is
9 related to the safety findings and supports that
10 the issuance of the ESP will not be inimical to
11 the common defense and security. Again, a few
12 details here that go with that are indeed that
13 the site is within the United States, here in
14 Illinois, and the ESP does not authorize any
15 safety-related construction activities as
16 discussed earlier by Mr. Mundy.
17 Also identified by Mr. Mundy the
18 applicant and its parents, directors, and
19 principal officers are citizens of the United
20 States, and Exelon is not owned, dominated, or
21 controlled by any alien, foreign corporation, or
22 foreign government.
23 JUDGE ABRAMSON: Let me stop you right
24 here. This is a very helpful and very
25 interesting way to view this.

1 We're charged with making safety
2 finding one that issuance of it will not be
3 inimical to the common defense and security, and
4 you've listed four criteria by which we might
5 judge that.
6 Is it your view that these are the
7 only relevant criteria for making this
8 determination? Maybe I should ask your counsel
9 that question.
10 MR. FRANTZ: Yeah, I would be happy to
11 answer that. In addition to these four, these
12 are illustrative, Mr. Grant did have a slide
13 previously on security, and it showed that we had
14 an adequate distance between the NR controlled
15 boundary and the vital area location. That would
16 also be relevant to this issue.
17 JUDGE ABRAMSON: And when you
18 addressed this particular finding in your brief
19 did you lay this out clearly that these are the
20 criteria one should look at to make this
21 determination?
22 MR. FRANTZ: I believe we did, and I
23 don't recall if we mentioned the standoff
24 distance or not. If we do not, it was an
25 oversight on our part, and we'll correct that in

1 our proposed findings.

2 JUDGE ABRAMSON: Thank you. That's

3 very helpful to us in addressing that particular

4 safety finding.

5 Sorry to interrupt you, Mr. Grant.

6 THE WITNESS: With regard to safety

7 finding 2 which is taking into consideration the

8 site criteria contained in 10 CFR Part 100,

9 reactor proposed characteristics can be -- a

10 reactor with the proposed characteristics can be

11 constructed and operated without undue risk to

12 the public.

13 As we've indicated, the SSAR complies

14 with the application content criteria 52.17(a)

15 and the seismic -- or both seismic and

16 non-seismic siting criteria, Part 100, and

17 provided the emergency planning information that

18 complies with the requirements of 52.17(b).

19 So in conclusion, a few points here

20 that the safety review has been conducted by the

21 NRC staff, and it has been adequate. The SSAR

22 and the SER contain sufficient information to

23 support the safety findings. The Clinton ESP

24 site is suitable for a nuclear station bounded by

25 the Plant Perimeter Envelope, and the ESP should

1 be issued subject to the terms and conditions
2 specified in the SER.
3 And that concludes my presentation.
4 MR. FRANTZ: And during the lunch
5 break we will look at two more issues for you and
6 hopefully have the answer when we come back from
7 lunch. We'll look at the issue on which reactor
8 has the largest single dose from design-basis
9 access and which county had the largest delta in
10 the population estimates from comparing the U. S.
11 census data and the Illinois State University
12 data.
13 JUDGE ABRAMSON: Mr. Frantz, does that
14 conclude the applicant's testimony with the
15 exception of these two points on safety?
16 MR. FRANTZ: That's correct.
17 JUDGE ABRAMSON: So immediately after
18 lunch we can start with the staff's presentation
19 on safety matters?
20 MR. FRANTZ: Hopefully have a
21 follow-up, right.
22 JUDGE ABRAMSON: Do either Judge
23 Baratta or Judge Hetrick have any questions at
24 this point?
25 Let's take a one hour break. We'll

1 take a one hour and four minute break. Let's
2 start at 1:00 p.m.
3 My watch says four minutes until
4 12:00, so let's come back at 1:00 p.m., and let's
5 hope we can get through all the safety stuff and
6 maybe even start on some of the environmental
7 stuff this afternoon.
8 (At this point a noon recess was
9 taken.)
10 JUDGE ABRAMSON: Let's go back on the
11 record. Counsel for the -- counsel for the
12 applicant, we had a couple of questions we left
13 with you that you were going to try and answer
14 for us.
15
16 CONTINUED TESTIMONY OF EDDIE GRANT
17
18 BY MR. FRANTZ:
19 Q. Yes, please.
20 Mr. Grant, Judge Baratta had a
21 question regarding the largest difference in the
22 estimates on a county-wide basis of the Illinois
23 State University 2000 estimate for population and
24 the actual population as determined by the 2000
25 census. Do you have any more information you can

1 provide on that topic?

2 A. I do. We do not have a

3 county-by-county for all of the counties of the

4 state of Illinois, but we did look at the five

5 counties that immediately surround the site, the

6 early site permit: Dewitt County in which it's

7 located and then the four counties that connect

8 around them, Logan, McLean, Macon, and Piatt.

9 Of those, as I indicated to you

10 earlier, when we looked at the combined

11 difference between the projections for 2000 and

12 the actual census data for 2000, for those five

13 counties we saw a difference of less than a half

14 percent, and I wasn't sure if that was for those

15 five counties or if it was state-wide, but I have

16 confirmed that it is just for the five counties

17 near the site.

18 Of those the largest difference is

19 McLean County, and the difference there is an

20 underprojection of not quite four percent.

21 However, if you look at another county of Logan,

22 for instance, which is very near, it's an

23 overprojection of just under four percent, so

24 when these things are all considered, all five of

25 them again, it balances out such that the actual

1 difference between the projected and actual for
2 all five counties together is less than a half
3 percent.
4 JUDGE ABRAMSON: Given the small
5 numbers of this population my guess is four
6 percent is not a lot of people?
7 THE WITNESS: That's true, yes. I
8 don't have those details of the numbers, but
9 you're right, they're all small.
10 JUDGE ABRAMSON: If it would be off by
11 two or three --
12 THE WITNESS: It would be a large
13 percentage, exactly right.
14 JUDGE ABRAMSON: And the other?
15 BY MR. FRANTZ:
16 Q. Mr. Grant, the board also had a
17 question regarding which of the reactors you
18 looked at had the largest dose for the various
19 design-basis accidents, and can you provide
20 information for each of the major types of
21 design-basis accidents as a collective set which
22 reactor had the highest dose?
23 A. I can. We had a chance to look at
24 that, and for that I would refer you to our Site
25 Safety Analysis Report and in particular table

1 3.3-2 which is titled Design-Basis Accident Off
2 Site Dose Consequences, and it gives a summary
3 all of the various accidents that we reviewed at
4 the time.
5 It covers such things as the main
6 steam line break for reactor coolant pump lock
7 rotor for PWA control route ejection, control
8 route dropbacks to the steam generator, tube
9 ruptures, small line breaks, the LOCA, loss of
10 coolant accident, and fuel handling accident.
11 In almost every case -- well, in every
12 case the bounding events are the AP1000 and the
13 ABWR. We did also look at, as I indicated, the
14 ESBWR and the ACR700 for the loss of coolant
15 accident, but, again, even for that event the
16 AP1000 and ABWR were bounding.
17 JUDGE ABRAMSON: That's very helpful
18 thank you.
19 THE WITNESS: In fact, that event is
20 bounding overall.
21 MR. FRANTZ: The applicant has no
22 further questions for Mr. Grant.
23 JUDGE ABRAMSON: Thank you. We'll
24 turn it over to staff.
25 MS. HODGDON: The NRC staff calls

1 Joelle Starefos, Goutam Bagchi, Lance Vail, Cliff
2 Munson, Brad Harvey, Robert Moody, and Jay Lee.
3 The board will recall that Robert Moody and Jay
4 Lee have already been sworn.
5 JUDGE ABRAMSON: Okay. Starting
6 with -- starting on my right, state your name,
7 please.
8 JOELLE STAREFOS: Joelle Starefos.
9 GOUTAM BAGCHI: Goutam Bagchi.
10 LANCE VAIL: Lance Vail.
11 CLINT MUNSON: Clint Munson.
12 BRAD HARVEY: Brad Harvey.
13 (Witnesses sworn.)
14 JUDGE ABRAMSON: Let the record
15 reflect that all five of these individuals have
16 so indicated. Be seated, please.
17 MS. HODGDON: Do you have before you
18 a document entitled NRC staff's pre-file and
19 direct testimony on health and safety issues in
20 the Clinton ESP proceeding.
21 JUDGE ABRAMSON: Each of you answer
22 individually, please.
23 JOELLE STAREFOS: Yes.
24 GOUTAM BAGCHI: Yes.
25 LANCE VAIL: Yes.

1 CLINT MUNSON: Yes.

2 BRAD HARVEY: Yes.

3 JAY LEE: Yes.

4 ROBERT MOODY: Yes.

5 JUDGE ABRAMSON: So the record can

6 reflect that all seven individuals have answered

7 in the affirmative.

8 MS. HODGDON: Did you prepare this

9 testimony for submission in this proceeding?

10 JOELLE STAREFOS: Yes.

11 GOUTAM BAGCHI: Yes.

12 LANCE VAIL: No.

13 CLINT MUNSON: Yes.

14 BRAD HARVEY: Yes.

15 JAY LEE: Yes.

16 ROBERT MOODY: Yes.

17 JUDGE ABRAMSON: Can we have the name

18 of the individual who responded no, please?

19 LANCE VAIL: Lance Vail.

20 JUDGE ABRAMSON: And so all except

21 Mr. Vail have indicated they've prepared the

22 testimony.

23 MS. HODGDON: Lance Vail will be a

24 witness for the Environmental Impact Statement.

25 He prepared that. He also helped prepare the

1 SER, but he did not submit pre-file testimony,
2 and, therefore, we have not entered his
3 professional qualifications at this time as they
4 are attached with other testimony.
5 I hope that's not a problem.
6 JUDGE ABRAMSON: That's fine, counsel.
7 MS. HODGDON: Thank you.
8 Have you prepared a statement of your
9 professional qualifications?
10 JOELLE STAREFOS: Yes.
11 GOUTAM BAGCHI: I have.
12 LANCE VAIL: Yes.
13 CLINT MUNSON: Yes.
14 BRAD HARVEY: Yes.
15 JAY LEE: Yes.
16 ROBERT MOODY: Yes.
17 JUDGE ABRAMSON: The record so
18 indicate all individuals indicated affirmatively.
19 BY MS. HODGDON:
20 Q. And is your statement of professional
21 qualifications attached to your pre-file
22 testimony?
23 JOELLE STAREFOS: Yes.
24 GOUTAM BAGCHI: Yes.
25 LANCE VAIL: My pre-file testimony

1 for the environmental review.

2 CLINT MUNSON: Yes.

3 BRAD HARVEY: Yes.

4 JAY LEE: Yes.

5 ROBERT MOODY: Yes.

6 JUDGE ABRAMSON: Again, all indicated

7 affirmatively.

8 BY MS. HODGDON:

9 Q. Does any of you have any corrections

10 or revisions to make to your testimony at this

11 time?

12 JOELLE STAREFOS: No.

13 GOUTAM BAGCHI: No.

14 CLINT MUNSON: No.

15 BRAD HARVEY: No.

16 JAY LEE: No.

17 ROBERT MOODY: Yes.

18 JUDGE ABRAMSON: So we have negatives

19 from all except Mr. Vail and Mr. Moody. Mr. Vail

20 had no comment, and Mr. Moody has indicated he

21 does have corrections to make.

22 ROBERT MOODY: Yes, Your Honor, I

23 would like to revise my testimony at paragraph

24 110 to read as follows: At this time the

25 Department of Homeland Security has not directed

1 state, tribal, and local governments to take any
2 radiological emergency preparedness actions in
3 response to the lessons learned from Katrina.
4 JUDGE ABRAMSON: Are you going to
5 provide us that in writing or a substitute page?
6 How are we going to get that in the record?
7 MS. HODGDON: We have affixed a
8 substitute page to the front of the testimony.
9 JUDGE ABRAMSON: That's fine.
10 MS. HODGDON: And if it's not
11 sufficient, we can -- but I think --
12 JUDGE ABRAMSON: That's sufficient.
13 That's fine.
14 MR. FRANTZ: Ms. Hodgdon, can we also
15 get a copy of that, please?
16 MS. HODGDON: Yes, you will be getting
17 a copy.
18 MR. FRANTZ: Thank you.
19 BY MS. HODGDON:
20 Q. So do all of you adopt this written
21 testimony as corrected as your sworn testimony in
22 this proceeding?
23 JOELLE STAREFOS: Yes.
24 GOUTAM BAGCHI: Yes.
25 CLINT MUNSON: Yes.

1 BRAD HARVEY: Yes.

2 JAY LEE: Yes.

3 ROBERT MOODY: Yes.

4 JUDGE ABRAMSON: The record will

5 reflect that that's all but Mr. Vail whose

6 testimony will be submitted with respect to the

7 EIS.

8 MS. HODGDON: The staff now moves to

9 have this direct testimony as corrected admitted

10 into the record of the proceeding as if read.

11 JUDGE ABRAMSON: Any objection?

12 MR. FRANTZ: None.

13 JUDGE ABRAMSON: Fine. Then it shall

14 so be. I assume you'll distribute the copies to

15 the --

16 MS. HODGDON: Yes, the distribution

17 will now take place.

18 JUDGE ABRAMSON: Three to the court

19 reporter, one for each member of the board, and X

20 to the applicant.

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October 16, 2006

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of	)	
	)	
EXELON GENERATION COMPANY, LLC.	)	Docket No. 52-007-ESP
	)	
(Early Site Permit for Clinton ESP Site)	)	

AFFIDAVIT OF GOUTAM BAGCHI CONCERNING PREFILED
DIRECT TESTIMONY IN THE CLINTON ESP PROCEEDING

I, Goutam Bagchi, do hereby state as follows:

1. I am a Senior Advisor in the Nuclear Regulatory Commission's (NRC's), Office of Nuclear Reactor Regulation (NRR), Division of Engineering (DE). A statement of my professional qualifications is attached.

2. As part of the NRC staff's health and safety review of the Exelon ESP application, documented in NUREG-1844, the "Safety Evaluation Report for an Early Site Permit (ESP) at the Exelon ESP Site: Final Report," May 2006 ("SER"), I reviewed the aspects of the Applicant's Site Safety Analysis Report that concerned hydology.

3. I have primary technical responsibility for those portions of the NRC Staff's Prefiled Direct Testimony on Health and Safety Issues in the Clinton ESP Proceeding marked with my initials (GB).

4. I attest to the accuracy of those statements, support them as my own, and endorse their introduction into the record of this proceeding by the health and safety Project Manager, Joelle L. Starefos. I declare under penalty of perjury that those statements, and my statements in this affidavit, are true and correct to the best of my knowledge, information, and belief.

Goutam Bagchi

Goutam Bagchi

October 17, 2006

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of	)	
	)	
EXELON GENERATION COMPANY, LLC.	)	Docket No. 52-007-ESP
	)	
(Early Site Permit for Clinton ESP Site)	)	

AFFIDAVIT OF KAZIMIERAS M. CAMPE CONCERNING PREFILED
DIRECT TESTIMONY IN THE CLINTON ESP PROCEEDING

I, Kazimieras M. Campe, do hereby state as follows:

1. In January 2006, I retired from full time employment with the U.S. Nuclear Regulatory Commission ("NRC") after 33 years of service. I am employed with the NRC staff under contract as a rehired annuitant. I am providing this testimony under that contract. A statement of my professional qualifications is attached.

2. As part of the NRC staff's health and safety review of the Exelon ESP application, documented in NUREG-1844, the "Safety Evaluation Report for an Early Site Permit (ESP) at the Exelon ESP Site: Final Report," May 2006 ("SER"), I reviewed the aspects of the Applicant's Site Safety Analysis Report that concerned man-made site hazards.

3. I have primary technical responsibility for those portions of the NRC Staff's Prefiled Direct Testimony on Health and Safety Issues in the Clinton ESP Proceeding marked with my initials (KC).

4. I attest to the accuracy of those statements, support them as my own, and endorse their introduction into the record of this proceeding by the health and safety Project Manager, Joelle L. Starefos. I declare under penalty of perjury that those statements, and my statements in this affidavit, are true and correct to the best of my knowledge, information, and belief.

Kazimieras M. Campe

October 16, 2006

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of	)	
	)	
EXELON GENERATION COMPANY, LLC.	)	Docket No. 52-007-ESP
	)	
(Early Site Permit for Clinton ESP Site)	)	

AFFIDAVIT OF R. BRAD HARVEY CONCERNING PREFILED
DIRECT TESTIMONY IN THE CLINTON ESP PROCEEDING

I, R. Brad Harvey, do hereby state as follows:

1. I am a Physical Scientist in the Nuclear Regulatory Commission's (NRC's), Office of Nuclear Reactor Regulation (NRR), Division of Risk Assessment (DRA). A statement of my professional qualifications is attached.

2. As part of the NRC staff's health and safety review of the Exelon ESP application, documented in NUREG-1844, the "Safety Evaluation Report for an Early Site Permit (ESP) at the Exelon ESP Site: Final Report," May 2006 ("SER"), I reviewed the aspects of the Applicant's Site Safety Analysis Report that concerned meteorology.

3. I have primary technical responsibility for those portions of the NRC Staff's Prefiled Direct Testimony on Health and Safety Issues in the Clinton ESP Proceeding marked with my initials (RH).

4. I attest to the accuracy of those statements, support them as my own, and endorse their introduction into the record of this proceeding by the health and safety Project Manager, Joelle L. Starefos. I declare under penalty of perjury that those statements, and my statements in this affidavit, are true and correct to the best of my knowledge, information, and belief.

R. Brad Harvey

R. Brad Harvey

October 17, 2006

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of	)	
	)	
EXELON GENERATION COMPANY, LLC.	)	Docket No. 52-007-ESP
	)	
(Early Site Permit for Clinton ESP Site)	)	

AFFIDAVIT OF STEPHEN KLEMENTOWICZ CONCERNING PREFILED DIRECT TESTIMONY IN THE CLINTON ESP PROCEEDING

I, Stephen Klementowicz, do hereby state as follows:

1. I am a Senior Health Physicist in the Nuclear Regulatory Commission's (NRC's), Office of Nuclear Reactor Regulation (NRR), Division of License Renewal (DLR). A statement of my professional qualifications is attached

2. As part of the NRC staff's health and safety review of the Exelon ESP application, documented in NUREG-1844, the "Safety Evaluation Report for an Early Site Permit (ESP) at the Exelon ESP Site: Final Report," May 2006 ("SER"), I reviewed the aspects of the Applicant's Site Safety Analysis Report that concerned the radioactive waste treatment system and the radiological impacts of routine operation to plant workers and members of the public, and to the environment.

3. I have primary technical responsibility for those portions of the NRC Staff's Prefiled Direct Testimony on Health and Safety Issues in the Clinton ESP Proceeding marked with my initials (SK).

4. I attest to the accuracy of those statements, support them as my own, and endorse their introduction into the record of this proceeding by the health and safety Project Manager, Joelle L. Starefos. I declare under penalty of perjury that those statements, and my statements in this affidavit, are true and correct to the best of my knowledge, information, and belief.

Stephen Klementowicz

October 16, 2006

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of	)	
	)	
EXELON GENERATION COMPANY, LLC.	)	Docket No. 52-007-ESP
	)	
(Early Site Permit for Clinton ESP Site)	)	

AFFIDAVIT OF JAY Y. LEE CONCERNING PREFILED
DIRECT TESTIMONY IN THE CLINTON ESP PROCEEDING

I, Jay Y. Lee, do hereby state as follows:

1. I am a Senior Health Physicist in the Nuclear Regulatory Commission's (NRC's), Office of Nuclear Reactor Regulation (NRR), Division of Risk Assessment (DRA). A statement of my professional qualifications is attached.

2. As part of the NRC staff's health and safety review of the Exelon ESP application, documented in NUREG-1844, the "Safety Evaluation Report for an Early Site Permit (ESP) at the Exelon ESP Site: Final Report," May 2006 ("SER"), I reviewed the aspects of the Applicant's Site Safety Analysis Report that concerned geography and demography, and radiological consequences of the design basis accidents.

3. I have primary technical responsibility for those portions of the NRC Staff's Prefiled Direct Testimony on Health and Safety Issues in the Clinton ESP Proceeding marked with my initials (JL).

4. I attest to the accuracy of those statements, support them as my own, and endorse their introduction into the record of this proceeding by the health and safety Project Manager, Joelle L. Starefos. I declare under penalty of perjury that those statements, and my statements in this affidavit, are true and correct to the best of my knowledge, information, and belief.

Jay Y. Lee

October 16, 2006

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of	)	
	)	
EXELON GENERATION COMPANY, LLC.	)	Docket No. 52-007-ESP
	)	
(Early Site Permit for Clinton ESP Site)	)	

AFFIDAVIT OF ROBERT MOODY CONCERNING PREFILED
DIRECT TESTIMONY IN THE CLINTON ESP PROCEEDING

I, Robert Moody, do hereby state as follows:

1. I am a Senior Emergency Preparedness Specialist in the Nuclear Regulatory Commission's (NRC's), Office of Nuclear Security and Incident Response, Division of Preparedness and Response (DPR). A statement of my professional qualifications is attached.

2. As part of the NRC staff's health and safety review of the Exelon ESP application, documented in NUREG-1844, the "Safety Evaluation Report for an Early Site Permit (ESP) at the Exelon ESP Site: Final Report," May 2006 ("SER"), I reviewed the aspects of the Applicant's Site Safety Analysis Report that concerned emergency planning.

3. I have primary technical responsibility for those portions of the NRC Staff's Prefiled Direct Testimony on Health and Safety Issues in the Clinton ESP Proceeding marked with my initials (RM).

4. I attest to the accuracy of those statements, support them as my own, and endorse their introduction into the record of this proceeding by the health and safety Project Manager, Joelle L. Starefos. I declare under penalty of perjury that those statements, and my statements in this affidavit, are true and correct to the best of my knowledge, information, and belief.

Robert Moody

October 16, 2006

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of	)	
	)	
EXELON GENERATION COMPANY, LLC.	)	Docket No. 52-007-ESP
	)	
(Early Site Permit for Clinton ESP Site)	)	

AFFIDAVIT OF CLIFFORD G. MUNSON CONCERNING PREFILED
DIRECT TESTIMONY IN THE CLINTON ESP PROCEEDING

I, Clifford G. Munson, do hereby state as follows:

1. I am a Senior Technical Reviewer in the Nuclear Regulatory Commission's (NRC's), Office of Nuclear Reactor Regulation (NRR), Division of Engineering (DE). A statement of my professional qualifications is attached.

2. As part of the NRC staff's health and safety review of the Exelon ESP application, documented in NUREG-1844, the "Safety Evaluation Report for an Early Site Permit (ESP) at the Exelon ESP Site: Final Report," May 2006 ("SER"), I reviewed the aspects of the Applicant's Site Safety Analysis Report that concerned geology and seismology.

3. I have primary technical responsibility for those portions of the NRC Staff's Prefiled Direct Testimony on Health and Safety Issues in the Clinton ESP Proceeding marked with my initials (CM).

4. I attest to the accuracy of those statements, support them as my own, and endorse their introduction into the record of this proceeding by the health and safety Project Manager, Joelle L. Starefos. I declare under penalty of perjury that those statements, and my statements in this affidavit, are true and correct to the best of my knowledge, information and belief.

Clifford G. Munson

Clifford G. Munson

October 16, 2006

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of	)	
	)	
EXELON GENERATION COMPANY, LLC.	)	Docket No. 52-007-ESP
	)	
(Early Site Permit for Clinton ESP Site)	)	

AFFIDAVIT OF PAUL F. PRESCOTT CONCERNING PREFILED
DIRECT TESTIMONY IN THE CLINTON ESP PROCEEDING

I, Paul F. Prescott, do hereby state as follows:

1. I am a Senior Technical Reviewer in the U.S. Nuclear Regulatory Commission's (NRC's), Office of Nuclear Regulation (NRR), Division of Engineering. A statement of my professional qualifications is attached.

2. As part of the NRC staff's health and safety review of the Exelon ESP application, documented in NUREG-1844, the "Safety Evaluation Report for an Early Site Permit (ESP) at the Exelon ESP Site: Final Report," May 2006 ("SER"), I reviewed the aspects of the Applicant's Site Safety Analysis Report that concerned quality assurance measures.

3. I have primary technical responsibility for those portions of the NRC Staff's Prefiled Direct Testimony on Health and Safety Issues in the Clinton ESP Proceeding marked with my initials (PP).

4. I attest to the accuracy of those statements, support them as my own, and endorse their introduction into the record of this proceeding by the health and safety Project Manager, Joelle L. Starefos. I declare under penalty of perjury that those statements, and my statements in this affidavit, are true and correct to the best of my knowledge, information, and belief.

Paul F. Prescott

October 16, 2006

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of	)	
	)	
EXELON GENERATION COMPANY, LLC.	)	Docket No. 52-007-ESP
	)	
(Early Site Permit for Clinton ESP Site)	)	

AFFIDAVIT OF JOELLE L. STAREFOS CONCERNING PREFILED DIRECT TESTIMONY IN THE CLINTON ESP PROCEEDING

I, Joelle L. Starefos, do hereby state as follows:

1. I am the NRC Project Manager for the health and safety review of Exelon Generation Company, LLC's (Exelon's) application for an early site permit (ESP) at the Exelon ESP site in Clinton, Illinois. A statement of my professional qualifications is attached.

2. I took over Project Management responsibilities in May 2006, following issuance of NUREG-1844, the "Safety Evaluation Report for an Early Site Permit (ESP) at the Exelon ESP Site: Final Report" ("SER"). I have been responsible for project management activities with respect to the SER since that time.

3. I have primary technical responsibility for those portions of the NRC Staff's Prefiled Direct Testimony on Health and Safety Issues in the Clinton ESP Proceeding marked with my initials (JS).

4. I attest to the accuracy of those statements, support them as my own, and endorse their introduction into the record of this proceeding. I declare under penalty of perjury that those statements, and my statements in this affidavit, are true and correct to the best of my knowledge, information, and belief.

Joelle L. Starefos

October 17, 2006

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of	)	
	)	
EXELON GENERATION COMPANY, LLC.	)	Docket No. 52-007-ESP
	)	
(Early Site Permit for Clinton ESP Site)	)	

AFFIDAVIT OF ALBERT TARDIFF CONCERNING PREFILED
DIRECT TESTIMONY IN THE CLINTON ESP PROCEEDING

I, Albert Tardiff, do hereby state as follows:

1. I am a Senior Technical Reviewer in the Nuclear Regulatory Commission's (NRC's), Office of Nuclear Security and Incident Response (NSIR), Division of Security Policy (DSP). A statement of my professional qualifications is attached.

2. As part of the NRC staff's health and safety review of the Exelon ESP application, documented in NUREG-1844, the "Safety Evaluation Report for an Early Site Permit (ESP) at the Exelon ESP Site: Final Report," May 2006 ("SER"), I reviewed the aspects of the Applicant's Site Safety Analysis Report that concerned physical security.

3. I have primary technical responsibility for those portions of the NRC Staff's Prefiled Direct Testimony on Health and Safety Issues in the Clinton ESP Proceeding marked with my initials (AT).

4. I attest to the accuracy of those statements, support them as my own, and endorse their introduction into the record of this proceeding by the health and safety Project Manager, Joelle L. Starefos. I declare under penalty of perjury that those statements, and my statements in this affidavit, are true and correct to the best of my knowledge, information, and belief.

Albert Tardiff

Errata
to
NRC Staff's Prefiled Direct Testimony on Health and Safety Issues
In the Clinton ESP Proceeding

In paragraph 110, change the sentence:

"At this time, the Department of Homeland Security has not directed state, tribal, and local governments to take any emergency preparedness actions in response to lessons learned from Katrina."

to

"At this time, the Department of Homeland Security has not directed state, tribal, and local governments to take any radiological emergency preparedness actions in response to lessons learned from Katrina."

October 17, 2006

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of	)	
	)	
EXELON GENERATION COMPANY, LLC.	)	Docket No. 52-007-ESP
	)	
(Early Site Permit for Clinton ESP Site)	)	

NRC STAFF'S PREFILED DIRECT TESTIMONY ON HEALTH AND SAFETY ISSUES IN THE CLINTON ESP PROCEEDING

The questions and answers below constitute the NRC Staff's prefiled direct testimony on health and safety issues in the Clinton ESP proceeding. Appended to the testimony are affidavits and statements of professional qualifications for the associated reviewers, whose initials are indicated for each portion of testimony for which they have technical responsibility in the context of this mandatory hearing. In most portions of the testimony, useful citations – for example, to applicable regulations or to relevant pages of the Staff's review documents – have been included for reference.

a. SER Chapter 1, "Introduction" & Project Manager's Overview

Q1: Describe briefly the scope and chronology of the Staff's safety review.

A1: 1. (JS) The Staff's Safety Evaluation Report ("SER") presents the conclusions of the Staff's review of relevant portions of the ESP application and supplemental information provided by the Applicant. The ESP application includes (1) a description of the site and nearby areas that could affect or be affected by a nuclear power plant located on the site, (2) a safety assessment of the site on which the facility would be located, including an analysis and evaluation of the major structures, systems, and components of the facility that bear significantly on the acceptability of the site, and (3) the proposed major features of an emergency plan. Specifically, the SER discusses the geography and demography of the site;

nearby industrial, transportation and military facilities; site meteorology; site hydrology; site geology, seismology, and geotechnical engineering; aircraft hazards; radiological effluent release dose consequences from normal operations; emergency planning and industrial security; accident analyses; and ESP quality assurance measures.

2. (JS) On September 25, 2003, Exelon Generation Company, LLC (the Applicant) filed an ESP application with the NRC; this application includes the site safety analysis report ("SSAR"), which describes the safety assessment of the site. Supplements were filed on November 23, 2005, and January 10, March 3 and April 14, 2006. Upon receipt of the original application the Staff reviewed the SSAR and produced a draft safety evaluation report ("DSER"), which it issued on February 10, 2005. At the time the DSER was issued, the Staff had not completed its review of seismology and geology, these issues were addressed in a supplemental DSER issued on August 26, 2005. Additionally, throughout the course of the review the Staff requested and received supplemental materials from the Applicant. The Applicant's responses to these Staff Requests for Additional Information ("RAIs") are included in the final SER.

3. (JS) The Advisory Committee on Reactor Safeguards ("ACRS") completed its review of the Application and of the Staff's DSER. SER at 18-1. The ACRS ESP subcommittee began a detailed review of the application and DSER in February 2005, and the ACRS ESP subcommittee met with representatives from Exelon and the NRC Staff on September 7, 2005. SER at 18-1. The ACRS issued an interim letter report in September 2005, and also met with the Staff in March 2006 to discuss resolution of open items and the responses to ACRS comments on the major elements of the ESP review. SER at 18-1. In its final letter report dated March 24, 2006, the ACRS concurred with the Staff's conclusions and concluded that the proposed site, subject to the permit conditions recommended by the Staff, can be used for nuclear power plants or modules having a total power generation rate of 2400 to 6800 MW

thermal without undue risk to public health and safety. SER at 18-1. The final SER was published (as NUREG-1844) in May 2006.

Q2: Describe briefly the primary regulatory guidance applicable to the Staff's safety review.

A2: 4. (JS) The NRC standards for review of an ESP application are outlined in 10 C.F.R. § 52.18. The NRC Staff conducts its reviews of ESP applications in accordance with guidance set forth in review standard RS-002. That review standard draws from the previously published NUREG-0800, *Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants*, as well as from NUREG-1555, *Standard Review Plans for Environmental Reviews for Nuclear Power Plants* (hereafter "ESRP").

Q3: Describe the general characteristics of the proposed Clinton ESP Site.

A3: 5. (JS) The Clinton ESP[1] facility would be located approximately 700 feet south of the current Clinton Power Station ("CPS") facility, on the existing CPS property (with its associated 4895-acre, man-made cooling reservoir, Clinton Lake) in DeWitt County in east-central Illinois, about 6 miles east of the city of Clinton. SER at 1-4. Although Exelon has not selected a specific reactor type for the Clinton ESP site, it used available information from a range of possible facilities to create a plant parameter envelope ("PPE") representing bounding values for the proposed development. SER at 1-4. Depending on the reactor type selected, the ESP facility would consist of a single reactor or multiple reactors (or modules) of the same reactor type and could have a total core thermal power rating between approximately 2400 and 6800 MWt. SER at 1-4. Unlike the existing CPS Unit 1, which uses Clinton Lake for normal cooling processes, the Clinton ESP facility would use cooling towers; Clinton Lake would be

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[1] The ESP site will be referred to in the Health and Safety Testimony as the Clinton ESP site; however, in the SER, the FEIS, and the "NRC Staff's Prefiled Direct Testimony on Environmental Issues in the Clinton ESP Proceeding," it is also referred to as the "EGC [Exelon Generation Company] ESP" or the "Exelon ESP."

used as the source of makeup water for the Clinton ESP facility cooling water systems. SER at 1-5.

Q4: What is the basis for the Applicant's plant parameter envelope, and how was it reviewed by the Staff?

A4: 6. (JS) The Applicant's PPE is based on various reactor designs that are either certified by the NRC, are in the certification process, or may be submitted for certification in the future. SER at 1-6. As discussed throughout the SER, the Staff reviewed the Applicant's PPE values and found them to be reasonable. SER at 1-7. The Staff identified certain PPE values as bounding parameters or controlling PPE values (bounding values are listed in Appendix A to the SER). SER at 1-7. Because the PPE is intended to bound multiple reactor designs, the NRC would review the actual design selected in a COL or construction permit application referencing any Clinton ESP to ensure that the design falls within the bounding parameters of the PPE. SER at 1-7.

Q5: Does the approach used by the Staff in its health and safety review differ from that used in the environmental review?

A5: 7. (JS) Yes. In general terms, there are some fundamental differences between the approaches used for the final safety evaluation report ("FSER") and the FEIS. The sources of these differences are the statutory and regulatory requirements for each review. The Staff's safety review is performed under the Atomic Energy Act and in accordance with the regulations in 10 C.F.R. Part 52. The environmental review is performed under NEPA as implemented in NRC regulations at 10 C.F.R. Part 51. Whereas the safety review is focused primarily on protecting the health and safety of the public, the environmental review considers a much broader range of impacts to the environment as a whole.

8. (JS, JL) The safety review generally focuses on the results of conservative analyses. For an environmental review under NEPA and Part 51, the Staff evaluates the reasonably foreseeable environmental impacts of issuing an ESP. In addition, the Staff has the latitude, if numerical data are not available, to qualitatively evaluate the impacts.[2] As an example, in considering χ/Q values the Staff used "typical" meteorological conditions in the FEIS (see FEIS at 5-63). "Typical" is defined as those conditions that give atmospheric dispersion factors that are exceeded [i.e., dispersion is less] 50 percent of the time. In contrast, for the Chapter 15 analyses in the FSER, the Staff used values for χ/Q associated with "adverse" meteorological conditions (defined as those conditions that give atmospheric dispersion factors that are exceeded no more than 5 percent of the time).

9. (JS) Another reason for differences in approach between the FEIS and the FSER is the matter of perspective. For example, both the FEIS and the FSER consider impacts related to hydrology. But in these two documents, the Staff is looking at hydrology for very different reasons. In the FEIS, the Staff is evaluating the impacts on the hydrology of the surrounding area of building and operating a nuclear plant (or plants). In the FSER, in contrast, the Staff is evaluating the potential impacts of local hydrology on the plant. Thus, in one case the Staff is looking from the inside out, and in the other case it is looking from the outside in. This difference in perspective leads to very different evaluations in relation to the same resource. Specifically, the analyses in the FSER address, for example, concerns related to the probable maximum flood, an issue unrelated to the environmental review. On the other hand, the analyses in the FEIS address concerns related to issues such as reductions in lake level, changes in flows, and the thermal plume.

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[2] As stated in 10 C.F.R. § 51.70(d), "The analysis for all draft environmental impact statements will, to the fullest extent practicable, quantify the various factors considered. To the extent that there are important qualitative considerations or factors that cannot be quantified, these considerations or factors will be discussed in qualitative terms."

10. (JS) In summary, because of the differences in the basic goals of the analyses in the FEIS and the FSER, there are differences in the data used and the approaches applied by the Staff in the analyses. Based upon the reasoning described above, these differences are to be expected between the FEIS and FSER reviews.

Q6: More specifically, do differences in the two documents' analysis of the impacts for reactors other than the ABWR and the AP1000 affect the logic of the Staff conclusions?

A6: 11. (JS, JL) With respect to the difference between the FEIS and the FSER in connection with the treatment of certified and non-certified designs, the Staff reviewed how it addressed designs other than the ABWR and AP1000 in Section 5.10 of the FEIS and in Chapter 15 of the FSER. The Staff does not believe that the depth of its analyses for these designs is markedly different. In both the FEIS and the FSER, the analyses related to accidents focused on the ABWR and the AP1000 because of the level of information available for these designs. In the case of the FSER, the Staff had already evaluated accidents for these designs as part of the design certification reviews. So, in essence, most of the work had already been done. For the FEIS, the Staff was, for the first time, evaluating the environmental impacts of accidents for these designs at a site. For the other reactor designs in both the FEIS and the FSER, the Staff indicated that there was not as much information available, but the Staff judged the results for the ABWR and the AP1000 as likely to bound the results for the other designs. In both documents, the Staff indicated that, if a design other than the ABWR or AP1000 were chosen at the COL stage, the assumption that the results were bounded would have to be confirmed.

Q7: Where the Staff intends to confirm certain assumptions at the CP or COL stage, what is the nature of the "verification" to be conducted by Staff at the COL stage beyond assuring that the actual plant design falls within those bounds?

A7: 12. (JS) The Staff would conduct the verification of key assumptions at the COL stage in a manner similar to that employed during the review of the ESP application. For example, the Staff would review information provided by the applicant in its ER and during the Staff's audit, and perform an independent review of these matters, including obtaining and reviewing information from local, State, Tribal, and Federal authorities.

13. (JS) The Staff also identified 32 COL action items[3] in the SER (compiled in SER Appendix A) in order to ensure that particular significant design and construction issues are tracked and considered during the COL or CP stage.[4] The Staff determined that these COL action items do not affect its regulatory findings at the ESP stage and are more appropriately addressed at later stages in the licensing process. SER at 1-9. Finally, the Staff identified 6 permit conditions (also listed in Appendix A) to control various safety matters; the Staff will recommend the Commission impose if an ESP is issued. SER at 1-9, 1-10.

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[3] A COL action item is a tool, devised by the Staff, used to highlight significant issues that the Staff identified during the ESP or design certification review. These items should be considered by the Staff during the review of a COL application. COL action items are used by the staff to track significant design and construction issues associated with individual site characteristics that should be considered at the COL or CP stage.

[4] COL action items do not establish requirements; rather, they identify an acceptable set of information to be included in the site-specific portion of the safety analysis report submitted by a COL or CP applicant referencing a Clinton ESP. SER at 1-9.

b. SER, Chapter 2, "Site Characteristics";

Section 2.1, Geography and Demography

14. (JS) In Chapter 2 of the SER, the Staff evaluated a range of information concerning the site characteristics of the proposed Clinton ESP site. In particular, the Staff reviewed the application with respect to geography and demography; nearby industrial, transportation, and military facilities; meteorology; hydrology; and geology, seismology, and geotechnical engineering.

Q8: Describe the Staff's health and safety review with respect to the geography and demography of the proposed site.

A8: 15. (JL) The Applicant provided information on the site location, including the site boundary for a new unit in reference to the existing CPS; the site location with respect to political subdivisions and prominent natural and manmade features of the area within the 2.5-mile low-population zone ("LPZ") and 50-mile population zone; the surrounding topography; the distance (defined as a circular radius of 0.64 miles) to the nearest exclusion area boundary ("EAB"); the location of potential radioactive material release points; the distance from U.S. and State highways; and confirmation that no physical characteristics unique to the proposed ESP site that could pose a significant impediment to the development of emergency plans were identified. SER at 2-1, 2-2, 13-13. No persons live within either the CPS EAB or the proposed ESP site EAB, and the Staff verified that the exclusion area distance is consistent with the distance used in the radiological consequence analyses performed by both the Applicant and the Staff. SER at 2-2, 2-3. The Staff found that the Application contained sufficient information for the Staff to evaluate compliance with the siting evaluation factors in 10 C.F.R. Part 100 and 10 C.F.R. § 52.17, as well as with the radiological consequence evaluation factors in 10 C.F.R. § 50.34(a)(1).

16. (JL) The Staff found that the Applicant had provided and substantiated information concerning its plan to obtain legal authority sufficient for it to determine all activities within the designated exclusion area. The Staff also found that the Applicant had appropriately described the exclusion area and the methods by which it will control access to (and occupancy of) this exclusion area during normal operation and in the event of an emergency situation. SER at 2-6. The Staff concluded that the Applicant's exclusion area is acceptable and meets the requirements of 10 C.F.R. Part 100, subject to two proposed permit conditions: 1) that Exelon obtain an agreement granting it an exclusive and irrevocable option to purchase, enter a long-term lease, and/or other legal right in the land, before submitting any COL application referencing a Clinton ESP, and 2) that an ESP holder seeking to perform any authorized 10 C.F.R. § 52.25 limited work activities obtain the authority to undertake such activities on the ESP site, along with the corresponding right to implement the site redress plan if no plant is actually built on the ESP site. SER at 2-6, 2-7.

17. (JL) With respect to population density, the Staff compared and verified the Applicant's population data against U.S. Census Bureau data. The Staff reviewed population projections (extending to the year 2060), and found that the Applicant's projected population data, including for the transient population, cover an appropriate number of years (through the projected year for end of plant life) and are therefore reasonable.[5] SER at 2-9. The Staff also determined that population densities for the proposed ESP site would be well below 500

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[5] The Applicant assumed that the rate of population change would remain essentially constant between 2010 and 2060. There are, however, no additional population predictions for the counties involved through 2060. The U.S. Bureau of the Census has projected population growth nationally through 2050 and statewide through 2030; the Staff determined that the Applicant's intermediate projections for Illinois are not inconsistent with the Bureau's conclusions.

The regulatory guidance for assessing population considerations for site suitability recognizes the uncertainty inherent in population projections over extended periods (*See, e.g.*, RG 4.7, "Reactor Site Criteria"). In the event that population growth in the site vicinity departs from the presented data, the new data will be factored into emergency plans for the site in accordance with Section G, "Maintaining Emergency Preparedness," of Appendix E to 10 C.F.R. Part 50.

persons per square mile, in conformance with Regulatory Position C.4 in RG 4.7, Revision 2. SER at 2-10. Finally, as the LPZ is located entirely within the 10-mile emergency planning zone ("EPZ"), and comprehensive emergency planning for the protection of all persons within the 10-mile EPZ would include those persons within the LPZ, the Staff concluded that appropriate protective measures could be taken on behalf of the populace within the LPZ in the event of a serious accident. SER at 2-10, 13-13. Therefore, the Staff found that the proposed LPZ and population center distance meet the definitions in 10 C.F.R. § 100.3, and it concluded that the Applicant's population data and population distribution meet the requirements of 10 C.F.R. § 52.17 and 10 C.F.R. Part 100. SER at 2-10.

Section 2.2, Nearby Industrial, Transportation, and Military Facilities

Q9: Describe the Staff's health and safety review with respect to nearby industrial, transportation, and military facilities.

A9: 18. (KC) The Applicant provided information on the relative location and separation distance of the ESP site from industrial, military, and transportation facilities and routes, including air, ground, and water traffic; pipelines; and fixed manufacturing, processing, and storage facilities. SER at 2-11. Noting that the ESP site is in a rural and agricultural area, the Applicant stated that only 3 small industrial facilities exist within 5 miles of the ESP site, and that no industrial facilities, pipelines, or other developments are located in the proposed exclusion area other than CPS. SER at 2-11. Five pipelines cross the CPS property, one of which passes within 1 mile of the ESP site. SER at 2-11. The Applicant identified four small private airstrips within 6 miles of the ESP site, and it stated that Clinton Lake is the only navigable waterway in the vicinity of the ESP site. SER at 2-13. The Staff, in its review, applied the regulatory positions and criteria in RG 1.91 and RG 1.78, Revision 1. The ESP facility would be located adjacent to the existing CPS facility, therefore the Staff also considered the CPS

updated safety analysis report ("USAR"), which identifies and evaluates the potential hazards from nearby industrial facilities. SER at 2-14. The Staff did not identify any relevant facilities not previously noted by the Applicant and, after consideration of the Application and RAI responses and its independent review, the Staff concluded that the Applicant identified all potentially hazardous activities on and near the site. SER at 2-14, 2-15.

19. (KC) The Staff reviewed the Applicant's probability analyses of potential accidents involving hazardous materials or activities on and near a new nuclear unit at the ESP site, including flammable vapor clouds, aircraft crashes, and toxic chemicals. SER at 2-15. The Staff also reviewed the Applicant's analyses of the consequences of accidents involving nearby industrial, military, and transportation facilities to determine if any should be identified as design-basis events. SER at 2-15. Based on the CPS USAR (concerning airway and airport facilities, rail shipments and onsite chemical storage at CPS), and also on the distance of the potential ESP facility from the worst-case train tank explosion accident, the Staff determined that the Applicant's analyses used the appropriate data and analytical models, that the Applicant properly identified potential accidents related to the presence of hazardous materials or activities on or near the ESP site that could affect a nuclear unit represented by the chosen PPE, and that the Applicant properly identified accidents that should be considered as design-basis events at the COL or CP stage. SER at 2-15, 2-17, 2-18. Since Exelon has not determined the specific design of the ESP facility, the Staff concluded it will need to review certain potential accidents (including some that might affect control room habitability) at the COL stage, using the guidance in Section 6.4 of the SRP. SER at 2-15, 2-17, 2-18. Therefore, the Staff concluded that the site location is acceptable with regard to accidents that could affect a nuclear unit (based on the Applicant's PPE) that might be constructed on the site, and that the site location meets the requirements of 10 C.F.R. § 52.17(a)(1)(vii), 10 C.F.R. § 100.20(b), and § 100.21(e). SER at 2-18.

Section 2.3, Meteorology

Q10: Describe the Staff's health and safety review with respect to meteorology.

A10: 20. (RH) The Staff found, as stated in Sections 2.3.1.4, 2.3.2.4, 2.3.4.4, and 2.3.5.4 of the SER, that the Applicant's identification and consideration of the meteorological characteristics of the site and surrounding area meet the requirements of 10 C.F.R. 100.20(c)(2),[6] 10 C.F.R. 100.21(c),[7] and 10 C.F.R. 100.21(d).[8] Although the Applicant did not identify all the applicable regulations and regulatory guidance, the Staff found that the Applicant did comply with the regulations and regulatory guidance that were not identified.[9]

21. (RH) As part of its review of meteorological characteristics, the Staff evaluated regional and local climatological information, including climate extremes and severe weather

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[6] §100.20(c)(2) states that the meteorological characteristics of the site that are necessary for safety analysis or that may have an impact upon plant design (such as maximum probable wind speed and precipitation) must be identified and characterized.

[7] §100.21(c) states that site atmospheric dispersion characteristics must be evaluated and dispersion parameters established such that (1) radiological effluent release limits associated with normal operation from the type of facility proposed to be located at the site can be met for any individual located offsite and (2) radiological dose consequences of postulated accidents shall meet the criteria set forth in §50.34(a)(1) for the type of facility proposed to be located at the site.

[8] §100.21(d) states that the physical characteristics of the site (including meteorology) must be evaluated and site parameters (e.g., site characteristics) established such that potential threats from such physical characteristics will pose no undue risk to the type of facility to be located at the site.

[9] For example, the Staff found that the Applicant should have identified Appendix I to 10 C.F.R. Part 50 as an applicable regulation regarding long-term (routine release) atmospheric dispersion estimates. Appendix I requires demonstrating compliance with the numerical guides for doses contained in this appendix by characterizing atmospheric transport and diffusion conditions to estimate the radiological consequences of routine releases of materials to the atmosphere. Nonetheless, the Staff found that the Applicant met these regulatory requirements by providing the appropriate atmospheric dispersion and deposition estimates for estimating the radiological consequences of routine releases of materials to the atmosphere. SER 2-50 to 2-51.

The Staff also found that the Applicant should have also identified RG 1.112 with respect to the criteria to be used to identify release points and release characteristics applicable to the extent the Applicant provides release points and release characteristics at the ESP stage. Nonetheless, the Staff found that the Applicant made conservative release characteristic assumptions by treating all releases as ground-level releases.

The Staff also noted that if the ESP site does not remain in compliance with the terms and conditions of the ESP, the Staff would seek to modify the ESP or impose requirements on the site. These meteorological concerns are not documented as COL Action Items or permit conditions because § 52.39 provides for the Staff's modification of the ESP to bring the site back into compliance.

occurrences affecting design and siting. The Staff reviewed information concerning the atmospheric dispersion characteristics of the proposed nuclear power plant site to ensure that radioactive effluents from postulated and operational releases stay within Commission guidelines. The Staff prepared Sections 2.3.1 through 2.3.5 of the SER in accordance with the review procedures and reference materials in RS-002 (Attachment 2), using information presented in Section 2.3 of the site safety analysis report ("SSAR"), and responses to Staff RAIs. SER at 2-18.

Q11: Please describe the Staff's examination of regional climatology.

A11: 22. (RH) The Applicant provided information regarding the regional climate and meteorological phenomena, including averages and extremes, that could affect the design and siting of a reactor (within the PPE) at the proposed site. These data were based on information provided by (1) the U.S. National Weather Service at the Peoria and Springfield, Illinois first-order weather stations, (2) nearby cooperative stations (such as the station in Decatur, Illinois), (3) the National Climatic Data Center (NCDC), (4) the American Society of Civil Engineers (ASCE), (5) the Illinois State Climatologist Office (ISCO), and (6) the Illinois State Water Survey (ISWS). SER at 2-18, 2-19.

23. (RH) The Staff's evaluation of the meteorological information utilized information provided by NCDC, National Severe Storms Laboratory ("NSSL"), ISCO, and ASCE. Additionally, Pacific Northwest National Laboratories ("PNNL") prepared a technical evaluation report assessing the tornado site characteristics of the Clinton ESP site. SER at 2-27, 2-28.

24. (RH) The Staff reviewed the available information and found that the Applicant's analysis of the regional and site meteorological characteristics met the requirements of 10 C.F.R. § 100.20(c)(2) and 10 C.F.R. § 100.21(d). SER at 2-33.

25. (RH) As part of its study of the regional meteorology, the Applicant evaluated the 48-hour probable maximum winter precipitation (PMWP). Based on its analysis, the Applicant found a PMWP value of 16.6 inches of water for the ESP site. This value was determined for a 296 square-mile drainage area surrounding the site. The Staff performed an independent 48-hour PMWP analysis for a smaller (more conservative) 10 square-mile drainage basin and found a PMWP value of 18.2 inches of water. However, the Staff found the Applicant's results to be acceptable. The difference between the results can most likely be attributed to the difference in drainage area evaluated (i.e., 10 square miles versus 296 square miles). The weight of the 48-hour PMWP is combined with the weight of the 100-year snowpack to determine the winter precipitation loads that should be included in the combination of extreme live loads in the design of roofs of safety related SSCs pursuant to the Site Analysis Branch Position on Winter Precipitation Loads (ADAMS Accession No. ML050630277). The Staff believes that combining the weight of the 48-hour PMWP with the 100-year snowpack is a very conservative design assumption and expects that a COL Applicant referencing the 48-hour PMWP site characteristic will satisfactorily demonstrate that the 48-hour PMWP (whether it is 16.6 inches of water or 18.2 inches of water) could neither fall nor remain entirely on top of the antecedent snowpack and/or roofs. The Staff therefore found that its 48-hour PMWP results were compatible with the Applicant's results.

Q12: Please describe the Staff's examination of local meteorology.

A12: 26. (RH) The Applicant provided information on the local meteorological conditions based on data collected by the meteorological monitoring program at the CPS. These data were provided for periods from April 1972–April 1977 (pre-CPS Construction) and January 2000-August 2002 (post-CPS Construction). Since the temperature and humidity data were collected from 1972 to 1977 (pre-CPS) the Staff asked the Applicant whether the

construction of Clinton Lake, which is heated, and the once-through cooling system of the CPS, had any effect on the validity of the data. The Applicant made qualitative comparisons of the 1972 - 1977 and 2000 - 2002 temperature and humidity data sets, and concluded that the two data sets were compatible, with only expected variations.[10] SER at 2-34, 2-35. The Applicant used the more recent 2000-2002 data set to develop the short-term (accident release) and long-term (routine release) atmospheric dispersion site characteristics presented in SER Sections 2.3.4 and 2.3.5. SER at 2-45, 2-49.

27. (RH) The Staff also evaluated the local intense precipitation for the site. The Staff's analysis produced an estimate of 18.15 in/h at the ESP site.[11] The local intense precipitation site characteristic of 18.15 in/h clearly bounds the highest recorded 1-day

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[10] Although the Staff has not reviewed the details of the Applicant's 1972-77 and 2000-02 temperature/humidity data set comparison, the Staff accepts the Applicant's conclusion that the data sets are compatible. The heating effects attributable to the heated lake should be minimal since the meteorological tower is located approximately ½ mile from the nearest shoreline which is more than 4 miles downstream of the CPS thermal plume discharge location. Any minimal heating effects would be difficult to discern, given the typical year-to-year variations in temperature and humidity as well as the accuracy of the measurements (e.g., typically ±0.5 °C per RG 1.23).

The minimal effects of a nearby lake (heated or unheated) may be more discernable on the delta- temperature (i.e., vertical temperature difference) measurements used to determine atmospheric stability since delta-temperature measurements are typically five times more sensitive than ambient temperature measurements (e.g., typically ±0.1 °C per RG 1.23). It is not unexpected to see a slight shift towards unstable conditions due to the water body's potential influence on the lower delta-temperature measurements 10 meters above ground level. Changes in monitoring equipment (e.g., sensors, data recorders) and data reduction methods that occurred between the 1972-77 and 2000-02 data sets may have also caused a change in the reported stability data.

[11] This value is noted as a Site Characteristic in Section 2.4.2.3 of the SER.

precipitation total of 14.25 inches of rain[12] and will be used to mitigate impacts of local site flooding based on grading and drainage design at the COL stage.

28. (RH) The Staff reviewed the Applicant's description of the local meteorology and determined that it represents the conditions at and near the site. The site characteristics listed in Appendix A.3, which will become part of the ESP if the permit is issued, include the winter site characteristics (100 year snowpack and 48-hour PMWP) that must be used by the Applicant in evaluating roof designs at the COL stage. The Staff also reviewed the expected terrain modifications associated with the development of the ESP facility and the site's attainment status designations with respect to the national ambient air quality standards and concluded that neither the terrain modifications nor site air quality conditions would affect plant design and operation. SER at 2-39. The Staff reviewed the available information and concluded that the Applicant's identification and consideration of the meteorological, air quality, and topographical characteristics of the site and the surrounding area meet the requirements of

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[12] The 14.25 inches of rain in one day (May 8, 1961) was recorded at the Clinton Climatic Station, which is located approximately 7 miles from the Clinton ESP site and 1 mile from the town of Clinton, IL. The rainfall event was recorded almost 15 years before the existing Clinton Power Station received its construction permit on February 24, 1976, when neither the man-made Lake Clinton nor the Clinton Power Station were in existence. The U.S. Weather Bureau publication "Storm Data" dated May 1961 (Volume 3 No. 5) described the storm event, noting that the entire event occurred from May 5-8, 1961, involving heavy rain, wind, hail, and lightning in Central and Southern Illinois; 2 persons were killed and 2 injured, with estimated property damage of $5,000,000–$50,000,000, and estimated crop damage of $50,000–$500,000.

The Weather Bureau publication provided further details as follows: Heavy rains accompanied by thunderstorms, high winds and hail overflowed lakes, rivers and streams flooding cities, towns and farmlands in central and southern Illinois. Hundreds of families were evacuated from their homes in the worst flooding since 1943. Heaviest 4 day rainfall totals were generally recorded on a line from East St. Louis to Vincennes, Indiana, where generally 10 to 13 inches occurred. The heaviest 4 day amount occurred at Clinton where 15.77 inches fell. 3 to 6 feet of water flooded streets in Browns, Centralia, Edwardsville, Collinsville, Belleville, Marion, Clinton, Mt. Carmel and other locations. At least 25 major highways were blocked by high water. One man suffered a fatal heart attack as his car plunged into deep water on a highway near Centralia. A New Athens farmer was drowned in an overflowed creek. At Tower Hill, a woman was burned by lightning, which struck and set fire to her home. In Decatur a man was injured by lightning, which blasted an 8 x 10 hole in his house. Golf ball sized hail broke 350 windows in a greenhouse in Milford and caused considerable damage to homes in the area.

10 C.F.R. § 100.20(c)(2) and 10 C.F.R. § 100.21(d) and are sufficient to determine the acceptability of the site. SER at 2-39.

29. (RH) The Staff concluded that the Applicant had presented and substantiated information on local meteorology, air quality, and topographic characteristics of importance to the safe design and operation of a nuclear power unit falling within its PPE that might be constructed on the proposed site.

Q13: Please describe the Staff's review of the onsite meteorological measurements program.

A13: 30. (RH) The Applicant used the existing onsite meteorological measurements program for the CPS facility to collect data for the Clinton ESP site. SER at 2-40. The Staff evaluated the onsite meteorological measurements program by reviewing the program description presented in the SSAR and conducting a site visit. The site visit consisted of reviewing the meteorological monitoring system location and exposure, sensor type and performance specifications, data transmission and recording, data acquisition and reduction, and instrumentation maintenance and calibration procedures. The Staff performed a quality review of the post-CPS construction hourly meteorological database. The Staff's examination of the data revealed generally stable and neutral atmospheric conditions at night and unstable and neutral conditions during the day, which was expected. SER at 2-42, 2-43.

31. (RH) The Staff reviewed available information relative to the meteorological measurements program and the data collected by the program. On the basis of its review, the Staff concluded that the system provides data adequate to represent site atmospheric dispersion conditions, as required by 10 C.F.R. § 100.21(c). The onsite data provided an acceptable basis for making estimates of atmospheric dispersion for design-basis accident and

routine releases from a nuclear unit falling within the Applicant's PPE, and for meeting the requirements of 10 C.F.R. Part 100 and Appendix I to 10 C.F.R. Part 50.

Q14: Please describe the Staff's examination of short-term diffusion estimates.

A14: 32. (RH) The Applicant generated its atmospheric diffusion estimates for postulated accidental airborne releases of radioactive effluents to the EAB and LPZ using the Staff-endorsed computer code PAVAN[13]. The Staff evaluated the applicability of the PAVAN model and concluded that no unique topographic features preclude the use of the PAVAN model for the Clinton ESP site. The Staff also reviewed the Applicant's input to the PAVAN computer code, including the assumptions used concerning plant configuration and release characteristics and the appropriateness of the meteorological data input. The Staff found that the Applicant had made conservative assumptions by ignoring building wake effects and treating all releases as ground-level releases. SER at 2-47.

33. (RH) The Staff independently evaluated the resulting atmospheric diffusion estimates by running the PAVAN computer model, and it obtained PAVAN results similar to those of the Applicant. SER at 2-47, 2-48. The Staff concluded that the Applicant had made conservative assessments of post-accident atmospheric dispersion conditions using its meteorological data and appropriate diffusion models. The Staff reviewed the Applicant's proposed atmospheric dispersion site characteristics for inclusion in an ESP for the Applicant's site, should one be issued, and found these characteristics acceptable. Therefore, the Staff

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[13] The PAVAN computer code used by the Applicant to estimate short-term (accident release) atmospheric dispersion site characteristics for the EAB and LPZ implements the methodology outlined in RG 1.145, "Atmospheric Dispersion Models for Potential Accident Consequence Assessments at Nuclear Power Plants." RG 1.145 states that the atmospheric dispersion factor selected for the EAB and LPZ should be the maximum sector X/Q value (i.e., the highest of each of the 16 sector values that are exceeded 0.5 percent of the total hours) or the 5 percent overall site X/Q value, whichever is higher. The intent of this methodology is to allow consideration of the directional variability of wind flow and diffusion conditions as well as EAB and LPZ distances. The technical basis for this methodology is documented in NUREG/CR-2260, "Technical Basis for Regulatory Guide 1.145, Atmospheric Dispersion Models for Potential Accident Consequence Assessments at Nuclear Power Plants."

concluded that the Applicant's short-term atmospheric dispersion estimates are appropriate for the assessment of consequences from radioactive releases for postulated (design-basis) accidents, in accordance with 10 C.F.R. § 100.21(c)(2). SER at 2-48, 2-49.

Q15: Please describe the Staff's examination of long-term diffusion estimates.

A15: 34. (RH) The Applicant generated its atmospheric diffusion estimates for routine airborne releases of radioactive effluents to the site boundary, EAB, LPZ, and special receptors of interest using the MIDAS software subprogram XDCALC. The Applicant stated that the XDCALC model is consistent with the guidance in RG 1.111. SER at 2-49. The Staff reviewed the Applicant's input assumptions to the XDCALC computer code concerning plant configuration and release characteristics and found these assumptions to be appropriate. SER at 2-52. The Staff independently evaluated the Applicant's resulting atmospheric diffusion estimates by executing the Staff computer code XOQDOQ and obtaining results similar to those obtained by the Applicant. SER at 2-52. The Staff concluded that the Applicant had used an appropriate atmospheric model and adequate meteorological data to calculate relative concentration and relative disposition at appropriate distances from postulated release points for evaluation of routine airborne releases of radioactive material. SER at 2-52.

35. (RH) The Staff concluded that the Applicant had provided the information necessary to address the requirements of 10 C.F.R. § 100.21(c)(1) and that the Applicant's characterization of long-term atmospheric transport and diffusion conditions is appropriate for use in demonstrating compliance with the numerical guides for doses in Appendix I to 10 C.F.R. Part 50.[14] SER at 2-55.

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[14] The Staff believes it may be helpful to clarify the meanings of the headings in Table 2.3.5-1, which presents the Applicant's long-term diffusion estimates. **Undepleted/No Decay** χ/Q values are atmospheric dispersion factors used to evaluate ground level concentrations of long-lived noble gases, tritium, and carbon 14. The plume is assumed to travel downwind without undergoing dry deposition or radioactive decay. **Undepleted/2.26-Day Decay** χ/Q values are atmospheric dispersion factors used to

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Section 2.4, Hydrology

Q16: Discuss how the Staff evaluated the Applicant's hydrologic analysis of the ESP site, beginning with the general hydrologic description.

A16: 36. (GB) The Applicant indicated that the safety-related structures associated with the ultimate heat sink ("UHS"), if the reactor design selected requires a UHS, are the intake structures, the essential service water cooling towers, and other structures that will be located within the ESP facility powerblock area. SER at 2-59.

37. (GB) The Staff conducted a site visit in accordance with the guidance in Section 2.4.1 of RS-002, Attachment 2; used information from the site visit, digital maps, and streamflow data from the USGS; and independently verified the hydrologic description in SSAR Section 2.4.1. SER at 2-63. The Applicant provided information, including maps, charts, and data from Federal, State, and regulatory bodies, describing the hydrologic characteristics and water use in the vicinity of the ESP site. SER at 2-63.

38. (GB) The Staff determined that a COL or CP applicant would need to ensure that the ESP facility intake piping is installed with adequate clearance from the CPS facility piping, and that such an applicant should provide the detailed design of the UHS system, if a UHS is required. SER at 2-66, 2-68. Specifically, the Staff found that 50 feet of horizontal clearance and 6.6 ft of vertical clearance would be required between CPS and EPS piping.[15]

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[14](...continued)
evaluate ground level concentrations of short-lived noble gases. The plume is assumed to travel downwind without undergoing dry deposition but is depleted assuming a half-life of 2.26 days, based on the half-life of Xe-133m. **Depleted/8.00-Day Decay** χ/Q values are atmospheric dispersion factors used to evaluate ground level concentrations of radioiodine and particulates for the inhalation pathway. The plume is assumed to travel downwind with dry deposition and is depleted assuming a half-life of 8.00 days, based on the half-life of I-131. Finally, **D/Q Values** are deposition factors used to evaluate dry deposition of radioiodine and particulates for the ground plane exposure and food pathways.

[15] The Staff used 6.6 ft of vertical clearance because it is about 3 times the diameter of the largest existing buried pipe and would therefore provide adequate separation for construction activity at the ESP site.

The Staff concluded that, by conforming to Section 2.4.1 of RS-002, Attachment 2, the Applicant met the requirements for general hydrologic descriptions with respect to 10 C.F.R. § 52.17(a) and 10 C.F.R. § 100.20(c). SER at 2-70.

Q17: Please describe the Staff's analysis with respect to floods.

A17: 39. (GB) In Revision 4 of the SSAR, the Applicant revised the maximum rainfall site characteristic to reflect information in Hydrometeorological Report (HMR) 52. SER at 2-73. The revised maximum rate for the 1-hour probable maximum precipitation ("PMP") is 18.15 in and for the 5-min PMP is 6.08 in. SER at 2-73. The Staff noted that a COL or CP applicant should design the ESP intake structures to withstand the combined effects of Probable Maximum Flood ("PMF"), coincident wind wave activity, and wind setup. With respect to site drainage, the local intense precipitation of 18.15 inches during one hour has been identified as a site characteristic; the Applicant should demonstrate that the local intense precipitation flooding can be discharged into Clinton Lake without relying on any active drainage systems, which may become blocked. SER at 2-78, 2-79. The Staff concluded that, by conforming to Section 2.4.2 of RS-002, Attachment 2, the Applicant complied with the flood requirements of 10 C.F.R. § 52.17(a) and 10 C.F.R. § 100.20(c). SER at 2-80.

Q18: Please describe the Staff's analysis with respect to the probable maximum flood on streams and rivers.

A18: 40. (GB) In Revision 4 of the Application, the Applicant described an assessment of the PMF static flood elevation height based on a unit hydrograph analysis of the 72-hour PMP. The PMP was estimated using current National Weather Service guidance for deriving a PMP for the Clinton watershed (HMRs 51, 52, and 53). SER at 2-82. In its evaluation, the Staff performed an independent analysis to verify the Applicant's PMF analysis. The Staff determined the PMP using HMRs 51 and 52 and ANSI/ANS-2.8-1992. SER at 2-84. The Staff

concluded that the Applicant provided sufficient information and evaluation of PMFs on streams and rivers at the site, and that, by conforming to Section 2.4.3. of RS-002, Attachment 2, the Applicant met the requirements to identify and evaluate PMFs on streams and rivers at the site with respect to 10 C.F.R. § 52.17(a) and 10 C.F.R. § 100.20(c). SER at 2-94.

Q19: Please describe the Staff's analysis with respect to potential dam failures.

A19: 41. (GB) In SSAR Section 2.2.4, the Applicant stated that no dams exist either upstream or downstream of the Clinton Dam. The Applicant also indicated that failure of Clinton Dam, which is not a safety-related structure, would not result in a loss of water from the submerged UHS pond; the water in the UHS pond would still be available for safe shutdown of the proposed reactor. SER at 2-94

42. (GB) The Staff consulted maps published by the USGS to independently verify the Applicant's statement that no dams exist upstream of the Clinton Dam. SER at 2-96. The Staff identified a small impoundment called Dawson Lake. SER at 2-96. The Applicant revised SSAR Section 2.4.1.2 to include the information on Dawson Lake, and stated that there were no existing reservoirs or dams upstream or downstream of Clinton Lake that are large enough to affect the availability of water to Clinton Lake. SER at 2-96, 2-97. The Applicant identified four recreational reservoirs, two upstream and two downstream, one of the upstream reservoirs being Dawson Lake. SER at 2-97. The staff determined, using a set of conservative assumptions, that a postulated dam breach upstream of Lake Clinton would only increase the normal Clinton Lake water level elevation, 690 ft MSL, by 3.1 ft. SER at 2-97.

43. (GB) The Staff stated it would include 716.5 ft MSL as a site characteristic for the combined effects maximum water surface elevation in any ESP that might be issued for this application and noted that even if the maximum water elevation were to be augmented by 3.1 ft because of a breech of the two upstream dams (leading to a water surface elevation of 719.6 ft

MSL in Clinton Lake), the ESP site (located at 735 ft MSL) would be safe from flooding. SER at 2-97. The Staff concluded that, by conforming to Section 2.4.4 of RS-002, Attachment 2, the Applicant met the requirements for potential dam failures with respect to 10 C.F.R. § 52.17(a) and 10 C.F.R. § 100.20(c).[16] SER at 2-97, 2-99.

44. (GB) The Staff also verified the Applicant's claim that the ESP facility requires no changes to the Clinton Dam spillways. There are two spillways on the Clinton Dam. The service spillway, with a crest elevation of 690 ft MSL, is designed to pass the 100-year flood with the water surface elevation in Clinton Lake at 697 ft MSL. The auxiliary spillway, with a crest elevation of 700 ft MSL, is designed to pass floods greater than the 100-year flood. According to the Staff's independent calculations, the maximum water surface elevation in Clinton Lake during the PMF event was 710.6 ft MSL, 1.2 ft below the top elevation of the Clinton Dam. Since the hydrostatic water surface elevation in Clinton Lake did not rise above the top elevation of the dam, the Staff concluded that the auxiliary spillway does not require any modifications to safely pass the PMF.

Q20: Please describe the Staff's analysis with respect to probable maximum surge and seiche flooding.

A20: 45. (GB) The Applicant stated in Revision 0 of SSAR Section 2.4.5 that there are no large bodies of water near the ESP site where significant storm surges and seiche can occur. The Applicant also stated that Clinton Lake is not large enough to develop surge and seiche conditions more critical than the PMF condition. In Revision 4 of the SSAR, the Applicant revised its approach to provide a higher level of conservatism, and the maximum storm surge at the site was stated as 0.3 ft. SER at 2-99.

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[16] The PMF value provided in section 2.4.10.3 of the FSER, 721.7 ft, is incorrect. The correct value is 716.5 ft.

46. (GB) The Staff conducted an independent evaluation to estimate seiche effects, and it determined that meteorologically forced resonance is not likely and that seismically induced seiche is not likely in Clinton Lake because of the large difference between the period of oscillation resulting from seiche (6.8 minutes) and that of seismically induced vibrations (less than 1 sec). SER at 2-102. The Staff concluded that, by conforming to Section 2.4.5 of RS-002, Attachment 2, the Applicant met the ESP-specific requirements to identify and evaluate probable maximum surge and seiche flooding at the site with respect to 10 C.F.R. § 52.17(a) and 10 C.F.R. § 100.20(c). SER at 2-104.

Q21: Please describe the Staff's analysis with respect to probable maximum tsunami flooding.

A21: 47. (GB) The Applicant stated in Revision 0 of SSAR Section 2.4.6 that the site would not be subjected to the effects of tsunami flooding because the site is not adjacent to a coastal area. In Revision 3 of the SSAR, the Applicant also considered the effects of a lake tsunami caused by a hillslope failure. The Applicant's analysis produced a maximum tsunami height at 0.4 ft. Based on the elevation of the ESP site, the Applicant concluded that landslide-induced tsunamis do not pose a risk to the site. SER at 1-104.

48. (GB) In its independent review, the Staff found that in extreme cases along coastal areas the shoreline water level has risen to more than 50 ft for a tsunami of distant origin and over 100 ft for tsunami waves near the earthquake's epicenter. SER at 2-107. However, since the ESP site is located at an elevation of 735 ft MSL and is at a great distance from the coast and more than 93 miles from the Great Lakes, the Staff concluded that the effects of even the largest ocean tsunami or a tsunami caused in the Great Lakes would not be high enough to exceed the elevation of the ESP site. SER at 2-107. The Staff found that by conforming to Section 2.4.6 of RS-002, Attachment 2, the Applicant met the ESP-specific

requirements to identify and evaluate tsunami flooding with respect to 10 C.F.R. § 52.17(a) and 10 C.F.R. § 100.20(c). SER at 2-107.

Q22: Please describe the Staff's analysis with respect to Ice effects.

A22: 49. (GB) The Applicant used the USGS streamflow data measured at the Rowell gauge to identify ice formation in streams. The Applicant stated that low-flow conditions resulting from ice jams on streams upstream of the EPS site would not affect the UHS because of its submerged conditions. The Applicant revised the SSAR and added a new section (Section 2.4.7.1), in which it stated that frazil ice and anchor ice can cause blockages of intake water systems. The Applicant stated in SSAR Revision 2 that an ice sheet equal in thickness to the maximum estimated thickness of 27.0 in would potentially block only a small portion of the intake opening, leaving approximately 18.75 ft of vertical opening for water intake with initial lake water surface elevation of 690 ft MSL before ice formation, and a vertical opening of 5.75 ft if the initial lake water surface elevation were at the minimum of 677 ft MSL. An opening of this size would be adequate for the intake water requirements of the ESP plant. SER at 2-108, 2-109, 2-111.

50. (GB) The Applicant reported an ice jam on Salt Creek at Rowell that formed on February 11, 1959. The Staff searched the USACE historical Ice Jam Database and found two reported ice jams on Salt Creek near Rowell. Once of these jams was the February 11, 1959, ice jam reported by the Applicant. This ice jam resulted in a maximum gauge height of 24.84 ft. The Staff found that the mean daily discharge in Salt Creek near Rowell on this day was 6800 cfs and the peak discharge was 7500 cfs. The other ice jam was reported on January 8, 1996. This ice jam resulted in low-water conditions on January 8 and 9, with a daily mean discharge of 8.5 cfs. Examination of daily streamflow records at Rowell shows a decrease in daily mean discharge from 13 cfs on January 1 to a low of 8.5 cfs on January 8

and 9, and a return to 13 cfs on January 16, 1996. The Staff prepared a stage-discharge relationship from available gauge heights for peak streamflow at the Rowell gauge, using data from the period before the construction of Clinton Dam. Using this relationship, the Staff estimated a stage of 22.9 ft corresponding to a discharge of 7500 cfs, and an ice-jam-induced stage increase of 2.0 ft. If an ice-jam-induced flood were to augment the PMF, the maximum expected water surface elevation in Clinton lake would be 718.5 ft MSL. SER at 2-114.

51. (GB) The Staff independently estimated the likely thickness of surface ice that might form near the intake structures, using Assur's method (Chow, 1964) to estimate a maximum ice thickness of 31.4 in. SER at 2-115. The Staff determined that it is possible for an ice sheet to form for extended periods in Clinton Lake. SER at 2-115. Since the ESP facility intake structure is safety related and the potential for ice formation is a site-induced condition, the Staff noted that a COL applicant would need to demonstrate that the intake structure can withstand the effects of any ice sheet crushing, bending, buckling, splitting, or a combination of these modes. SER at 2-116. Based on e-mail communication with the U.S. Army Corps of Engineers ("USACE") Cold Regions Research and Engineering Laboratory, the Staff determined that a 2002 USACE standard is the currently accepted standard for design ice engineering. SER at 2-118. Thus, the Staff determined that the 2002 USACE equation is acceptable for estimating the ice thickness in Clinton Lake and proposes to use a maximum ice thickness of 27.0 in as a site characteristic in any ESP that may be issued for the site. SER at 2-118, 2-122. The Staff noted that a COL applicant would have to design the ESP facility's UHS intake, if one is required, to maintain a minimum water temperature of 40 °F at all times to preclude formation of frazil and anchor ice on the intake inlet. SER at 2-124. The Staff also noted that a COL applicant should ensure that the ice sheet formed on Clinton Lake will not constrain the intake, predicated on the ESP facility's UHS intake's being located at an elevation of 668 ft MSL. SER at 2-125.

52. (GB) The Staff found that by conforming to RS-002, Attachment 2, Section 2.4.7, the Applicant met the requirements to identify and evaluate ice effects at the site with respect to 10 C.F.R. § 52.17(a) and 10 C.F.R. § 100.20(c), except as noted in the applicable COL Action Items. SER at 2-127.

Q23: Please describe the Staff's analysis with respect to cooling water canals and reservoirs.

A23: 53. (GB) The Applicant stated in SSAR Section 2.4.8.1 that it would use Clinton Lake as a source of raw water for the ESP facility. The Applicant would add a new intake structure near the existing CPS Unit 1 screenhouse to supply water to the ESP facility, which would use cooling towers for normal cooling and possibly also for safety-related cooling. The lake would supply makeup water for evaporation and blowdown losses from the tower(s). The Applicant stated in SSAR Section 2.4.8.1.5 that the existing submerged UHS pond would serve as the source of makeup water for the safety-related cooling tower(s) for the ESP facility when water from Clinton Lake was not available. SER at 2-127, 2-129. The Applicant calculated the amount of cooling water required for the ESP site using the LAKET model. This model captures only one-dimensional (longitudinal) variations in water temperature throughout the lake. This depth-averaged temperature model may lead to a decreased estimate of heat transfer from the water's surface to the atmosphere. While this model may be conservative at estimating the temperature in the lake, it may not be conservative when used to compute the volume of water evaporated. Therefore, lake water levels computed with the LAKET model may be higher than expected; a depth-averaged model may not be conservative in terms of volumetric analysis during periods of relative drought.

54. (GB) The Staff visually inspected the site during the site safety analysis visit. SER at 2-136. The Staff determined that the SSAR accurately describes the intakes, discharge

canals, outfalls, and reservoirs near the ESP site. SER at 2-136. The Staff determined that it is possible that the ESP facility may require a water-cooled UHS. SER at 2-137. The Staff noted that although the actual design of the NHS and UHS is beyond the scope of the ESP review, site characteristics that govern and may limit the design of the NHS and UHS must be established at the COL stage; thus, a COL or CP applicant should conclusively establish that any water-cooled UHS that may be required by a reactor selected for the ESP facility will be designed to a maximum 30-day makeup water requirement not exceeding 87 ac-ft, and also that the ESP facility's NHS is designed such that there is no over-reliance on the UHS for frequent plant shutdowns.[17] SER at 2-137. The Staff also noted that a COL or CP applicant should ensure the monitoring and any required dredging of the submerged UHS pond. SER at 2-143. The Staff concluded that by conforming to SRP Section 2.4.8, the Applicant met the requirements for cooling water canals and reservoirs at the site with respect to 10 C.F.R. § 52.17(a) and 10 C.F.R. § 100.20(c)(3), except as noted in the applicable COL Action Items. SER at 2-143.

Q24: Please describe the Staff's analysis with respect to channel diversions.

A24: 55. (GB) The Applicant stated in SSAR Section 2.4.9 that there is no existing historical evidence of channel diversion in Salt Creek or in the North Fork of Salt Creek upstream of the Clinton Dam. SER at 2-144. The Staff developed a basic understanding of the geomorphology of the region during its site visit of May 11, 2004. The Staff contacted the USGS Illinois Water Science Center to obtain references of channel diversion studies carried out on Salt Creek and the North Fork of Salt Creek; the Center stated in an email to the Staff that no channel diversion studies had been carried out on these streams. SER at 2-145.

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[17] The NHS (Clinton Lake) and the UHS are separate systems; the design of the NHS does not affect the functioning of the UHS and vice-versa. Regardless of the cooling system selected by the COL applicant, Clinton Lake will remain the source of the NHS, the failure of which would require the use of the UHS to safely shut the plant down.

56. (GB) The Staff concluded that by conforming to Section 2.4.9 of RS-002, Attachment 2, the Applicant met the requirement to identify and evaluate channel diversion at the site with respect to 10 C.F.R. § 52.17(a) and 10 C.F.R. § 100.20(c). SER at 2-146.

Q25: Please describe the Staff's analysis with respect to flooding protection requirements.

A25: 57. (GB) SSAR Section 2.4.3.6 estimated the design-basis flood elevation at the ESP site as 713.8 ft MSL. The Applicant stated that the flooding effects of local PMP are design related and would be considered at the COL stage. SER at 2-146, 2-147. The Staff noted that a COL or CP applicant would need to design the ESP facility's intake structures to withstand the combined effects of PMF, coincident wave activity, and wind setup. SER at 2-148. The Staff concluded that by conforming to SRP Section 2.4.10 the Applicant met the requirements of flooding protection at the site with respect to 10 C.F.R. § 52.17(a) and 10 C.F.R. § 100.20(c)(3), except as noted in the applicable COL Action Item. SER at 2-148.

Q26: Please describe the Staff's analysis with respect to low water considerations.

A26: 58. (GB) The ESP site is adjacent to Clinton Lake, which provides cooling water for CPS Unit 1 and would provide cooling water for the proposed ESP facility. The submerged UHS pond would provide 30-day emergency cooling makeup water for the ESP facility's UHS system. SER at 2-149. The Applicant used a design drought with a recurrence interval of 100 years to determine the minimum water surface elevation in Clinton Lake. This analysis considered factors that affect the water surface elevation in Clinton Lake, such as runoff, evaporation, and forced evaporation. SER at 2-149. The Applicant stated that a drawndown analysis of Clinton Lake for the original planned CPS (two 992 MWe units at 70% load factor) was performed. The Applicant's analysis assumed the starting water surface in Clinton Lake to be equal to the normal pool water surface elevation of 690 ft MSL. The drawdown analysis

assumed a minimum reservoir release rate of 5 cfs. This analysis also assumed a seepage loss rate of 0.5 percent of the lake capacity per month. The original analysis evaluated the ability of Clinton Lake to provide cooling tower(s) makeup water to the ESP facility in addition to meeting the cooling water requirements of CPS Unit 1. The Applicant stated that the previous forced-evaporation rate estimate was based on heat rejection from the CPS. In the ESP facility evaluation, the Applicant adjusted this estimate by: (1) dividing the original estimate by two, since only one of the two units originally planned was constructed, (2) dividing by 0.7[18] to conservatively adjust the forced-evaporation rate for a 100-percent load factor, and (3) multiplying by 1.2 to conservatively adjust for the additional head load caused by the power uprate of the existing CPS Unit 1. SER at 2-149.

59. (GB) The Staff performed an analysis to assess the maximum rate at which the lake water surface elevation could be expected to drop, which resulted in a conservative estimate of a maximum drop of 4.85 ft/mo. SER at 2-155. The Staff determined that the drop would be gradual enough for the operators to react and safely shut down the EPS facility before the minimum operating threshold was reached. The Staff noted that if the reactor type selected for the ESP facility requires a UHS, a COL applicant would need to develop a plant shutdown protocol when the water surface elevation in Clinton Like falls to 677 ft MSL. SER at 2-156. The Staff concluded that, by conforming to Section 2.4.11 of RS-002, Attachment 2, the

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[18] The 0.7 factor is used to correct for the 70% load factor used in the Applicant's original analysis. The use of this factor adjusts the estimate to 100% load factor, which is the value assumed for the existing CPS and the proposed ESP facility for lake drawdown calculations during droughts. This is a conservative estimate, because there is some downtime for all nuclear power plants (i.e., no plant operates at 100% load factor).

Applicant met the requirements for low-water conditions with respect to 10 C.F.R. § 52.17(a) and 10 C.F.R. § 100.20(c) except with respect to the applicable COL Action Item. SER at 2-156.

Q27: Please describe the Staff's analysis with respect to ground water.

A27: 60. (GB) In Section 2.4.133, the Applicant provided a description of regional and site hydrogeology and ground water conditions. The Applicant generally used the CPS USAR to derive the information presented in the SSAR, including the subsurface site characterization performed for the two previously proposed CPS units, as well as the ongoing monitoring for the constructed Unit 1. The Applicant reported that it obtained an additional four borings within the ESP footprint as part of its pre-ESP application activities: these borings further confirm the site geologic conceptual model presented previously in the USAR. SER at 2-157.

61. (GB) Based on its review of a USGS document (Lloyd and Lyke,1995), the Staff determined that the Applicant's description of regional hydrogeological conditions is accurate. SER at 2-160. The Staff further determined that the SSAR accurately describes onsite and offsite ground water use. SER at 2-160. The Staff determined that the normal and safety-related requirements for the ESP facility depend on the selected reactor type; therefore, it concluded that a COL Action Item is sufficient to ensure that ground water will not be used in normal or safety-related plant operations for the ESP facility. SER at 2-160.

62. (GB) The Applicant's description of the effluent-holding facility, which is associated with the type of reactor selected, presumed(see SER Sections 2.4.13.1 and 2.4.13.3) that no scenario exists in which liquid radioactive effluent could be accidentally released above the ambient ground water table. The Staff agreed that under these assumptions accidental release of liquid effluent to ambient ground water could be precluded. SER at 2-162. Therefore, the Staff determined that it is necessary to ensure 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 ESP facility including the time in which recovery of groundwater occurs to near its dewatering elevation; as a result, the Staff identified Permit Condition 3. SER at 2-162. In an open item from the DSER, the Staff determined that the Applicant needed to provide the potential impact of future construction for the ESP facility on the piezometric gradient for the ESP site; the Staff reviewed the Applicant's response to the open item and determined that the Applicant had not provided data to verify the conservatism of the ground water hydraulic gradient or that of soil properties. SER at 2-161, 2-163. Consequently, the Staff noted that a COL or CP applicant would need to undertake additional characterization to establish conservative ground water flow velocities and conservative soil properties representative of the hydrogeologic conditions at the ESP site, i.e., that a hydraulic gradient be maintained in a direction away from Clinton Lake. SER at 2-161, 2-162, 2-163.

63. (GB) The Staff concluded that, except with respect to the applicable COL Action Items and Permit Condition 3, the Applicant, by conforming to Section 2.4.12 of RS-002, Attachment 2, met the requirements to identify and evaluate ground water characteristics at the site with respect to 10 C.F.R. § 52.17(a) and 10 C.F.R. § 100.20(c). SER at 2-164.

Q28: Please describe the Staff's analysis with respect to accidental releases of liquid effluent.

A28: 64. (GB) In the two paragraphs comprising SSAR Section 2.4.12, the Applicant stated that it is extremely unlikely that effluents can move out of facilities containing liquid radioactive wastes because of the high water table elevation. The Applicant's position is that the high water table results in an inward-directed hydraulic gradient that would allow ground water into the facility but not out of the facility. SER at 2-164.

65. (GB) The Staff determined that the Applicant's description of the effluent-holding facility presumed that no scenario would exist in which the liquid radioactive effluent could be released above the ambient ground water table, including the scenario in which the effluent-holding facility could be flooded, raising the release point above the ambient grand water table. SER at 2-167. The Staff agreed that, under these assumptions, release of liquid radioactive effluent to ambient ground water could be precluded. SER at 2-167. However, the Staff noted that a COL or CP applicant would need to demonstrate that there will be no likely scenario that could lead to liquid radioactive release to the ambient ground water, either above the ambient ground water table or below it. SER at 2-167. Further, as per Permit Condition 3, a COL or CP applicant would be required to put a ground water monitoring system in place to ensure that the hydraulic gradient would always point inwards into the radwaste holding and storage facility from ambient ground water during construction and operation of the ESP facility, including the time during which recovery of ground water occurs to near its predewatering condition. SER at 2-167. The Staff also determined that a permit condition requiring a radwaste facility design for a future reactor with features to preclude any and all accidental releases of radionuclides into any potential pathway is necessary; as a result, the Staff identified Permit Condition 4. SER at 2-167. The Staff also identified Permit Condition 5, which would provide that the requirements of Condition 3 be kept in place and/or in operation for the life of the facility, including its decommissioning. SER at 2-168.

66. (GB) The Staff concluded that, by conforming to Section 2.4.13 of RS-002, Attachment 2, the Applicant met the requirements to identify and evaluate the accidental release of liquid effluents to ground water and surface water at the site with respect to 10 C.F.R. § 52.17(a) and 10 C.F.R. § 100.20(c), except as noted in Section 2.4.13.3 of the SER. SER at 2-169.

Q29: Please describe the Staff's analysis with respect to thermal discharges.

A29: 67. (GB) The ESP site is adjacent to Clinton Lake, which provides cooling water for CPS Unit 1. The Normal Plant Heat Sink ("NPHS") water supply for the ESP facility would be obtained from Clinton Lake, and normal operation of the ESP facility would use a cooling tower(s) operated with water drawn from a cooling tower basin(s). SER at 2-169. The NPHS has no safety function and is not required for shutdown or accident mitigation. However, in the event that the NPHS fails frequently and suddenly, there would be excessive reliance on the UHS. SER at 2-171. The Staff's analysis of the information provided by the Applicant led the Staff to conclude that the NPHS would be likely to perform its function consistent with the maximum thermal discharge assumed in the PPE and that the consequences of the NPHS operation on the UHS are acceptable and do not lead to frequent plant shutdown or frequent use of the UHS. SER at 2-172.

Q30: Please describe the Staff's analysis with respect to the ultimate heat sink.

A30: 68. (GB) At the ESP stage, because a specific reactor type is not identified, it is not known whether a UHS will be required for the ESP facility. If the ESP facility does require a UHS, the Staff used the PPE evaporation rate for the UHS equal to 411 gpm for 30 days to establish excess capacity within the submerged UHS pond. SER at 2-174. As discussed in SER Section 2.4.8.3, the Staff determined that the submerged UHS pond has an excess capacity of approximately 318 ac-ft. SER at 2-174. The Staff found that the Applicant provided sufficient information pertaining to the NPHS to determine that the consequences of NPHS operation on the UHS are acceptable. Therefore, the Staff concluded that the Applicant met the requirements of 10 C.F.R. § 52.17(a) and 10 C.F.R. § 100.20(c). SER at 2-175.

Section 2.5, Geology, Seismology, and Geotechnical Engineering

Q31: How did the Staff evaluate the Application with respect to the geological, seismological, and geotechnical engineering properties of the ESP site?

A31: 69. (CM) The Staff's analysis focused on a review of the basic geological and seismological site and regional data, the vibratory ground motion of the site, and the safe-shutdown earthquake ("SSE") ground motion. The Staff's analysis is summarized in Sections 2.5.1 through 2.5.6 of the SER. SER at 2-177.

Q32: Please describe the Staff's health and safety analysis with respect to site and regional geology.

A32: 70. (CM) SSAR Sections 2.5.1.1, "Regional Geology," and 2.5.1.2, "Site Geology," describe the geology of the site and the surrounding region. The Staff's evaluation of the Applicant's submission was based on four areas designated in RG 1.165, corresponding to areas 320km, 40km, 8km, and 1km from the site. SER at 2-195. In order to ensure a thorough review of the Applicant's submission, the Staff obtained the assistance of the U.S. Geological Survey ("USGS"). SER at 2-195. The interpretations, assumptions, and conclusions presented by the Applicant were confirmed by the Staff and USGS advisors through a visit to the ESP site. SER at 2-196. The Staff review of Section 2.5.1 focused on (1) the tectonic or seismic information, (2) the nontectonic deformation information, and (3) the conditions caused by human activities, with respect to both the regional geology and site geology. SER at 2-195, 2-196.

71. (CM) The Staff review of the regional geology evaluated the structural geology, seismology, paleoseismology, physiography, geomorphology, stratigraphy, and geologic history, within 200 miles (320km) of the site. SER at 2-196. The Applicant concluded that the ESP site is one of the most geologically stable areas in the United States, and that the geologic

conditions at the ESP site are the same as those at the CPS site. SER at 2-196. The Staff, after reviewing SSAR Section 2.5.1.1, concluded that the Applicant provided a thorough and accurate description of the geologic features and characteristics of the site. SER at 2-196.

72. (CM) The Staff review of the site geology, presented in SER Section 2.5.1.2, evaluated the site-related geologic features and structure, as well as conditions caused by human activities. SER at 2-199. In the application, the Applicant described the site physiography, stratigraphy, structural geology, ground water conditions, and other geologic conditions. SER at 2-199. The Applicant concluded that the site is located in a tectonically stable area of North America and that there is no evidence of surface faulting at the site. SER 2-200. The Staff found that the Applicant's analysis described readily observable local geologic features and provided an adequate description of the local site conditions, and the Staff concluded that the Applicant provided a thorough and accurate description of the local geology in support of the ESP application. SER at 2-199, 2-200.

73. (CM) After reviewing the geological and seismological information submitted by the Applicant in SSAR Section 2.5.1, the Staff concluded that the Applicant provided a thorough characterization of the geological and seismological characteristics of the site, as required by 10 C.F.R. § 100.23. SER 2-200. The Staff found that no capable tectonic sources that have the potential to cause near-surface fault displacement exist in the site area. SER at 2-200. In addition, the Staff concluded that the Applicant had identified and appropriately characterized the seismic sources significant to determining the SSE for the ESP site, in accordance with RG 1.165 and SRP Section 2.5.1. SER at 2-200. By identifying and classifying the seismic sources significant to determining the SSE for the ESP site, the Staff found that the Applicant satisfied the necessary requirements of 10 C.F.R. § 100.23(c) and GDC 2. SER at 2-200. Based on the Applicant's geological investigations of the site vicinity and the site area, the Staff concluded that the Applicant had properly characterized the site lithology, stratigraphy, geologic

history, and structural geology. SER at 2-200. The Staff also concluded that there is no potential for the effects of human activities (i.e., ground water withdrawal or mining activity) to compromise the safety of the site. SER at 2-200. Therefore, the Staff concluded that the proposed ESP site is acceptable from a geological and seismological standpoint and meets the requirements of 10 C.F.R. § 100.23. SER at 2-200.

Q33: Please describe the Staff's health and safety analysis with respect to vibratory ground motions.

A33: 74. (CM) SSAR Section 2.5.2, "Vibratory Ground Motion," describes the Applicant's determination of the SSE ground motion at the ESP site from possible earthquakes in the site area and region. SER at 2-200. The SSE is based upon a detailed evaluation of earthquake potential, taking into account regional and local geology, Quaternary tectonics, seismicity, and specific geotechnical characteristics of the site's subsurface materials. SER at 2-244. To determine the SSE, the Applicant used RG 1.165. SER at 2.244. According to RG 1.165, applicants may develop the SSE using either the Central and Eastern Unites States ("CEUS") seismic source and ground motion models published by Electric Power Research Institute ("EPRI"), issued in 1986, or those from Lawrence Livermore National Laboratory ("LLNL"), published in 1993. SER at 2-245. However, RG 1.165 recommends that applicants perform geological, seismological, and geophysical investigations and evaluate any relevant research to determine whether revisions to the EPRI or LLNL seismic models are necessary. SER at 2-245. As a result, the Staff focused its review on geologic and seismic data published since the late 1980s that could indicate a need for changes to the EPRI or LLNL seismic models. SER at 2-245.

75. (CM) Rather than attempting to characterize the seismic potential of each of the geologic faults and folds in the region surrounding the ESP site, the Applicant defined broad

seismic source zones that encompass these structural features. SER at 2-246. Within a 200-mile radius of the site (or just beyond), the two major sources of potential earthquakes are the New Madrid seismic zone ("NMSZ"), whose northern boundary is generally considered to lie at or just beyond the 200-mile radius, and the Wabash Valley/Southern Illinois seismic zone ("WVSZ"), located in southeastern Illinois and southwestern Indiana. SER at 2-246. In addition to the NMSZ and WVSZ, evidence from recent studies indicates that significant earthquakes have occurred in the central Illinois basin, where there are no obvious geologic faults at the surface. SER at 2-246. Although the size, location, and recurrence of such earthquakes are not well constrained, the Applicant developed a seismic source zone for this region, referred to as the central Illinois basin source zone. SER at 2-246. The Staff concurred with the Applicant's decision to use large areal seismic source zones rather than attempting to characterize the seismic potential of each of the regional structural features. SER at 2-246. Both the LLNL and EPRI seismic models, endorsed by RG 1.165, use this approach.

76. (CM) The Staff focused its review of SSAR Section 2.5.2.3, "Correlation of Earthquake Activity with Geologic Structure or Tectonic Province," on the Applicant's updating of the EPRI seismic source and ground motion models used for its probabilistic seismic hazard analysis ("PSHA") for the ESP site. SER at 2-246. The Applicant based its update on an evaluation of recent geologic and seismological information. SER at 2-246. The specific areas that the Applicant focused on for each of the three major seismic source zones (NMSZ, WVSZ, and central Illinois) are earthquake recurrence rates, maximum earthquake magnitudes, and ground motion attenuation. SER at 2-247.

77. (CM) With respect to earthquake recurrence rates, the Applicant concluded that for the central Illinois and the WVSZ, the earthquake recurrence relationships did not need to be updated. SER at 2-247. However, for the NMSZ, the Applicant found that recent studies provide evidence that large-magnitude earthquakes have occurred more frequently than the

rates specified in the EPRI seismic source models. SER at 2-247. The Applicant updated the rates for the NMSZ using data from recent studies; however, the Staff questioned the Applicant's interpretation of the data. SER at 2-248. The Applicant revised its recurrence model for the NMSZ to address the Staff's concern through the use of a sensitivity analysis. SER at 2-249. However, the Applicant concluded that since the changes were on the order of 10 percent or less, a revision to the ESP Application was not warranted. SER at 2-249. The Staff determined that an update of the NMSZ seismic models is of sufficient importance to justify updating both the PSHA and SSE for the ESP site. SER at 2-249. In response, the Applicant updated its NMSZ seismic source models, PSHA, and SSE. SER at 2-249.

78. (CM) With respect to maximum earthquake magnitude, the Applicant focused on the maximum magnitudes for the NMSZ, WVSZ, and central Illinois seismic source zone, since these three zones are the main contributors to the total seismic hazard at the ESP site. SER at 2-250. For the NMSZ, the applicant concluded that the maximum magnitudes used for the EPRI seismic model, which range from 7.2 to 8.8, are consistent with the more recent maximum magnitude evaluations, which range from 7.4 to 8.2. SER at 2-250. For the WVSZ, the EPRI seismic models have a maximum magnitude that ranges from 5.0 to 8.0, while recently published maximum magnitudes range from 7.0 to 7.8. SER at 2-250. Similarly, for the central Illinois source zone, the EPRI seismic models have a maximum magnitude that ranges from 4.3 to 7.6, while the recently published maximum magnitudes range from 6.0 to 7.0. SER at 2-250. As a result, the Applicant concluded that the maximum magnitude ranges for both the WVSZ and central Illinois source zone need to be increased to reflect the magnitudes implied by recent studies. SER at 2-250. The Staff reviewed the NMSZ, WVSZ, and central Illinois source zone maximum magnitude ranges used by the Applicant for its PSHA for the ESP site. SER at 2-250. The staff concurred with the Applicant's conclusion that the EPRI seismic models for the NMSZ adequately cover the range of magnitudes estimated from

recent geologic investigations. SER at 2-250. For the WVSZ and central Illinois source zone, the staff reviewed the revised maximum magnitude ranges used by the Applicant to verify its consistency with recent geologic studies. SER at 2-250. Based on its review, the Staff concurred with the Applicant's decision to increase the maximum magnitude distributions of the WVSZ and the central Illinois source zone. SER at 2-252.

79. (CM) With respect to seismic ground motion attenuation, the Applicant chose not to use the original EPRI ground motion models. SER at 2-252. Instead, the Applicant used CEUS ground motion models developed in an EPRI 2003 study. SER at 2-252. The ESP applicant for the North Anna, Virginia, site also used the EPRI 2003 ground motion study for its PSHA. SER at 2-254. The Staff's review of the EPRI 2003 ground motion models is described in Section 2.5.2 of the SER for North Anna. SER at 2-254. Based upon its review, the Staff concluded that the ESP applicant for the North Anna, Virginia, site adequately resolved each of the Staff's concerns with regard to the development by EPRI of new ground motion models for the CEUS. SER at 2-254.

80. (CM) The Staff focused its review of SSAR Section 2.5.2.4, "Maximum Earthquake Potential," on the Applicant's PSHA results for the ESP site. SER at 2-254. Following the guidance provided in RG 1.165, the Applicant determined the low- and high-frequency controlling earthquakes[19] for the ESP site. SER at 2-254. This procedure involves the deaggregation of the PSHA results to determine the controlling earthquakes in terms of a magnitude and source-to-site distance. SER at 2-255. Based on its review of the ESP site controlling earthquakes, the Staff concluded that the Applicant's PSHA adequately characterized the overall seismic hazard of the ESP site. SER at 2-255. The Staff concluded

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[19] The controlling earthquake is determined by summing the percentage contribution for each magnitude range and determining an overall value. An example of the determination of a controlling earthquake is provided in Appendix C of RG 1.165.

that the controlling earthquakes for the ESP site are generally consistent with both the historical earthquake record and paleo-earthquake studies in the NMSZ, WVSZ, and central Illinois seismic source zone. SER at 2-255. The Staff also concluded that ground motions developed by the Applicant from the controlling earthquakes are consistent with the most recent CEUS ground motion evaluations. SER at 2-255. Accordingly, the Staff concluded that the Applicant followed the guidance in RG 1.165 for evaluating the regional earthquake potential and determining the ground motion resulting from the controlling earthquakes. SER at 2-255.

81. (CM) The staff focused its review of SSAR Section 2.5.2.4, "Seismic Wave Transmission Characteristics of the Site," on the method used by the Applicant to develop the site free-field ground motion spectrum. SER at 2-255. The seismic hazard curves from the PSHA are defined for generic hard rock conditions. SER at 2-255. According to the Applicant, these hard rock conditions exist at the ESP site at a depth of several thousand feet or more below the ground surface. SER at 2-255. To determine the free-field ground motion, the Applicant performed a site response analysis. SER at 2-255. The Applicant developed 60 different randomized soil/rock columns in order to model the uncertainties in the soil and rock properties. SER at 2-255. The Applicant determined these soil and rock properties through its field explorations and laboratory tests. SER at 2-255. The Staff reviewed the Applicant's analysis to ensure that it accurately incorporated the local site soil and rock properties and conditions as well as their uncertainties. SER at 2-255. Specifically, the Staff reviewed the range of values encompassed by the Applicant's 60 different randomized soil/rock columns to ensure that it adequately characterized the variability in the uppermost soil layers. SER at 2-256. In response to the Staff's questions about the adequacy of the 60 randomized soil/rock columns to cover the variability of the uppermost soil layers, the Applicant stated that these uppermost layers would be removed during plant construction and replaced by engineering fill. SER at 2-256. The Staff accepted this response and closed

Open Item 2.5.2-2. SER at 2-256. Even though the uppermost soil layers will be replaced by compacted fill material, ESP applicants are required to determine the SSE ground motion using the actual site conditions and not anticipated future conditions. Therefore staff should have documented that it accepted the applicant's response to Open Item 2.5.2-2 based on a comparison of the randomized shear wave velocity profiles, shown in FSAR Figures 4.2-11 and 4.2-12 in Appendix B, with the actual shear wave velocity measurements, shown in FSAR Table 5-2 in Appendix A. A comparison by the staff of these 60 shear wave velocity profiles and the table of shear wave velocity results showed that the applicant's randomization process adequately encompassed the range of field measurements. Although staff reached the accurate conclusion on SER page 2-259 that the applicant' site response analysis adequately incorporated the effects of the local site properties and their uncertainties into the determination of the SSE, as required by 10 C.F.R. 100.23, the bases for this conclusion should have been more completely documented in the SER. In addition to the 60 randomized soil/rock columns, the Staff reviewed the applicability of the dynamic soil models used by Applicant to determine the response of the soils to earthquake ground motion. SER at 2-256. Finally, the Staff reviewed the earthquake time histories used by the Applicant to perform its site response analysis and the final site amplification functions. SER at 2-258, 2-259. The Staff concluded that the Applicant's site response analysis adequately incorporated the effects of the local site properties and their uncertainties in the determination of the ESP free-field SSE, as required by 10 C.F.R. 100.23. SER at 2-259.

Q34: With respect to the Staff's health and safety analysis concerning vibratory ground motions, please describe the primary differences between the standard accepted methodology and the "performance based" approach used by the applicant.

A34: 82. (CM) Rather than using the methodology described in RG 1.165[20] to determine the SSE ground motion, the Applicant chose to use a different approach, which is described in the American Society of Civil Engineers ("ASCE") / Structural Engineering Institute ("SEI") Standard 43-05, "Seismic Design Criteria for Structures, Systems, and Components in Nuclear Facilities and Commentary." SER at 2-220. This new approach is referred to as a "performance-based" approach, which sets a goal or target of a mean annual frequency of 10^{-5} of unacceptable performance of nuclear SSCs as a result of seismically initiated events. SER at 2-220. Specifically, the performance-based approach is intended to achieve a mean 10^{-5} risk per year of core damage caused by seismic initiators. SER at 2-220. This safety performance goal is based on assuming a target 10^{-4} mean annual risk of core damage caused by all accident initiators and on the assumption that seismic initiators contribute about 10 percent of the risk of core damage posed by all accident initiators. SER at 2-220.

83. (CM) As noted previously, this safety performance target, P_{FT}, is based on assuming (1) a target 10^{-4} mean annual risk of core damage from all accident initiators and (2) that seismic initiators contribute about 10 percent of the risk of core damage posed by all accident initiators. SER at 2-259. The basis for the target 10^{-5} annual performance goal is from the results of seismic probabilistic risk analyses (PRAs) of 25 nuclear power plants, which is documented in NUREG-1742, "Perspectives Gained from the IPEEE Program." SER at 2-238.

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[20] In RG 1.165, the NRC Staff recommended basing an SSE for proposed sites on the median annual probability (reference probability) of exceeding the SSE ground motion for a group of 29 operating nuclear power plant sites in the Central and Eastern United States. The reference probability was determined to be 10^{-5}/yr, which implies that new NPP sites in the CEUS should be designed to remain functional during and after an earthquake ground motion level with a medial recurrence interval of 100,000 years.

NUREG-1742 shows that the median value for the mean seismic core damage frequency ("SCDF") for these 25 nuclear power plants is 1.2 x 10^{-5}/yr. Rather than targeting SCDF, the performance-based approach targets the annual frequency of onset of significant inelastic deformation ("FOSID") for structures, systems, and components ("SSCs"). SER at 2-238. The onset of significant inelastic deformation implies that SSCs remain essentially elastic in their performance or have a limited inelastic response during the seismic event. SER at 2-238. In contrast, core damage due to a seismic event would result from failure (i.e., large inelastic deformations) of SSCs. SER at 2-238. In order to determine the SSE that achieves the annual performance goal of 10^{-5}, this approach scales the site-specific mean 10^{-4} uniform hazard response spectrum ("UHRS"), determined in the pervious section, by a design factor ("DF"). SER at 2-259.

84. (CM) The performance of SSCs in terms of annual probability of exceeding acceptable behavior limits (i.e., FOSID) can be evaluated by convolution of seismic hazard and seismic fragility curves. SER at 2-223. The site seismic hazard characteristics are quantified by the PSHA seismic hazard curves. SER at 2-223. Seismic fragility curves describe the probability of unacceptable performance versus ground motion level and are modeled using a lognormal distribution. SER at 2-225. Combining seismic hazard curves and fragility curves gives the risk integral, which forms the basis for the performance-based approach. SER at 2-230. Solving the risk integral results in a simplified equation for the DF used to determine the performance-based SSE. SER at 2-236.

85. (CM) After extensive review, the Staff found the performance-based approach to be an advancement over the solely hazard-based reference probability approach recommended in RG 1.165. SER at 2-268. The Staff noted that the performance-based approach uses not only the seismic hazard characterization of the site from the PSHA, but also basic seismic fragility modeling in order to obtain an SSE that directly targets a structural performance

frequency value. SER at 2-268. To review the performance-based approach, the Staff examined in detail the derivation of the DF that, when multiplied by the mean 10^{-4} UHRS, achieves an SSE that meets the target performance goal of 10^{-5}. SER at 2-262. In addition, the Staff reviewed the assumptions underlying the performance-based approach. SER at 2-262. To evaluate these assumptions, the Staff requested four PSHA hazard curves from the Applicant. SER at 2-263. The Staff then evaluated the parameter and modeling assumptions by directly convolving the seismic hazard and fragility curves. SER at 2-263. To verify that FOSID is larger than SCDF, the Staff used the four seismic hazard curves to calculate SCDF values for each of the corresponding performance-based SSE values. SER at 2-265. SCDF values for the corresponding performance-based SSE vary from about 1×10^{-6}/yr to 3×10^{-6}/yr. SER at 2-265. As such, the Staff concluded that the Applicant targeted a sufficiently low value (10^{-5}/yr), which it set to be equivalent to FOSID, such that the resulting performance-based SSE achieves an SCDF that is about 10 times smaller (10^{-6}/yr) than the median of the mean SCDF for the 25 nuclear power plants in NUREG-1742. SER at 2-268.

86. (CM) Consequently, after reviewing SSAR Section 2.5.2 and the Applicant's responses to the RAIs, the Staff found that the Applicant provided a thorough characterization of the seismic sources surrounding the site, as required by 10 C.F.R. § 100.23. SER at 2-273. The Staff found that the Applicant had adequately addressed the uncertainties inherent in the characterization of these seismic sources through a PSHA, and that this PSHA follows the guidance provided in RG 1.165. SER at 2-273. The Staff concluded that the controlling earthquakes and associated ground motion derived from the Applicant's PSHA are consistent with the seismogenic region surrounding the ESP site, and that the Applicant's SSE adequately represents the regional and local seismic hazards and accurately includes the effects of the local ESP subsurface properties. SER at 2-273. Therefore, based on its review, including

approval of the performance-based approach used by the Applicant, the Staff concluded that the proposed ESP site is acceptable from a geologic and seismologic standpoint and meets the requirements of 10 C.F.R. § 100.23. SER at 2-273. However, it should be remembered that the Staff has neither accepted nor evaluated the ASCE 43-05 standard in its entirety. The Staff's review has focused only on the portion of ASCE 43-05 that specifies the development of seismic design response spectra. The Staff is currently preparing a new regulatory guide that will describe in detail its recommendations for implementation of the ASCE 43-05 performance-based approach.

Q35: Please describe the Staff's health and safety analysis with respect to surface faulting.

A35: 87. (CM) Section 2.5.3.3 of the SER provides the Staff's evaluation of the seismological, geological, and geophysical investigations carried out by the Applicant to address the potential for surface deformation that could affect the site. SER at 2-275. The technical information presented in the SSAR Section 2.5.3 reflected the Applicant's surface and subsurface investigations, performed in progressively greater detail as they moved closer to the ESP site. SER at 2-275.

88. (CM) In order to thoroughly evaluate the surface faulting investigations performed by the Applicant, the Staff sought the assistance of the USGS. SER at 2-275. The Staff and its USGS advisors visited the ESP site and met with the Applicant to assist in confirming the interpretations, assumptions, and conclusions presented by the Applicant concerning potential surface deformation. SER at 2-275. The Staff concluded that the Applicant performed extensive field investigations and concurred with the Applicant's conclusion that there are no capable faults within the site area. SER at 2-276. Based on its site visit and its review of SSAR Section 2.5.3, the Staff concurred with the Applicant that there are no

capable tectonic sources within 25 miles of the site that would cause surface deformation in the site area. SER at 2-276. The Staff concluded that the Applicant performed its investigations in accordance with 10 C.F.R. § 100.23 and RG 1.165 and provided an adequate basis to establish that no capable tectonic sources exist in the site vicinity that would cause surface deformation in the site area. SER at 2-276. Therefore, the Staff concluded that the site is suitable from the perspective of tectonic surface deformation and meets the requirements of 10 C.F.R. § 100.23. SER at 2-276, 2-277.

Q36: Please describe the Staff's health and safety analysis with respect to the stability of subsurface materials and foundations.

A36: 89. (CM) SSAR Section 2.5.4 presents the Applicant's evaluation of the stability of subsurface materials and foundations at the ESP site. In SSAR Section 1.5, the Applicant stated that it developed the geological, geophysical, and geotechnical information used to evaluate the stability of the subsurface materials in accordance with the requirements of 10 C.F.R. § 100.23. SER at 2-293. The Applicant applied the guidance of RS-002, RG 1.70, DG-1105,[21] RG 1.132, and RG 1.138, "Laboratory Investigations of Soils for Engineering Analysis and Design of Nuclear Power Plants." SER at 2-293. The Staff reviewed SSAR Section 2.5.4 for conformance with the regulatory requirements and guidance applicable to the characterization of the stability of subsurface materials. SER at 2-293.

90. (CM) Based on its review of SSAR Section 2.5.4 and the Applicant's responses to the associated RAIs and an earlier open item, the Staff concluded that the Applicant adequately determined the engineering properties of the soil and rock underlying the ESP site through its field and laboratory investigators. SER at 2-306. The Staff concluded that the Applicant performed sufficient field investigations and laboratory testing to determine the overall

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[21] This guidance has been superseded by RG 1.198 since the Applicant submitted the SSAR.

subsurface profile, the properties of the soil and rock underlying the site, and the similarity between the CPS and ESP subsurface profiles and properties. SER at 2-306. Specifically, the Staff concluded that the Applicant adequately determined (1) the soil and rock dynamic properties through its field investigations and laboratory tests and (2) the liquefaction potential of the soils. (The Staff noted that the Applicant covered the response of the soil and rock to dynamic loading in SSAR Section 2.5.2. SER at 2-306.)

91. (CM) In SSAR Table 1.4-1, the Applicant identified three subsurface material properties as ESP site characteristic values, the first of which specifies that there is no liquefaction below 60 feet below the ground surface (bgs). SER at 2-307. The Staff found that the Applicant demonstrated, in SSAR Section 2.5.4.8, that any liquefaction at the ESP site would be limited to the upper 60 ft of soil. SER at 2-307. SSAR Table 1.4-1 states that "soils above 60 ft bgs to be replaced or improved." However, in SSAR Section 2.5.4.12 the Applicant stated, "decisions regarding the need for and type of ground improvement will be made during the COL stage." Therefore, the Staff identified Permit Condition 6, an unequivocal commitment by the Applicant to improve or replace and remove the soils above 60 ft below the ground surface. SER at 2-307.

Q37: Please describe the Staff's health and safety analysis with respect to the stability of slopes.

A37: 92. (CM) The Applicant did not carry out slope stability analyses for the ESP application. SER at 2-307. Therefore, the Staff was unable to reach any conclusions regarding the stability of slopes that have not been designed or constructed. SER at 2-308.

Q38: Please describe the Staff's health and safety analysis with respect to embankments and dams.

A38: 93. (CM) SSAR Section 2.5.6 states that the ESP facility will use cooling towers for cooling, with Clinton Lake being used to provide makeup water to the cooling towers. Because the ESP facility will use the CPS UHS to supply makeup water to the cooling towers, the Applicant stated that it would perform evaluations (if appropriate) at the COL stage to assess the performance of the submerged dam forming the UHS under the ESP SSE ground motion. The Staff found the Applicant's decision to delay this evaluation until the COL stage to be acceptable. SER at 2-309.

c. SER, Chapter 3, "Site Safety Assessment"

Q39: How did the Staff conduct its assessment of site safety?

A39: 94. (KC) In Chapter 3 of the SER, the Staff reviewed the Applicant's assessment of aircraft hazards to verify that the risks due to such hazards are sufficiently low for a new nuclear unit that might be constructed on the proposed site. The Staff noted that the four private airstrips in the site vicinity do not have commercial operations and are only available for public use in emergencies. SER at 3-1. Although the Applicant determined, based on the criterion in RG 1.70, that none of the fields has enough flight operations to require a detailed analysis of the risk to a plant at the proposed ESP site, the Staff conducted an independent evaluation of the hazards associated with the Martin RLA Airport because it is within 5 miles of the ESP site. SER at 3-1, 3-3. The Staff concluded that aircraft hazards associated with the Martin RLA Airport do not pose a significant risk to a plant constructed at the Clinton ESP site; an aircraft from the Martin RLA Airport has a probability of about 6×10^{-8} per year of impacting the ESP facility, lower than the 10^{-7} threshold in the acceptance criteria in SRP Section 3.5.1.6. SER at 3-3.

95. (KC) The Applicant found that a detailed evaluation of the hazards of airport flight operations was not necessary because the number of flights per year associated with the area airports (including the closest public airports – the Central Illinois Regional Airport in Bloomington, about 23 miles north of the site; the Decatur Airport, about 23 miles south of the site; and the Rantoul National Aviation Center Airport (Frank Elliott Field), about 37 miles east of the site) does not exceed the threshold specified in Section 3.5.1.6 of RS-002. SER at 3-1. The Staff did an independent review of public airports in the vicinity of the proposed ESP site and identified 10 airports within 50 miles of the site but, on the basis of the distances from the airports to the site and the annual number of operations, it found that the hazards of operations at these airports near the proposed ESP site do not pose a significant risk to safety-related structures that might be built at the site. SER at 3-4.

96. (KC) Four low-altitude airways pass near the ESP site and are sufficiently close to require detailed evaluations of the hazards; the CPS USAR analysis concluded that the probability of an aircraft crash on the CPS site from flights along the four airways is 5.42×10^{-8} per year. The Staff performed an independent assessment of the risks associated with the airways and concluded that the probability of an aircraft crash on the ESP site having radiological consequences greater than the 10 C.F.R. 50.34(a)(1) criteria is less than 5.0×10^{-8}.

97. (KC) Since the cumulative risk from identified aircraft hazards was estimated to be on the order of magnitude of 10^{-7} per year ~~Therefore~~, the Staff concluded that, from the perspective of aircraft hazards, the proposed site is acceptable for siting a plant or plants of the types specified by the Applicant.[22] SER at 3-4.

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[22] The Staff identified two types of sources of potential aircraft impact hazards that could not be dismissed by inspection. First, the Staff did the screening analysis described with respect to the Martin RLA Airport. Second, the Staff also estimated the likelihood of an aircraft crash due to air traffic mishaps on nearby airways. As indicated in Table 3.5.1.6-2 of the SER, the total probability for the four airways was estimated to be about 4.96×10^{-8} per year. Therefore, the Staff estimated the total aircraft crash

(continued...)

d. SER, Chapter 11, "Radioactive Effluent Dose Consequences from Normal Operations"

Q40: How did the Staff conduct its assessment of radioactive effluent dose consequences from normal operation?

A40: 98. (SK) The Staff evaluated the Application in order to determine whether the site characteristics would maintain radiation doses to the public within the regulatory limits. SER at 11-1. The licensee indicated that the proposed facility will be able to handle these radiological effluents and solid waste materials with minimal environmental, public, and personnel exposure during normal plant operation and maintenance; a plant constructed at the ESP site would be able to ensure that radiation levels are as low as reasonable achievable (ALARA). SER at 11-1. The Staff did not independently verify that the applicant's estimated bounding quantities of radioactive gaseous and liquid waste meet the concentration values in Appendix B to 10 C.F.R. Part 20.[23] However, the Staff did perform independent calculations of

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[22](...continued)
probability for the proposed site to be about 1.1×10^{-7}. However, the Staff judged the actual probability to be less than 10^{-7} per year due to the conservatism used in the analysis (e.g., assuming all aircraft using the airways are large).

The Staff also notes that, in the absence of precise data for low probability events, staff review guidance described in Standard Review Plan Section 2.2.3 considers a probability of about 10^{-6} per year to be acceptable if, when combined with reasonable qualitative arguments, the realistic probability can be shown to be lower.

[23] The Staff has not routinely performed independent verification of the source term because of the low risk significance associated with the calculated doses to members of the public from routine radioactive gaseous and liquid effluents. The historical data from licensee radiological effluent release reports and associated dose calculations support the position that doses are well within the NRC's ALARA criteria (Appendix I to 10 C.F.R. Part 50) for power reactors. The ALARA dose criteria in Appendix I to Part 50 are a requirement in each power reactor's license. Additionally, there is also a license condition that uses Appendix B, Table 2 to 10 C.F.R. Part 20 as the basis for limiting the release rate of radionuclides in routine effluent discharges. Thus, the NRC requires dose and concentration controls to maintain routine effluents ALARA. These license conditions are routinely inspected by NRC Regional Inspectors. The inspection examines the licensee's radiological effluent monitoring and release programs to ensure their programs meet NRC requirements. Thus, the data and inspection reports support the conclusion that the existing fleet of nuclear reactors meets NRC's ALARA criteria.

In summary, based on the information described above, the Staff did not independently derive the routine effluent source term.

dose to members of the public, using the applicant's source term data, meteorological data, and liquid dispersion data.

99. (SK) After evaluating bounding effluent, solid waste, and dose estimates provided by the Applicant, the Staff concluded that the Applicant had provided adequate information to give reasonable assurance that it will control, monitor, and maintain radioactive gaseous and liquid effluents from the ESP facility within the regulatory limits specified in 10 C.F.R. Part 20, 10 C.F.R. Part 71, and 49 C.F.R. Part 173. This analysis also indicated that the Applicant would maintain radioactive effluent releases at ALARA levels, in accordance with the effluent design objectives contained in Appendix I to 10 C.F.R. Part 50. SER at 11-3. However, the Staff noted that any COL applicant that references an ESP for the site should verify that the calculated radiological doses to members of the public from radioactive gaseous and liquid effluents for any facility to be built on the site are bounded by the radiological doses included in the SSAR for the ESP application and reviewed by the NRC Staff. SER at 11-3.

100. (SK) For the ESP review, the Staff was asked to review the Applicant's data using a Plant Parameter Envelope (PPE) concept. The PPE does not contain enough detailed information on plant systems and components that will be used to control radioactive material generated and sent to radioactive waste reduction systems for the Staff to verify the Applicant's assumptions. At the COL stage, the Staff will have specific details on the applicant's reactor design, radioactive waste processing systems, locations of effluent release points, and distances to receptors. This detailed information will allow the Staff to perform independent verification and calculations of the radioactive source term and the dose to members of the public; however, the Staff has not yet determined the level of independent verification and calculation that will be performed at the COL application stage.

e. SER Chapter 13, Conduct of Operations

Section 13.3, "Emergency Planning"

Q41: Describe how the Staff evaluated the Applicant's emergency plan for the ESP site.

A41: 101. (RM) The Staff evaluated the emergency planning aspects of the Early Site Permit (ESP) Application to determine whether the information was acceptable and met the requirements of 10 C.F.R. § 52.17(b)(1), 10 C.F.R. § 52.17(b)(2)(I), 10 C.F.R.§ 52.17(3), and 10 C.F.R. § 52.18. SER at 13-1. An ESP Application, pursuant to 10 C.F.R. § 52.17(b)(1), must identify any physical characteristics unique to the proposed site that could pose a significant impediment to the development of emergency plans. SER at 13-1. Pursuant to 10 C.F.R. § 52.17(b)(3), an ESP Application must also describe the contacts and arrangements that the Applicant has made with Federal, State, and local government agencies with emergency response planning responsibilities. SER at 13-1.

102. (RM) In addition, under 10 C.F.R. § 52.17(b)(2), the Applicant chose to seek approval of the major features of its emergency plans. This option is described in NRC Review Standard RS-002, "Processing Applications for Early Site permits," issued May 2004, and Supplement 2 to NUREG-0654/FEMA-REP-1, Revision 1, "Criteria for Preparation and Evaluation of Radiological Emergency Response Plans and Preparedness in Support of Nuclear Power Plants—Criteria for Emergency Planning in an Early Site Permit Application—Draft Report for Comment" (hereafter referred to as Supplement 2), issued April 1996. SER at 13-12. In its review, the Staff also applied the requirements of 10 C.F.R. § 52.18, "Standards for Review of Applications," that establish "acceptable" as the standard of review for proposed major features of emergency plans as opposed to the "reasonable assurance" standard established for complete and integrated plans. The Staff evaluated the information that the Applicant provided and concluded that it was consistent with the guidance

in RS-002 and Supplement 2 and therefore was acceptable and met the requirements of 10 C.F.R. § 52.18. SER at 13-14.

103. (RM) In addition to this review, the Staff will review the complete and integrated emergency plan submitted as part of a COL or OL application to ensure compliance with the requirements of Appendix E, "Emergency Planning and Preparedness for Production and Utilization Facilities," to 10 C.F.R. Part 50, "Domestic Licensing of Production and Utilization Facilities," and 10 C.F.R. § 50.47, "Emergency Plans." SER at 13-2.

104. (RM) The Applicant stated that the evacuation time estimate ("ETE") analysis performed in 1993 for the CPS plume exposure pathway served as the basis for its ETE analysis. SER at 13-2. The Applicant further stated that the 1993 ETE analysis assessed the relative feasibility of an evacuation for the 10-mile (mi) EPZ plume exposure pathway. The Applicant found that the assumptions used for the 1993 ETE analysis are still valid for the area surrounding the ESP site. SER at 13-2, 13-3. The Applicant used the NETVAC computer simulation model,[24] evacuation preparation and departure time distributions, and population and vehicle demand distribution data to simulate a variety of evacuation scenarios.[25] SER at 13-3.

105. (RM) Because the ESP site is adjacent to Clinton Power Station, an operating nuclear power plant with integrated onsite and offsite radiological emergency plans, it can be

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[24] According to the Applicant's 1993 ETE analysis, the NETVAC model was developed to provide evacuation time estimates for emergency response planning and has been used at over 30 nuclear facilities in the United States. This code meets the requirements of NUREG-0654/FEMA-REP-1, Rev. 1 and has been accepted by FEMA (now the Department of Homeland Security) and been used by the NRC at several ASLB hearings. The code provides a "reasonably sophisticated" model of evacuation time estimates during an emergency situation.

[25] For example, the 1993 ETE study assumed that it would take up to one hour to assemble transportation for local students. The Staff, based on information provided by the Applicant and an NRC contractor with extensive expertise in the area of evacuation time estimates, believes that the results of the 1993 study still provide a valid projection of the evacuation timetable for the local schools. The evacuation plans for the local schools will not impact the evacuation plans for the Apple and Pork Festival. Since the Festival is held on the last full weekend of September, and school is not in session on the weekends, the buses that would be used for school children during the week would be available to evacuate the Festival.

presumed that no significant impediments exist to the development of emergency plans for the ESP site. SER at 13-13. The Staff also found that the Applicant adequately identified physical characteristics unique to the proposed site by performing a preliminary analysis of the time required to evacuate the transient and permanent population from various sectors and distances within the plume exposure pathway EPZ. The NRC and Department of Homeland Security Staffs' examination of the Applicant's analysis did not find any significant impediments to the development of emergency plans for the ESP site. SER at 13-13. The Staff determined that the Application's ETE analysis includes an estimate of the number of people to be evacuated, using the latest population census numbers and the most recent local conditions. SER at 13-13. Therefore, with respect to impediments to emergency plan development, the Staff concluded that the information the Applicant provided is consistent with the guidance in RS-002 and Supplement 2 and meets the requirements of 10 C.F.R. § 52.17(b)(1) and 10 C.F.R. § 52.18. SER at 13-14.

106. (RM) The Staff found that the Applicant provided an acceptable description of contacts and arrangements made with Federal, State, and local governmental agencies with emergency planning responsibilities. This description included the name and location of the organizations contacted, the title of the persons contacted, and the role of the organization in emergency planning. Therefore, the Staff concluded that the Application is consistent with the guidelines in RS-002 and Supplement 2 and meets the requirements of 10 C.F.R. § 52.17(b)(3). SER at 13-17.

107. (RM) With respect to emergency planning zones, the Application stated that the EPZ boundary of the Clinton ESP site is identical to the CPS EPZ boundary. The CPS EPZ boundary was defined in 1985 following a detailed review of the demography, topography, land characteristics, access routes, and jurisdictional boundaries in the area surrounding the power facility. SER at 13-17. The Staff thus found that the Applicant proposed a plume exposure

pathway EPZ of approximately a 10-mile radius and an ingestion pathway EPZ of approximately a 50-mile radius, both of which reflect local emergency response needs and capabilities. SER at 13-18. The Staff concluded that the size and configuration of the EPZs is consistent with the guidance in RS-002 and Supplement 2, thereby meeting the requirements of 10 C.F.R. § 50.33(g), 10 C.F.R. § 50.47(c)(2), 10 C.F.R. § 52.17(b)(2)(I), 10 C.F.R. § 52.18, and Sections I, III, and IV of Appendix E to 10 C.F.R. Part 50. SER at 13-18.

108. (RM) The Applicant also sought NRC acceptance of 14 major features of its emergency plan. The Staff evaluated the Application with respect to each of these major features, and concluded that 13 of the proposed features (Major Features A-G, I-L, O & P) were consistent with the guidance in RS-002 and Supplement 2, thereby meeting the requirements of 10 C.F.R. § 52.17(b)(2)(I), 10 C.F.R. § 52.18, and the appropriate sections of Appendix E to 10 C.F.R. Part 50, to the extent those requirements apply to the proposed features. SER at 13-22, 13-25, 13-27 to 13-28, 13-29, 13-31, 13-35, 13-38, 13-45, 13-63 to 13-64, 13-70, 13-72, 13-75, 13-79 to 13-80. These features, which the Staff found acceptable, included assignment of responsibility (organization control); onsite emergency organizations; emergency response support and resources; emergency classification system; notification measures; emergency communications; public education and information; accident assessment; protective response; radiological exposure control; medical and public health support; radiological emergency response training; and responsibility for the planning effort (development, periodic review, and distribution of emergency plans). *Id.*

109. (RM) With respect to Major Feature H (related to emergency facilities and equipment), the Staff found that the Applicant had not described in sufficient detail the emergency facilities and related equipment for the operational and technical support centers ("OSC" and "TSC" respectively) as specified in RS-002 and Supplement 2. Therefore, the Staff concluded that proposed Major Feature H was unacceptable. SER at 13-43. However, the

Staff will determine the acceptability of Planning Standard H (since there is no Major Features option at the COL stage) at the COL or OL stage based on the emergency response facility guidance in NUREG-0696. Because the review of Planning Standard H will take place at the later COL or OL stage and is an integral part of a complete and integrated plan that will be required at that stage, it is unnecessary to track this issue in the ESP.

Q42: In reaching its conclusions with respect to emergency planning, did the Staff take into account any lessons learned from the response to Hurricane Katrina?

A42: 110. (RM) No, lessons learned from Hurricane Katrina were not included in the Staff's SER analysis because the hurricane occurred after the issuance of the Draft SER. However, a study has been funded by the NRC to analyze the response to Katrina, and the results of the study will be considered in the future. At this time, the Department of Homeland Security has not directed state, tribal and local governments to take any radiological emergency preparedness actions in response to lessons learned from Katrina.

Section 13.6, Industrial Security

Q43: Describe how the Staff evaluated the Applicant's assessment of the site characteristics in regard to physical security plans for the ESP site.

A43: 111. (AT) The Staff, employing the criteria in 10 C.F.R. 100.21(f), reviewed the physical security sections of the ESP application, the Applicant's RAI response, and conducted a site visit in order to ensure that the site characteristics will allow the development of adequate security plans and measures. SER at 13-80 to 13-81. Specifically, the Staff considered pedestrian land approaches, vehicular land approaches, railroad approaches, water approaches, potential high-ground adversary advantage areas, nearby road transportation routes, nearby hazardous materials facilities, nearby pipelines, and culverts that could provide a pathway into the protected area. SER at 13-81. With respect to pedestrian and water

approaches, the Staff concluded that the distance from possible locations of vital equipment and structures (which might be located anywhere in the identified PPE site footprint) to the owner controlled area ("OCA") boundary is sufficiently large to locate barriers, detection equipment, and isolation zones on the site as required by RG 4.7. SER at 13-81.

112. (AT) The Staff also found that the existing roads, railroad line and spur, and site terrain features, when considered with the size of the OCA, do not preclude the establishment of adequate vehicle control plans or security plans or measures. SER at 13-81, 13-82. Furthermore, hazardous materials facilities and pipelines, and those hazardous materials identified as associated with them, were sufficiently distant from the ESP site areas to preclude any impediment to the development of adequate security plans or measures. SER at 13-82. Based on this evaluation, the Staff concluded that the Clinton ESP site characteristics would allow a COL or CP applicant to develop adequate security plans and measures for a new unit on the ESP site. SER at 13-82.

Q44: Describe how the Staff evaluated the Applicant's assessment of the site characteristics in regard to physical security plans for the ESP site.

A44: 113. (AT) The Staff, employing the criteria in 10 C.F.R. 100.21(f), reviewed the physical security sections of the ESP application, the Applicant's RAI response, and conducted a site visit in order to ensure that the site characteristics will allow the development of adequate security plans and measures. SER at 13-80 to 13-81. Specifically, the Staff considered pedestrian land approaches, vehicular land approaches, railroad approaches, water approaches, potential high-ground adversary advantage areas, nearby road transportation routes, nearby hazardous materials facilities, nearby pipelines, and culverts that could provide a pathway into the protected area. SER at 13-81. With respect to pedestrian and water approaches, the Staff concluded that the distance from possible locations of vital equipment

and structures (which might be located anywhere in the identified PPE site footprint) to the owner controlled area ("OCA") boundary is sufficiently large to locate barriers, detection equipment, and isolation zones on the site as required by RG 4.7. SER at 13-81.

114. (AT) The Staff also found that the existing roads, railroad line and spur, and site terrain features, when considered with the size of the OCA, do not preclude the establishment of adequate vehicle control plans or security plans or measures. SER at 13-81, 13-82. Furthermore, hazardous materials facilities and pipelines, and those hazardous materials identified as associated with them, were sufficiently distant from the ESP site areas to preclude any impediment to the development of adequate security plans or measures. SER at 13-82. Based on this evaluation, the Staff concluded that the Clinton ESP site characteristics would allow a COL or CP applicant to develop adequate security plans and measures for a new unit on the ESP site. SER at 13-82.

f. SER, Chapter 15, "Postulated Accidents and Accident Dose Consequences"

Q45: Describe how the Staff evaluated the Application with respect to postulated accidents and accident dose consequences.

A45: 115. (JL) The Staff evaluated the radiological consequences of design-basis accidents (DBAs) in order to determine whether a new nuclear unit could be built at the ESP site without undue risk to the public health and safety, as required by 10 C.F.R. § 52.17, "Contents of Applications," and 10 C.F.R. Part 100, "Reactor Site Criteria." SER at 15-1. The Applicant, instead of selecting a particular reactor design, used surrogate reactor characteristics to develop a set of reactor DBA source term parameters. SER at 15-1. The Applicant used these parameters and accident-related site specific characteristics to assess the suitability of the proposed ESP site as part of its PPE. SER at 15-1. Seven reactor designs,

five water-cooled reactors and two gas-cooled reactors[26], were reviewed to develop the PPE; the Applicant used the source terms for only two of these designs, the ABWR and the AP1000, as inputs to its DBA analyses.[27] SER at 15-1.

116. (JL) As discussed in RS-002, the Staff considers the PPE approach to be an acceptable method for assessing site suitability. For the purposes of this analysis, the Applicant proposed a fission product release from the ESP footprint to the environment; the Staff reviewed the Applicant's dose evaluation based on this proposed release. SER at 15-4. Using the ABWR and AP1000 source terms and the site-specific χ/Q values, the Applicant performed and provided radiological consequence analyses. SER at 15-1.

117. (JL) The Staff found that the Applicant's PPE values for source terms used as inputs to the radiological consequence analyses were reasonable and that the Applicant's site-specific χ/Q values and dose consequence evaluation methodology were acceptable. Therefore, the Staff concluded that the proposed distances to the EAB and the LPZ outer boundary of the proposed ESP site are adequate to provide reasonable assurance that the radiological consequences of the DBAs would be within the dose consequence evaluation factors set forth in 10 C.F.R. 50.34 (a)(1) for the proposed ESP site. SER at 15-9.

Q46: Describe the Staff's review of the Applicant's selection of DBAs.

A46: 118. (JL) The Staff concluded that the Applicant's DBAs are consistent with the DBA list and analysis presented in the SRP and RG 1.183, "Alternative Radiological Source Terms

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[26] The five light water reactor ("LWR") designs are the Advanced Pressurized Water Reactor 1000 ("AP1000"); the Advanced Boiling Water Reactor ("ABWR"); the Advanced Canada Deuterium Uranium Reactor ("ACR-700"); the Economic Simplified Boiling Water Reactor ("ESBWR"), and the International Reactor Innovative and Secure ("IRIS") Reactor. The two gas-cooled designs are the Gas Turbine Modular Helium Reactor ("GT-MHR") and the Pebble Bed Modular Reactor ("PBMR").

[27] Based on a limited review of the ACR-700 design and the Ft. St. Vrain gas cooled reactor, the Staff believes that any conclusions regarding the site acceptability based on the AP1000 and ABWR designs will be valid for the other designs being considered by the Applicant. Whether or not such designs are in fact bounded, these DBA analyses will be subject to the Staff's review during any COL or CP application related to the ESP site.

for Evaluating Design Basis Accidents at Nuclear Power Plants," issued July 2000. SER at 15-5. The Staff also found that the site acceptability conclusions based on the AP1000 and ABWR designs are likely to be valid for the Applicant's other reactor designs; the Staff will verify the acceptability of these other reactor designs at the COL or CP stage. SER at 15-5. Therefore, the Staff found that the Applicant provided 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.

Q47: Describe the Staff's review with respect to design-specific (postulated) χ/Q values.

A47: 119. (JL) After Westinghouse revised the χ/Q (atmospheric dispersion factor) values for the AP1000 design certification, the Applicant chose to update the ESP application to apply the new values to all DBAs. The Staff verified that the χ/Q values used by the Applicant are the same as those in the AP1000 design certification document (DCD). SER at 15-5. The Applicant used both the site-specific χ/Q and postulated χ/Q values for the AP1000 to obtain its ratios. These ratios were used in conjunction with the radiological consequence doses certified in the AP1000 DCD to demonstrate the compliance of the radiological consequence doses with 10 C.F.R. § 50.34. SER at 15-7. In evaluating the ABWR, the applicant did not use the postulated χ/Q values in the ABWR certified DCD. Instead, the applicant calculated the radiological consequence doses using the postulated activity releases in the ABWR certified DCD, the site-specific χ/Q values and the dose conversion factors in Federal Guidance Reports 11 and 12.[28] SER at 15-6.

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[28] Federal Guidance Report 11, "Limiting Values of Radionuclide Intake and Air Concentration and Dose Conversion Factors for Inhalation, Submersion, and Ingestion (1988)," U.S. Environmental Protection Agency and Oak Ridge National Laboratory. Federal Guidance Report 12, "External Exposure to Radionuclides in Air, Water, and Soil (1993)," U.S. Environmental Protection Agency and Oak Ridge National Laboratory.

Q48: What are χ/Q values?

A48: 120. (JL) The χ/Q values (atmospheric dispersion factors expressed in seconds per cubic meter) indicate the atmospheric dilution capability. The "χ" is the radioactivity concentration (in curies per cubic meter) and "Q" is the radioactivity release rate (in curies per second). Smaller χ/Q values are associated with greater dilution capability, resulting in lower radiological doses. The radiological consequence doses are directly proportional with the χ/Q values: in other words, as the EAB and LPZ distances from the site increase, the resulting χ/Q values become smaller. The Applicant identified and proposed appropriate EAB and LPZ sizes and distances to demonstrate the compliance of the radiological consequence doses with 10 C.F.R. § 50.34. SER at 15-7.

Q49: How are the radiological doses calculated?

A49: 121. (JL) Total effective dose equivalent (TEDE) as set forth in 10 C.F.R. 50.34 (a)(1) means the sum of the deep-dose equivalent (for external exposure) and the committed effective dose equivalent (for internal exposure). The internal exposure is calculated by multiplying the source term, the χ/Q values, the breathing rate provided in Federal Guidance Reports 11, and the dose conversion factors provided in Federal Guidance Reports 12. The external exposure is calculated by multiplying the source term, the χ/Q values, and the dose conversion factors provided in Federal Guidance Reports 11.

Q50: Describe the Staff's review with respect to site-specific χ/Q values.

A50: 122. (JL) The Staff, following the guidance in Section 2.3.4 of RS-002, performed an independent analysis of the Applicant's site specific χ/Q values. After the Applicant revised its χ/Q values to account for additional meteorological data[29] and a new minimum distance of

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[29] The Applicant expanded the scope of the data considered from January 2000-August 2002 to January 2000-December 2002.

805 meters to the EAB (the previous calculations used a minimum distance of 1025 meters), the Staff found the Applicant's analysis to be acceptable. SER at 15-6.

Q51: Describe the Staff's review with respect to source terms and radiological consequence evaluations.

A51: 123. (JL) Based on the AP1000 DCD and the design certification rule for the ABWR, the Staff found that the certified ABWR and the proposed AP1000 designs met the radiological consequence evaluation factors identified in 10 C.F.R. § 50.34(a)(1) with their postulated χ/Q values. SER at 15-7. The radiological consequences of the DBAs for the final reactor design, assuming that neither the AP1000 nor ABWR is selected by the COL applicant, are likely to be bounded by the AP1000 and ABWR analysis. For a new reactor design other than the proposed AP1000 and the certified ABWR, the Staff will evaluate, at the COL stage, whether the design of the facility falls within the parameters specified in any ESP issued for the Clinton ESP site. SER at 15-8. The Staff found the PPE source terms to be reasonable and acceptable and noted that the Applicant's dose consequences for the AP1000 and ABWR comply with the dose consequence factors in 10 C.F.R. § 50.34(a)(1). SER at 15-8. The Staff concluded that the proposed distances to the EAB and LPZ outer boundary of the ESP site, when considered with the Applicant's fission product release rates to the environment, provide reasonable assurance that the radiological consequences of the DBAs will be within the dose consequence evaluation factors required by 10 C.F.R. § 50.34(a)(1). SER at 15-9. Therefore, the Staff found that: (1) the Applicant demonstrated the suitability of the proposed ESP site, in terms of risk to the public health and safety, and (2) the Applicant complied with the requirements of 10 C.F.R. § 52.17 and 10 C.F.R. Part 100. SER at 15-10.

g. SER Chapter 17, "Early Site Permit Quality Assurance Measures"

Q52: Describe the Staff's evaluation of the Applicant's quality assurance measures.

A52: 124. (PP) As part of its safety review, the Staff evaluated the Applicant's, and its contractors'[30], ESP quality assurance measures.[31] Even though current NRC regulations do not require ESP applicants to implement a 10 C.F.R. Part 50 Appendix B[32] QA program, applicants are expected to have an equivalent program in place in order to ensure the effective use of ESP data in the formulation of safety SSCs at the COL or CP stage. SER at 17-1. The Applicant is not required to comply with Appendix B at this time because the ESP permit process does not involve Systems, Structures, or Components (SSCs). The focus of the ESP permit process is on design, documentation, personnel qualification, and other applicable quality controls to ensure the reliability of this information in subsequent phases of design and construction. Specifically, the ESP QA program did not include: the Identification and Control of Materials; Parts and Components; Inspection; Inspection, Test and Operating Status; and Nonconforming Materials, Parts, or Components. Therefore, the Staff evaluated the Applicant's ESP QA measures to ensure the integrity and reliability of SSC-related site information. SER at 17-1. The Staff focused its review on the compliance of the Applicant's program with the QA measures described in RS-002 Section 17.1.1. SER at 17-1. The Staff performed much of its inspection in January 2004 and documented the results in a February 2004 Inspection Report. SER at 17-1, 17-2.

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[30] Contractors identified with respect to the QA review included CH2M HILL, Parsons Energy & Chemicals Group, Testing Services Corporation, Geomatrix, GRL Engineers, Inc., Stratigraphics, and the University of Texas.

[31] Some contractors and subcontractors were not audited because they are listed as "approved suppliers." Approved suppliers have already been audited and have provided evidence that they meet the requirements of 10 C.F.R. Part 50 Appendix B.

[32] "Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants"

125. (PP) The Staff reviewed 18 QA elements and found that each element was either acceptably implemented with respect to ESP application activities, or was not required based on the scope of work for the ESP project. SER 17-2 to 17-40. The elements examined by the Staff included QA organization; the quality assurance program; design control; procurement document control; instructions, procedures, and drawings; document control; control of purchased material, equipment, and services; identification and control of materials, parts, and components; control of special processes; inspection; test control; control of measuring and test equipment; handling, storage, and shipping; inspection, test, and operating status; nonconforming materials, parts, or components; corrective action; quality assurance records; and audits.[33] SER 17-2 to 17-40. As part of the Staff's safety review, two open items from the draft SER were resolved: first, the Staff determined through review of supporting documentation during a follow-up inspection that the Applicant had provided adequate QA measures to authenticate and verify data retrieved from internet web sites; and, second, the Staff determined the applicability of 10 C.F.R. Part 21 to ESP applicants.

126. (PP) Based on its review and evaluation of the Applicant's QA program, the Staff concluded that the program conforms to the guidance in RS-002, Attachment 2, as well as to appropriate industry standards, and that the Applicant and its contractors implemented it for the ESP application activities. SER at 17-40.

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[33] The elements the Staff found not to be required based on the scope of work for the ESP project were identification and control of materials, parts, and components; control of special processes; inspection; inspection, test, and operating status; and nonconforming materials, parts, or components. SER at 17-21, 17-23, 17-24, 17-31, and 17-32.

STATEMENT OF PROFESSIONAL QUALIFICATIONS OF GOUTAM BAGCHI

CURRENT POSITION

Senior Level Advisor for Civil Engineering and Geoscience, Division of Engineering, United States Nuclear Regulatory Commission

EDUCATION

M.S.	Mechanical Engineering, Northeastern University, Boston, MA, 1974
M.Sc.	Structural Engineering, London University, London, United Kingdom, 1964
B.E.	Civil Engineering, Calcutta University, India, 1959

PROFESSIONAL

American Society of Civil Engineers: Fellow, Member ASCE Nuclear Standards Committee
American Society of Mechanical Engineers: Member
Earthquake Engineering Research Institute: Member
Professional Engineer: Massachusetts, Pennsylvania and New York

QUALIFICATIONS

Mr. Goutam Bagchi has over 47 years of professional work experience of which 39 years is in the design, evaluation, inspection, regulation of nuclear power plant structures, systems and components. He is currently a Senior Level Advisor in the Division of Engineering, NRR. He provides authoritative technical advice and assistance to the Director, Division of Engineering, as the Senior Level Advisor and Lead Coordinator on a broad variety of technical and regulatory issues. He serves as the agency's authority in performing and coordinating the evaluation and resolution of technical and regulatory issues related to structural mechanics involving structures, seismic geosciences and civil engineering areas in nuclear power plants under licensing review related to design certification and early site permit applications, under construction, in operation, under license renewal or in decommissioning.

Mr. Bagchi joined the NRC in 1975 as a technical reviewer. In 1976 he became a senior structural engineer. In 1978 he became the Branch Chief of the Structural Research Branch in the Office of Research. He was instrumental in developing the research program on containment capacity through testing of large scale containment structures to failure. In 1987 he joined the Senior Executive Service and became the Branch Chief for Structural and Civil Engineering Branch, NRR, DE. In 1999 he joined the Senior Level Service and has since served in DE, NRR. He was instrumental in the development of the endorsement of containment inspection requirements in 10 CFR Part 50.55a and maintenance of safety-related structures within the scope of the maintenance rule, 10 CFR 50.65.

In 1987 and 1997, he and his staff conducted the standard plant certification reviews for ABWR, CE System 80+, AP600, and AP 1000 in civil, mechanical and materials engineering areas. As a senior advisor he was involved in the discussions with stake holders on issues related to early site permit applications. He provided input for the ESP template, and the criteria to be used to determine permit conditions, site characteristics and COL action items. He is involved in the review of three ESP applications in the hydrology area. He participated in

a leadership role in all major seismic programs associated with NRR since 1978: Siting rule, 10 CFR Part 100.23, Appendix S to Part 50 and the associated Regulatory Guide 1.165 and corresponding Standard Review Plan Sections, Individual Plant Examination of External Events, Seismic Margins related Unresolved Safety Issues A 40 and A 46, Probabilistic Seismic Hazard Study update of 1993, Diablo Canyon Long Term Seismic Program review and evaluation, including determination of fragility of structures, systems and components. He participated and significantly contributed to the development of risk informed in-service inspection (ISI) of reactor coolant system piping, and was instrumental in the timely review and approval of ISI programs in the Chairman's Tracking List. He has made significant contributions to the development and acceptance of the performance-based seismic design of nuclear power plants.

Mr. Bagchi provided input for the hydrology portion of RS-002, by adapting the Standard Review Plan Section 2.4 for the review of ESP applications. In 2005, Mr. Bagchi represented the NRC, and served as co-chair of two sessions, at the International Workshop on External Flooding, which looked at issues related to tsunami hazards, and was held in Kalpakkam, India. He participated in the development of a tsunami guideline document for the IAEA in Trieste, Italy in 2006 under the joint sponsorship of the International Atomic Energy Agency and the International Center for Theoretical Physics. Currently he is the technical monitor for updating Section 2.4, Hydrologic Engineering, of the SRP.

SELECTED PUBLICATIONS AND PRESENTATIONS

Ashar, H, Bagchi G, NUREG 1522, "Assessment of Inservice Conditions of Safety-Related Nuclear Plant Structures." June, 1995.

Bagchi G. et al, "U. S. Regulatory Criteria on Nuclear Plant Protection against External Flooding," presented at the International Workshop in Kalpakkam, India in October, 2005.

Bagchi G. et al, "Containment Design, Performance Criteria and Research Needs for Advanced Reactor Designs," presented at the 12th International Conference on Nuclear Engineering.

Presentation in Trieste on U. S. Tsunami Hazard Protection.

Kazimieras M. Campe
Statement of Professional Qualifications

Current Position:
Consultant
Accident Dose Branch
Division of Risk Assessment
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Washington, D.C.

Education:
B.S., Mechanical Engineering, University of Connecticut
M.S., Mechanical Engineering, University of Connecticut
Ph.D., Nuclear Engineering, Purdue University

Post-Graduate Courses and Training
- Rensselaer Polytechnic Institute (Mathematics)
- Massachusetts Institute of Technology (Nuclear Power Plant Operations)
- Babcock & Wilcox (Nuclear Power Plant Operations)
- U. S. Nuclear Regulatory Commission
  - Applying Statistics
  - System Reliability and Safety Analysis
  - BWR Fundamentals
  - PWR Fundamentals
  - Fault Tree Analysis
  - Radiological Accident Assessment
  - Fundamentals of Inspection
  - Supervision and Management

Experience:

U. S. Nuclear Regulatory Commission (formerly U. S. Atomic Energy Commission), 1972 - Present

Dr. Campe has retired from the NRC as of January, 2006. Currently Dr. Campe is a rehired annuitant employed as a contractor to the NRC and provides technical support in the area of nuclear power plant site hazards within the Accident Dose Branch of the Division of Risk Assessment. Specifically, a principal part of his duties involves the performance of safety assessments of nuclear power plant facilities with respect to risks posed to nuclear facilities by external man-made hazards. These include assessment of risks associated with aircraft activity as well as other modes of transportation (e.g., railroads, highways, navigable waterways, and pipelines). The assessments also include evaluation of hazards such as explosions, toxic gas releases, fires, and missiles.

Prior to his present position, Dr. Campe was assigned to the Analytic Support Group, which provided analytic services to the technical branches within the Division of Systems Safety and Analysis. As a technical staff member of this group, he primarily performed thermal hydraulic analyses of nuclear power plant transients and design basis accidents using advanced nuclear analysis codes. Part of his duties within the group involved

code development and maintenance activities. In addition, he provided analytic support in other areas, such as spent fuel pool thermal analysis code work.

Before joining the Analytic Support Group, Dr. Campe was employed as Section Chief in the Risk Applications Branch. His responsibilities within the branch were to supervise and participate in the administrative and technical activities of the Reliability Applications Section. This involved the planning, coordinating, and directing risk evaluations with respect to the design and operation of nuclear power plants. Specifically, using a diverse background of systems engineering and risk assessment, Dr. Campe supervised the development and application of systems reliability and plant risk analysis for the purpose of identifying significant contributors to risk. As Section Chief, he also performed technical evaluations and provided expert consultation in the area of man-made hazards.

Prior to the Risk Applications Branch, Dr. Campe held the positions of Section Leader in the Plant Systems Branch and the Site Analysis Branch. His principal responsibilities were the technical and administrative supervision of licensing actions relating to plant systems design and operation, external hazards, and site suitability determinations.

Before accepting the position of Section leader, Dr. Campe was employed as Senior Site Analyst, Site Analyst, and Nuclear Engineer. He was responsible for performing licensing reviews, principally in the areas of man-made external hazards associated with toxic, flammable, or explosive substances, as well as missile impacts. In addition, he performed reviews of tornado and turbine missile risks, and control room habitability systems with respect to design basis accidents.

His activities in generic studies included technical contract management, computer code development, drafting of Regulatory Guides, and participating in Fission Product Release and Foreign Reactor Safety Research Groups. Specifically, he prepared most of the technical input for Regulatory Guide 1.115 on turbine missiles. He also prepared the following sections of the Standard Review Plan, NUREG-0800 (formerly NUREG-75/087): Standard Review Plan § 3.5.1.3, "Turbine Missiles"; Standard Review Plan § 2.2.1-2.2.2, "Identification of Potential Hazards in Site Vicinity"; Standard Review Plan § 2.2.3, "Evaluation of Potential Accidents"; Standard Review Plan § 3.5.1.5, "Site Proximity Missiles (Except Aircraft)"; and Standard Review Plan § 3.5.1.6, "Aircraft Hazards."

Hittman Associates, Inc., Columbia, MD, 1966 - 1972

As Section Chief for radiation analysis and special projects, Dr. Campe was responsible for radiation analysis of systems which either use or interface with radioisotopes.

In this capacity, he performed numerous parametric studies on the radiation shielding characteristics of conceptual polonium, promethium, and plutonium fueled heat sources, and was responsible for detailed analysis of the radiation fields and the radiation shielding requirements of radioisotope thermoelectric generators for spacecraft. He also performed radiation analyses for implanted medical devices.

Dr. Campe also was active in reactor physics analysis, performing calculations and developing advanced computer codes for analyzing water moderated reactor lattices.

Pratt and Whitney, CANEL, Middletown, CT, 1960 - 1962 (plus summer of 1963)

As Analytical Engineer, Dr. Campe worked in the Analytic Physics Group on problems

associated with the design of a nuclear propulsion reactor for an aircraft. This involved extensive reactor physics analyses of a liquid metal fast fission spectrum reactor.

STATEMENT OF PROFESSIONAL QUALIFICATIONS OF R. BRAD HARVEY

CURRENT POSITION

Physical Scientist
Division of Risk Assessment
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission

EDUCATION

M.S. Atmospheric Science, University of Michigan, Ann Arbor, MI, 1976
B.S. Physics, Rensselaer Polytechnic Institute, Troy, NY, 1975

PROFESSIONAL AFFILIATIONS

American Meteorological Society
American Nuclear Society
Nuclear Utility Meteorological Data Users Group

CERTIFICATIONS

Certified Consulting Mèteorologist, American Meteorological Society, 1992

INDUSTRY COMMITTEE ACTIVITIES

ANS-3.11 Working Group. One of the primary authors for ANSI/ANS-3.11-2005, "Determining Meteorological Information at Nuclear Facilities"

NEI Control Room Habitability Task Force. Participated as an industry member coordinating and authoring Appendix D, "Atmospheric Dispersion," and Appendix G, "Toxic Gas Assessments," to the original (June 2001) version of NEI 99-03, "Control Room Habitability Assessment Guidance"

QUALIFICATIONS

Mr. Harvey is a Certified Consulting Meteorologist with over 29 years of experience in performing and reviewing meteorological monitoring, atmospheric dispersion modeling, climatic evaluations, and air quality licensing analyses for the nuclear power industry. Mr. Harvey's experience includes performing atmospheric dispersion analyses and dose assessments for nuclear plant routine release and design basis accident applications. Mr. Harvey has also participated in developing emergency response dose assessment models and in performing toxic gas analyses for control room habitability evaluations. In addition, he has assisted nuclear plants in completing air emission inventories and air quality licensing documents. Mr. Harvey has been active on industry committees concerned with control room habitability and meteorological monitoring.

Mr. Harvey joined the NRC in 2003. Prior to joining the NRC, Mr. Harvey was employed by an NRC licensee (Yankee Atomic Electric Company) and several consultants (Sargent & Lundy, Duke Engineering and Services, and Framatome-ANP).

NRC Experience

Meteorological Site Safety Reviews for Early Site Permits. Mr. Harvey reviewed the Site Safety Analysis Report (SSAR) submittals supporting the Clinton, Grand Gulf, and North Anna Early Site Permit (ESP) applications, including preparing the associated Safety Evaluation Report (SER) sections related to climatology, meteorological monitoring, and design-basis accident and routine release atmospheric dispersion modeling. These reviews established that (1) site climatic characteristics to ensure potential threats from severe weather will pose no undue

risk to the type of facility proposed to be located at the site, and (2) site atmospheric dispersion characteristics to ensure radiological effluent release limits associated with normal operation and radiological dose consequences associated with postulated accidents can meet regulatory criteria.

Meteorological License Amendment Reviews for Alternative Source Term Implementation. Mr. Harvey reviewed onsite meteorological data sets and control room and offsite atmospheric dispersion analyses submitted in support of nine license amendment requests related to implementation of the Alternative Source Term (AST) pursuant to 10 C.F.R. 50.67.

Revision to Regulatory Guide 1.23, "Onsite Meteorological Programs." Mr. Harvey served as technical lead in the development of DG-1164 (Third Proposed Revision 1 of Regulatory Guide 1.23), "Meteorological Monitoring Programs for Nuclear Power Plants." This regulatory guide describes a suitable onsite meteorological monitoring program for collecting the basic meteorological data needed to support new reactor licensing and operating plant needs. The draft regulatory guide revision updates the discussion of applicable regulations and references to associated regulatory guides, provides new guidance to reflect current meteorological monitoring equipment and practices, and clarifies monitoring criteria for supporting emergency planning requirements.

Revision to Regulatory Guide 1.76, "Design Basis Tornado for Nuclear Power Plants." Mr. Harvey served as project manager coordinating the development of DG-1143 (Proposed Revision 1 of Regulatory Guide 1.76), "Design-Basis Tornado and Tornado Missiles for Nuclear Power Plants." DG-1143 provides new guidance for use in selecting the design-basis tornado and design-basis tornado-generated missiles that a nuclear plant should be designed to withstand. The new guidance is based on a more extensive set of historical tornado data and improved methods for estimating the frequency of exceedance of tornado wind speeds. Mr. Harvey's associated activities included (1) co-authoring SECY-04-0200, "A Risk-Informed Approach to Defining the Design Basis Tornado for New Reactor Licensing," and (2) serving as co-program monitor for Revision 1 to NUREG/CR-4461, "Tornado Climatology of the Contiguous United States."

Member of NRC's Incident Response Organization. Mr. Harvey was assigned as a weather and dispersion analyst on the protective measures team (PMT) for responding to reactor, fuel cycle, and material transportation incidents.

Private Sector Experience

Supervisor, Radiological Engineering. Mr. Harvey directed the technical, administrative, and business development activities of more than 20 radiological engineering professionals. He managed many functions including radiological design engineering (activation analysis, shielding, equipment qualification, accident analysis, source term), effluent and environmental monitoring (RETS/REMP, waste management, pathway dose), and meteorological services (database management, dispersion analyses). Clients included operational commercial power reactors, facilities undergoing decommissioning, and other firms requiring radiological support (e.g., biotech).

Onsite Meteorological Monitoring Support. Mr. Harvey developed nuclear plant meteorological monitoring system design basis documents, instrumentation specifications, and data collection algorithms. He wrote procedures for the review and validation of onsite meteorological data and supervised meteorological data reduction and validation activities for the Yankee Rowe, Vermont Yankee, Maine Yankee, and Seabrook nuclear plants. He developed a Program Manual for the Millstone Station meteorological monitoring program that identified and coordinated the resolution of over 200 regulatory and guidance document criteria that were applicable to the monitoring program.

Meteorological Sections of Safety Analysis Reports and Environmental Reports. Mr. Harvey prepared the meteorological sections of the Safety Analysis Reports and Environmental Reports supporting the operating license applications for the Byron, Braidwood, and Seabrook nuclear plants, addressing such topics as climatology, onsite meteorological monitoring, and atmospheric dispersion modeling.

Atmospheric Dispersion Analyses for Nuclear Power Plant Applications. Mr. Harvey managed the development of a software code, AEOLUS-2, for calculating atmospheric dispersion factors for routine gaseous releases from nuclear plants, and he generated atmospheric dispersion factors for use in nuclear plant offsite dose calculation manuals (ODCMs). He calculated offsite dose estimates resulting from routine liquid and gaseous effluent releases for the Annual Radioactive Effluent Release Reports for the Yankee Rowe and Seabrook nuclear stations. He generated atmospheric dispersion analyses to evaluate control room habitability for potential accident radiological and toxic gas releases for several nuclear plants.

Emergency Response Dose Assessment Support. Mr. Harvey developed near real-time atmospheric dispersion modeling tools for use during radiological emergencies at several nuclear plants, including a variable-trajectory plume-segment atmospheric dispersion model called METPAC, which handled the site-specific topographic features of flat terrain (e.g., Maine Yankee), river valley (e.g., Yankee Rowe, Vermont Yankee), and coastal (e.g., Seabrook) sites. He trained nuclear plant emergency response personnel in atmospheric dispersion modeling techniques and provided meteorological support during nuclear plant radiological emergency response drills and exercises for the Yankee Rowe, Vermont Yankee, Maine Yankee, and Seabrook nuclear plants.

Consequence Analysis for Domestic Licensing of Special Nuclear Material. Mr. Harvey developed and implemented the consequence analysis methodology (e.g., estimating and classifying worker and public exposures to potential accident UF_6 releases) in support of the Louisiana Energy Services (LES) Gas Centrifuge Facility Integrated Safety Analysis (ISA) in accordance with Subpart H of 10 CFR 70 and NUREG-1520, "Standard Review Plan for the Review of a License Application for a Fuel Cycle Facility."

SELECTED PRESENTATIONS AND PROCEEDINGS

"ANSI/ANS-3.11-2005: American National Standard for Determining Meteorological Information at Nuclear Facilities," presented at the 16th Annual RETS/REMP Workshop, Mashantucket, CT, June 2006.

"Climatic Site Characteristics for Early Site Permits," presented at the 2005 ANS Annual Meeting, San Diego, CA, June 2005.

"The ARCON96 Atmospheric Dispersion Model," presented at the 2004 ANS Winter Meeting, Embedded Topical Meeting: 2004 Operating Nuclear Facility Safety (2004 ONFS), Washington, DC, November 2004.

"Using ARCON96 for Control Room Radiological Habitability Assessments," co-authors Steve LaVie and Leta Brown, presented at the Ninth Nuclear Utility Meteorological Data Users Group Meeting, Chattanooga, TN, October 2003.

"Atmospheric Dispersion Factors: What Are They and Why Do We Use Them," co-author Ted A Messier, presented at the 2002 RETS/REMP workshop, Atlantic City, NJ, June 2002.

"Meteorological Data Processing for Commercial Nuclear Power Plants," co-author Ted A Messier, presented at the 2002 RETS/REMP workshop, Atlantic City, NJ, June 2002.

"NEI 99-03 Appendix D, Atmospheric Dispersion, and Appendix G, Toxic Gas Assessments," presented at the NEI Control Room Habitability Workshop, Clearwater Beach, FL, August 2001.

"Ongoing Developments in Atmospheric Dispersion Analyses for Control Room Habitability Evaluations," presented at the 2001 ANS Annual Meeting, Milwaukee, WI, June 2001.

"NEI 99-03: Control Room Habitability Assessment Guidance," presented at the Seventh Nuclear Utility Meteorological Data Users Group Meeting, Las Vegas, NV, October 2000.

"Millstone Station Meteorological Monitoring Program Manual," co-authors Gary W Johnson and John Leavitt, presented at the Seventh Nuclear Utility Meteorological Data Users Group Meeting, Las Vegas, NV, October 2000.

"Time-Dependent Atmospheric Dispersion Factors for Use in Offsite Dose Calculation Manuals," co-author M. S. Strum, presented at the 2000 RETS/REMP Workshop, Falmouth, Mass., June 2000.

"A Methodology for Calculating Meteorological Channel Accuracies," presented at the Sixth Nuclear Utility Meteorological Data Users Group Meeting, Syracuse, N.Y., May 1999.

"A Review of the NRC Emergency Response Code RASCAL Version 2.1," presented at the Fourth Nuclear Utility Meteorological Data Users Group Meeting, San Francisco, Calif., April 1996.

"Atmospheric Dispersion Modeling Applications in the Nuclear Power Industry," presented at the ASTM 1995 Johnson Conference on Performance Evaluation of Atmospheric Dispersion Models, Johnson, Vt., July 1995.

"Meteorological Aspects of Emergency Action Level Schemes: NUREG-0654 Versus NUMARC-007," presented at the Third Nuclear Utility Meteorological Data Users Group Meeting, Charlotte, N.C., October 1994.

"Experience in Implementing a 10m Backup Meteorological Tower," co-author T. A. Messier, presented at the Second Nuclear Utility Meteorological Data Users Group Meeting, Boston, Mass., April 1993.

"Regional Weekly Background Variations in REMP-Reported Airborne Gross-Beta Activity: Influence of Meteorological Factors," co-author S. Farber, presented at the 1992 RETS/REMP Workshop, Concord, Mass., June 1992.

"Technical Specification and Off-Site Dose Calculation Manual Meteorological Requirements," presented at the First Nuclear Utility Meteorological Data Users Group Meeting, Chattanooga, Tenn., November 1991.

STATEMENT OF PROFESSIONAL QUALIFICATIONS OF STEPHEN P. KLEMENTOWICZ

CURRENT POSITION

Senior Health Physicist
Office of Nuclear Reactor Regulation, U.S. Nuclear Regulatory Commission

EDUCATION

M.S. Health Physics, University of Florida, Gainesville, FL, 1981
B.S. Radiological Science, Manhattan College, New York, NY, 1980

QUALIFICATIONS

Mr. Stephen Klementowicz joined the NRC in 1990 and has over 25 years experience in Health Physics, which includes extensive regulatory experience in radiological effluent monitoring programs, radiological environmental monitoring programs, radioactive material control programs. Mr. Klementowicz's current activities involve working as a Senior Health Physicist to prepare the Environmental Impact Statement for power reactor license renewal applications, in the areas of Occupational and Public radiation exposure from routine plant operation.

In his work for the Health Physics Branch in the Division of Inspection Program Management, Mr. Klementowicz was the lead NRR technical staffer for radiological effluent and environmental issues and was frequently called upon to review difficult and complex radioactive effluent and environmental monitoring program issues, in order to determine whether licensee actions were in conformance with NRC regulatory requirements and Commission policy and direction.

Mr Klementowicz was a member of the Liquid Lessons Learned Task Force, which dealt with abnormal spills and leaks of liquid radioactive material at nuclear power reactor plant sites. He prepared a thorough discussion of the regulatory requirements and guidance for the radiological effluent and environmental monitoring programs and made recommendations to enhance the effectiveness of the NRC regulatory programs.

Mr Klementowicz was the Lead for the Public Radiation Safety Cornerstone within the NRR Reactor Oversight Process inspection program. He was responsible for the following inspection program areas: radioactive material control, radiological effluent monitoring program, and the radiological environmental monitoring program. In his role as Lead for the Public Radiation Safety Cornerstone, he provided programmatic and technical support to Regional Inspectors during their on-site inspections and assisted in the review and comment of inspection findings in the final report.

Over his career with the NRC, in the areas of effluent and environmental monitoring, he has frequently led or been a prominent speaker at public meetings with a wide variety of stakeholders.

Mr. Klementowicz was also a Team Leader for the Health Physics Branch. In that role, he provided guidance, direction, and technical support to co-workers. He planned and directed their development, providing challenging and meaningful assignments that allowed the individuals to grow in their professional careers.

Mr. Klementowicz is a member of the NRC's Emergency Response Organization. He performs dose assessment calculations to assess the radiological dose impact to members of the public from a nuclear power reactor accident.

Awards

Mr Klementowicz has received numerous performance awards for his outstanding work as a Health Physicist with the NRC. He also received an award for his work as a mentor to new NRC employees in the Nuclear Safety Professional Development Program.

Reports/Publications

Liquid Radioactive Release Lessons Learned Task Force Final Report, 2006, S. Richard, T. Frye, J. Shepherd, T. Nicholson, G. Kuzo, R. Allen, U. Shoop, S. Sakai, M. Shannon, A. Keim, S. Klementowicz, R. Nimitz, S. Orth, S. Burnell. Prepared for the NRC's Executive Director of Operations.

STATEMENT OF PROFESSIONAL QUALIFICATIONS OF JAY Y. LEE

CURRENT POSITION

Senior Health Physicist
Accident Dose Branch
Division of Risk Assessment
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission

EDUCATION

B.S.	University of Minnesota, Chemical Engineering	1962
M.S.	Catholic University of America, Radiation Protection	1978

PROFESSIONAL AFFILIATIONS

American Nuclear Society
American Health Physics Society

INDUSTRY COMMITTEE ACTIVITIES

ANS-18.1 Working Group, "Radioactive Source Term for Normal Operation of Light Water Reactors."
ANS-55.6, Working Group, "Liquid Radioactive Waste Processing System for Light Water Reactor Plants."
ANS-55.4, Working Group, "Gaseous Radioactive Waste Processing System for Light Water Reactor Plants."

QUALIFICATIONS

Mr. Lee joined the NRC in 1974 and has over 40 years of experience in design, construction, operation, and licensing of nuclear power reactors.

Prior to joining the NRC in 1974, Mr. Lee worked at Pathfinder Atomic Power Plant (decommissioned) of (then) Northern States Power Company in Sioux Falls, SD as a nuclear chemist (1962 to 1966) and at Rancho Seco Nuclear Generating Station (decommissioned) of the Sacramento Municipal Utility District in Sacramento, CA as a chemical engineer and a health physicist (1969 to 1974). From 1966 to 1969, Mr. Lee worked at Bechtel Corporation in San Francisco, CA as a nuclear engineer and worked on design and construction of the Radioactive Waste Management Systems and the Reactor Water Treatment Systems for nuclear power plants (Palisades and Peach Bottom Nuclear Stations).

Current NRC Work

Site Characteristics and Radiological Consequence of Design Basis Accident Reviews for Early Site Permits. Mr. Lee reviewed the Site Safety Analysis Report (SSAR) submittals supporting the Clinton, Grand Gulf, and North Anna Early Site Permit (ESP) applications, including the preparation of the associated Safety Evaluation Report (SER) sections related to site characteristics and radiological consequences of design basis accidents. He reviewed draft and final Environmental Impact Statements prepared by an NRC contractor for the Clinton, Grand Gulf, and North Anna Early Site Permit (ESP) applications.

Standard Reactor Design Certification Review. He is reviewing General Electric ESBWR standard reactor design certification application Chapter 6, "Containment systems," and Chapter 15, "Safety Analysis."

License Amendment Reviews for Alternative Source Term (AST) Implementation. He is reviewing the radiological consequence analyses in support of licensing amendment requests related to implementation of the AST pursuant to 10 CFR 50.67.

He is participating in the NRC's new rulemaking of 10 CFR 52, "Early Site Permits; Standard Design Certifications; and Combined Licenses for Nuclear Power Plants."

He is preparing Regulatory Guide and Standard Review Plan Development for COL Applications.

He is developing reactor accident source terms for high burnup fuel and MOX fuel.

Recent Selected NRC Experience

Review Standard (RS)-002, "Processing Applications for Early Site Permits." He prepared selected sections of Chapter 2 and Chapter 15, "Radiological Consequences of Design Basis Accidents,"of RS-002.

Standard Reactor Design Certification Reviews. He reviewed the standard reactor design certification of GE/ABWR, CE System 80+, Westinghouse AP600, and ACR 700 reactors and prepared safety evaluation reports for the radiological consequence analyses of the postulated reactor design basis accidents. Mr. Lee also completed the review of EPRI Advanced Light-Water Reactor Requirement Documents for Evolutionary and Passive Designs.

He helped refine the NRC Severe Accident Computer Code (MELCOR) and Consequence Computer Code (MACCS)

SELECTED PUBLICATIONS AND PRESENTATIONS

- NUREG-0016, Revision 1, "Calculation of Releases of Radioactive Materials in Gaseous and Liquid Effluents from Boiling Water Reactors (BWR-Gale Code)." 1979.
- NUREG-0017, Revision 1, "Calculation of Releases of Radioactive Materials in Gaseous and Liquid Effluents from Pressurized Water Reactors (PWR-Gale Code)." 1985.
- ANSI/ANS Standard 18.1 (as a working member), "Radioactive Source Term for Normal Operation of Light Water Reactors." Revision 0 (1976), Revision 1(1984), and Revision 2 (1999).
- SECY-94-302, "Source Term Related Technical and Licensing Issues Pertaining to Evolutionary and Passive Light-Water Reactor Designs" (1994).
- Presentation to 2004 ANS Winter Meeting, "Reactor Accident Source Term Program at U.S. Nuclear Regulatory Commission," Washington, D.C. November 2004.
- Presentation to 2006 ANS Annual Meeting, "Alternative Source Term Implementation at U.S. Reactors," Reno, NV, 2006.
- Presentation to 14th Pacific Basin Nuclear Conference, "Implementation of Alternative Source Term at U.S. Power Reactors," Honolulu, Hawaii, March 2004.

- Presentation to 2006 Cooperative Severe Accident Research and MELCOR code Assessment Technical Review Meeting, "Alternative Source Term Implementation at U.S. Power Reactors," Albuquerque, NM, September 2006.

STATEMENT OF PROFESSIONAL QUALIFICATIONS OF ROBERT E. MOODY

Current Position

Senior Emergency Preparedness Specialist
Licensing and Regulatory Improvements Branch
Division of Preparedness and Response
Office of Nuclear Security and Incident Response
U.S. Nuclear Regulatory Commission

Education/Certifications

Certification	Incident Investigation Team member, 2003
Certification	Lead Auditor, ASME NQA-1, 1995
Certification	Senior Reactor Operator, 1992
M.S.	The University of Michigan, environmental science/health physics, 1973
License	Reactor Operator, N.S. Savannah, 1970
License	Second Assistant Engineer, U.S. Coast Guard, 1969
B.S.	Maine Maritime Academy, marine engineering, 1968

Professional Affiliations

American Nuclear Society (1993 - present)

Qualifications

Mr. Moody has over 25 years experience in the area of commercial nuclear power with over 15 years in the emergency preparedness area. He has visited more than fifty U.S. nuclear power plants and three international plants. Since joining the NRC in 2000, Mr. Moody has served in several positions primarily in the emergency preparedness area.

Prior to joining the NRC in 2000, Mr. Moody worked in the commercial nuclear power industry in several capacities including employment with the Institute of Nuclear Power Operations for over 12 years, managed his own consulting company for five years, and worked for several other consulting companies as a sub-contractor. Mr. Moody was also employed as a health physicist with the Michigan Department of Public Health for eight years and served as a reactor operator on the N.S. Savannah.

NRC Experience

Emergency Planning Reviews for Early Site Permits. Mr. Moody is the principal reviewer of the emergency preparedness area for the Clinton Early Site Permit application. Responsibilities included preparing the associated Safety Evaluation Report (SER) section related to emergency preparedness. This review evaluated: 1) whether there were any significant impediments to the development of emergency plans for the site, 2) whether the Applicant provided acceptable descriptions of contacts and arrangements made with Federal, State, and local agencies with emergency planning responsibilities, and 3) whether the proposed major features of the proposed emergency plan were acceptable.

Development of a COL Review Template for Emergency Planning. Mr. Moody developed a template to enhance efficiency and consistency when a large number of combined license (COL) applications (expected in FY 2008) may be reviewed by a number of different individuals, including contract personnel. The template also includes all the emergency preparedness regulations (combines the requirements of Appendix E and planning standards in 10 CFR 50.47 for the first time) and current guidance related to emergency preparedness in one document. As part of the development of the template Mr. Moody reviewed over 250 NRC generic communications related to emergency preparedness and identified which ones were current, out-of-date, no longer valid, needed updating, or had been superseded. This final list was included as an attachment to revised Chapter 13.3, "Emergency Planning," to the Standard Review Plan (NUREG-0800)."

Reviews of proposed emergency plan changes. For several years Mr. Moody has performed reviews of many emergency plan change requests from licensees. The proposed changes involve emergency action levels associated with emergency classification, shift staffing and augmentation, and the relocation of emergency response facilities.

Emergency Preparedness Program Inspections. Mr. Moody participated in two in-depth inspections at plants with repeat emergency preparedness program problems.

Revision to Regulatory Guide 1.23, "Onsite Meteorological Programs." Mr. Moody worked with the technical lead to develop a new section specifically related to emergency preparedness.

Project Manager for River Bend. Mr. Moody served as the Project Manager for the River Bend nuclear power plant. His responsibilities included performing acceptance reviews of requested license changes, project management of technical reviews, and planning and conducting public meetings. One emergency plan change request involved the extension of emergency response organization augmentation response times.

Member of the Incident Response Organization. Mr. Moody has served in various positions on the Protective Measures Team, most recently as the Protective Actions Assistant Director.

Private Sector Experience

Consulting Services. Mr. Moody provided consulting services to the commercial nuclear power industry and a Department of Energy facility for seven years as President of his own company and as a subcontractor in the areas of root cause, corrective action, operating experience, and emergency preparedness.

Project Manager/Program Manager at the Institute of Nuclear Power Operations. From 1981 through 1993, Mr. Moody conducted in-depth evaluations of many U. S. and international commercial nuclear power plant emergency preparedness programs, drills and exercises. Mr. Moody periodically performed on-call duties and was responsible for receiving emergency notifications from commercial nuclear power plants and activating INPO's emergency center, when necessary.

Inspecting Industry Emergency Preparedness Programs. Mr. Moody has over six years of experience as a team leader and team member evaluating emergency preparedness programs, drills and exercises. Responsibilities included leading teams of up to eight technical experts, briefing senior utility management, and development of reports.

Emergency Plan Implementation. As an operator and certified SRO, Mr. Moody received emergency preparedness training and implemented the training during drills and exercises. In addition, he also participated in commercial nuclear power plant exercises and drills in the offsite dose assessment area in the State of Michigan emergency operations center.

Supervisor, Emergency Preparedness. Following the accident at TMI, Mr. Moody developed and tested the State of Michigan's Nuclear Facility Emergency Plan. Other responsibilities included supervision of the radiological protection portion of the State's emergency preparedness program, participating in emergency preparedness seminars, staff training, and drill and exercise participation.

Expertise outside the Emergency Preparedness Area. While at INPO for over 12 years, Mr. Moody evaluated U.S. and international commercial nuclear plant operations in the areas of radiological protection, operating experience, corrective action and training. In addition, Mr. Moody has extensive experience teaching root cause courses and conducting root cause investigations.

Documents Related to Emergency Preparedness. Mr. Moody was directly involved in the development of the following documents:

INPO, "Maintaining Emergency Preparedness Manual"
INPO, "Dose Assessment Manual"
INPO, "Analysis of 1990 Significant Events"
NUMARC/NESP-008, "Analysis of Dose Models for Accidental Airborne Radioactive Releases"

STATEMENT OF PROFESSIONAL QUALIFICATIONS OF CLIFFORD G. MUNSON

CURRENT POSITION

Senior Geophysicist
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission

Since joining the NRC in 1995, Dr. Munson has been involved in projects covering a diverse set of seismic related issues. His professional experience includes basic and applied research, and regulatory compliance assessments. His areas of expertise cover a broad spectrum of areas related to the geosciences.

PROFESSIONAL INTERESTS

Seismic Source Characterization
Seismic Ground Motion Modeling
Probabilistic Seismic Hazard Analysis
Site Response Analysis

EDUCATION

B.S.	Brigham Young University, statistics	1987
M.S.	University of Wisconsin - Madison, geophysics	1991
Ph.D.	University of Wisconsin - Madison, geophysics	1995
M.C.E.	Johns Hopkins University, civil engineering	2001

PROFESSIONAL AFFILIATIONS

American Geophysical Union
Seismological Society of America

CURRENT PROJECTS

Seismic and Geologic Site Safety Reviews for Early Site Permits. Lead reviewer for geology, seismology, and geotechnical engineering sections. Three applications for an Early Site Permit (ESP) have been submitted to the Nuclear Regulatory Commission.

Standard Review Plan Update. Lead for update of NUREG-0800, "Standard Review Plan For The Review of Safety Analysis Reports For Nuclear Power Plants," in the areas of geology, seismology, and geotechnical engineering.

Regulatory Guide Development. Key participant for development of new regulatory guide for determining performance-based site-specific earthquake ground motion.

KEY PUBLICATIONS

Munson, C.G. and C.H. Thurber (1997). Analysis of the attenuation of strong ground motion on the island of Hawaii, Bull. Seismol. Soc. Of Am., 87, 945-960.

Munson, C.G., C.H. Thurber, Y. Li, and P.G. Okubo (1995). Crustal shear-wave anisotropy in southern Hawaii: Spatial and temporal variations, J. Geophys. Res., 100, 20367-20377.

Munson, C.G., C.H. Thurber, and Y. Li (1993). Observations of shear-wave splitting on the southeast flank of Mauna Loa Volcano, Hawaii, Geophys. Res. Lett., 20, 1139-1142.

STATEMENT OF PROFESSIONAL QUALIFICATIONS OF PAUL F. PRESCOTT

CURRENT POSITION

Senior Operations Engineer
U.S. Nuclear Regulatory Commission
Office of Nuclear Reactor Regulation
Division of Engineering
Quality and Vendor Branch A

EDUCATION

B. S., Marine Engineering, Maine Maritime Academy, 1979

QUALIFICATIONS

Mr. Paul Prescott joined the U.S. Nuclear Regulatory Commission in 1990 and has over 20 years experience in fossil and nuclear plant operations, maintenance, test and inspection activities. Mr. Prescott has been a senior resident inspector and resident inspector at both PWR and BWR reactor facilities. Mr. Prescott holds a United States Coast Guard combined license as a First Assistant Engineer (steam, unlimited horsepower) and Third Assistant Engineer (diesel, unlimited horsepower).

Mr. Prescott's current activities involve technical support in licensee quality assurance program reviews, vendor inspections and new reactor licensing activities. He assists in technical, policy and program development for the implementation of licensee quality assurance programs. He provides decisions, guidance and assistance in the resolution of issues raised as a result of reviews associated with the development of regulatory guidance and issues.

Specific examples of his activities include: 1) development and execution of quality assurance measures applied to early site permit and combined license activities; 2) providing assistance in the development of SECY 03-117, which outlined the staff's position on use of other international quality assurance standards; 3) work on licensee-specific submissions for changes to existing quality assurance programs; 4) membership and participation in ASME codes and standards committees; 5) development of the quality assurance inspection program for new reactors by participation on the Construction Inspection Program Team, and; 6) providing assistance in the development of a review standard for extended power uprates.

STATEMENT OF PROFESSIONAL QUALIFICATIONS OF JOELLE L. STAREFOS

CURRENT POSITION

Senior Project Manager
Division of New Reactor Licensing
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission

EDUCATION

M.P.A.	Master of Public Administration, American University, Washington, DC, 2006
B.S.	Mathematics, University of Massachusetts-Dartmouth, North Dartmouth, MA, 1991
B.S.	Mechanical Engineering, University of Massachusetts-Dartmouth, 1991

QUALIFICATIONS

In 1991, Ms. Starefos joined the NRC in the Region II Office in Atlanta, Georgia. After completing several rotational assignments, including nine months at the Vogtle Electric Generating Plant resident inspectors' office, she qualified as a pressurized water reactor operations inspector. She held numerous positions of increasing responsibility in Region II, including Project Engineer for three commercial reactor sites, Resident Inspector assigned to pressurized water reactor and boiling water reactor plants for nearly seven years, and two Senior Resident Inspector rotational assignments.

In 2002, Ms. Starefos was promoted to Project Manager as a member of the AP1000 design certification project team in the Office of Nuclear Reactor Regulation; within a year she was further promoted to Senior Project Manager for the new reactors effort in NRC Office of Nuclear Regulatory Research (RES). Subsequently, in May of 2004, she was selected as the Technical Assistant to the Director of the Division of Safety Analyses and Regulatory Effectiveness within RES. As the technical assistant, she was responsible for coordination of work associated with the division's budget and operating plan and has been an advisor to the division's Director on project management issues.

Ms. Starefos has been a key contributor in numerous high-profile assignments during her career with the NRC, including work on the Institutionalizing Agency Lessons Learned Task Force 2006, the NRC's Davis-Besse Lessons Learned Task Force in 2002, and the Hatch Augmented Inspection Team in 2000.

Ms. Starefos concurrently earned a Bachelor of Science degree in Mechanical Engineering and a Bachelor of Science degree in Mathematics at the University of Massachusetts-Dartmouth in 1991, and a Master of Public Administration degree at American University in 2006. She began her Federal career with the Department of the Navy and has contributed over 17 years of Federal government service.

AWARDS

Ms. Starefos has received numerous performance and special act awards while working at the NRC. She is also a member of Pi Alpha Alpha, the National Honor Society for Public Affairs and Administration.

STATEMENT OF PROFESSIONAL QUALIFICATIONS OF ALBERT N. TARDIFF

CURRENT POSITION

Security Specialist
U.S. Nuclear Regulatory Commission
Office of Nuclear Security and Incident Response
Division of Security Policy
Reactor Security Branch

EDUCATION

B.S. Chemical Engineering, University of Maryland, College Park, MD, 1985

QUALIFICATIONS

Mr. Albert Tardiff joined the U.S. Nuclear Regulatory Commission in 2000 and has over 20 years experience in chemical/biological physical protection, nuclear material measurements, and nuclear material/facility physical protection. Mr. Tardiff currently serves as a security specialist in the New Reactor Security Team. As part of this assignment, he initiated the development of the cyber security program for the U.S. nuclear power reactor fleet and conducted security-related spent fuel pool studies. Mr. Tardiff was also responsible for the development of the security-related elements of the scope of review for design certification and early site permit applications and is currently helping to develop the scope of review for combined license applications.

Mr. Tardiff is assisting in the development of the new security assessment rule for design certification and combined license applications.

Mr. Tardiff managed a study to identify the physiological effects of blast overpressures and the resultant loss in combat effectiveness.

Mr. Tardiff developed and manages the interagency agreement between the Office of Nuclear Security and Incident Response and the U.S. Army Corps of Engineers. This agreement focuses on the development of blast effects guidance and vehicle threat protection measures. He also participates in the interagency Counter Terrorism Technical Support Office's Technical Support Working Groups (both the Physical Protection and Infrastructure Protection subgroups).

Mr. Tardiff is assisting the International Atomic Energy Agency in the development of the sections of its new Security Series guidance documents dealing with the design and evaluation of physical protection systems to protect against radiological sabotage.

PATENT RECEIVED

Multilayer Protective Gas Mask, patent number 5,181, 506, January 26, 1993

1

2 JUDGE ABRAMSON: Except as indicated,
3 counselor, except as indicated on the changed
4 page which is attached to the front, this is
5 identical to the pre-file testimony which is
6 already in the record?
7 MS. HODGDON: It is.
8 JUDGE ABRAMSON: Thank you.
9 MS. HODGDON: Now, I would like to
10 make a statement regarding Ms. Starefos's
11 testimony.
12 She -- there are several witnesses who
13 prepared -- several persons who prepared
14 testimony who are not present today, and
15 Ms. Starefos as the -- as the sponsor -- as the
16 project manager and therefore who -- whose
17 testimony derives from the staff document, the
18 staff safety document, the Final Safety
19 Evaluation Report.
20 Ms. Starefos would answer any
21 questions directed to them that will need to be
22 answered by them. She's responsible for the
23 document, and if that proves -- if there prove to
24 be questions from persons who are not here that
25 Ms. Starefos doesn't feel comfortable answering,

1 we will answer them in writing.

2 JUDGE ABRAMSON: That will suffice.

3 MS. HODGDON: Then also I think in

4 connection with this panel I would like to

5 identify an exhibit, and that exhibit is Exhibit

6 No. 1 which will be the Clinton Early Site Permit

7 Hearing Safety Review which are the slides --

8 which is -- constitutes the slides that these

9 witnesses will use in giving their presentations,

10 so I've identified that slide -- these slides,

11 and it's marked Staff's Exhibit 1.

12 JUDGE ABRAMSON: So are you moving for

13 that?

14 MS. HODGDON: Yes, I now move that the

15 six of them be accepted into the record as

16 evidence.

17 JUDGE ABRAMSON: Any objection?

18 MR. FRANTZ: No objection.

19 JUDGE ABRAMSON: Fine. So be it.

20 MS. HODGDON: Ms. Starefos will begin

21 the staff's proceedings.

22 MR. FRANTZ: Before we begin, I'm

23 sorry, does the staff intend to offer the SER

24 into evidence or has the board already considered

25 that to be --

1 JUDGE ABRAMSON: The SER is in the
2 record, need not be offered into evidence, nor
3 the FEIS.
4 MR. FRANTZ: Thank you.
5 JUDGE ABRAMSON: I assume you mean
6 FSER?
7 MS. HODGDON: Yes, FSER and the FEIS
8 we understand is already in the record, and we
9 are aware that it's our obligation to present
10 those, but since they're already in --
11 JUDGE ABRAMSON: They're in the
12 record. We see no need to do anything further.
13 MR. FRANTZ: Yes. Thank you.
14 JUDGE ABRAMSON: With respect thereto.
15 MS. HODGDON: May Ms. Starefos,
16 proceed?
17 JUDGE ABRAMSON: She may. Carry on.
18
19 JOELLE STAREFOS
20 called as a witness, after having been first duly
21 sworn, was examined and testified as follows:
22
23 THE WITNESS: Good afternoon. My name
24 is Joelle Starefos. I'm a project manager with
25 the NRC Office of New Reactors. I will begin the

1 staff's presentation of the safety review of
2 Exelon Generation Company's early site permit
3 noting that the EGC/ESP site is located
4 approximately six miles east of the city of
5 Clinton in East Central Illinois.
6 The NRC staff performed a technical
7 review of the Exelon Generation Company
8 application and concluded that the EGC/ESP site
9 characteristics comply with the requirements of
10 10 CFR Part 100 with the limitations and
11 conditions proposed by the staff in the SER --
12 the FSER.
13 The FSER is documented as NUREG-1844.
14 Taking into consideration the site criteria
15 contained in 10 CFR Part 100 a reactor, or
16 reactors, having characteristics that fall within
17 the parameters for the site and which meet the
18 terms and conditions proposed by the staff in
19 this SER can be constructed and operated without
20 undue risks to the health and safety of the
21 public. Issuance of the requested ESP will not
22 be inimical to the common defense and security or
23 to the health and safety of the public.
24 Exelon's ESP application was submitted
25 on September 25th, 2003, and contained a

1 description of the site and nearby areas that
2 could affect or be affected by a nuclear power
3 plant located on the site. It also contained a
4 safety assessment of the site on which the
5 facility would be located including an analysis
6 and evaluation of the major structures, systems,
7 and components of the facility, those that bear
8 significantly on the acceptability of the site,
9 and it contained the proposed major features of
10 an emergency plan.
11 The NRC standards for review of an ESP
12 application are outlined in 10 Code of Federal
13 Regulations Section 52.18. The NRC review
14 standard for processing applications for early
15 site permits is RS-002.
16 This review standard draws from the
17 previously established -- previously published
18 NUREG-0800 which is the standard review plan for
19 the review of safety analysis reports for nuclear
20 power plants as well as from NUREG-1555 which is
21 the standard review plan for environmental
22 reviews for nuclear power plants.
23 The areas addressed on this and the
24 next slide were within the scope of the NRC
25 staff's safety evaluation for this early site

1 permit.

2 For the topics on the first slide I

3 will provide an overview of the staff conclusions

4 noting specific permit conditions where

5 appropriate. For the topics on the next slide I

6 will note specific permit conditions where

7 appropriate and introduce the reviewer

8 responsible for this review who will provide no

9 review of their conclusions following my portion

10 of the presentation.

11 Regarding geography and demography of

12 the site the staff concluded that the applicant's

13 population data and population distribution are

14 acceptable and meet the applicable regulations.

15 The staff concluded that the applicant's

16 exclusion area is acceptable and meets the

17 applicable requirements subject to the limitation

18 and conditions identified in this SER.

19 Two such permit conditions were

20 identified that provide reasonable assurance

21 that: first, an ESP provides for a control of

22 the exclusion area; and, two, or second, that the

23 ESP holder demonstrates that it will have

24 authority to perform the activities authorized by

25 10 CFR 52.25 should it choose to do so and the

1 corresponding right to implement the site redress
2 plan.
3 Regarding nearby industrial,
4 transportation, and military facilities, the
5 staff reviewed the nature and extent of
6 activities involving potentially hazardous
7 materials at industrial, military, and
8 transportation facilities near the ESP site to
9 identify any potential hazards that might pose an
10 undue risk to the proposed facility in this ESP
11 -- this ESP application and concluded that the
12 applicant has identified all potential
13 hazardous -- potentially hazardous activities on
14 and near the site.
15 The staff concluded that the site
16 location is acceptable with regard to potential
17 accidents that could affect a nuclear power plant
18 based on the applicant's Plant Parameter Envelope
19 that might be constructed on the site and site
20 location meets the applicable requirements.
21 The staff did independent analysis as
22 well as review of the applicant's assessment of
23 aircraft hazards at the site and concluded that
24 aircraft hazards at the proposed ESP site pose no
25 undue risks to the health and safety of the

1 public, and that the proposed site is acceptable
2 for siting a plant, or plants, of the type
3 specified by the applicant.
4 Regarding industrial security, the
5 staff concluded that the ESP site characteristics
6 would allow an applicant for a combined license
7 or construction permit to develop adequate
8 security plans and measures for reactor, or
9 reactors, that the applicant might construct and
10 operate at this ESP site.
11 Regarding ESP quality assurance
12 measures, the staff reviewed the applicant's QA
13 measures and those of its primary contractor and
14 concluded in part that they have implemented an
15 acceptable organization, that these measures form
16 an acceptable QA program, that the contractor
17 implemented acceptable design controls, that they
18 have implemented acceptable controls for purchase
19 of material, equipment, and services, that they
20 have implemented an acceptable corrective action
21 program, that they have implemented an acceptable
22 level of controls for QA records, and that they
23 have implemented acceptable audit controls, all
24 of which meet the applicable guidance and help
25 provide reasonable assurance that any information

1 that is derived from the ESP activities that
2 could be used in the design and/or construction
3 of the systems, structures, and components
4 important to safety will provide satisfactory
5 performance of such systems, structures, and
6 components once they are in service.
7 Regarding radiological effluent
8 release dose consequences from normal operation
9 the staff concluded that the applicant provided
10 adequate information to provide reasonable
11 assurance that it would control, monitor, and
12 maintain radioactive gases and liquid effluents
13 and solid wastes from the ESP facility within the
14 regulatory limits and maintain them -- maintain
15 them ALARA, or as low as is reasonably
16 achievable, levels in accordance with the
17 effluent design objectives set forth in the
18 regulations.
19 Regarding site hydrology, three permit
20 conditions were identified related to hydrology
21 generally necessitating that the hydrologic
22 radiant always points inwards into the radwaste
23 holding and storage facility requiring that the
24 radwaste facility for a future reactor be
25 designed for features to preclude accidental

1 liquid releases and requiring that groundwater
2 monitoring programs be implemented and be kept in
3 place for the life of the ESP facility including
4 its decommissioning.
5 Mr. Goutam Bagchi, the hydrology
6 reviewer for this ESP site, will discuss the
7 staff's conclusions later in this presentation.
8 Regarding site geology, seismology,
9 and geotechnical engineering one permit condition
10 was identified for geology, seismology, and
11 geotechnical engineering, because portions of the
12 upper 60 feet of the soil are susceptible to
13 liquefaction.
14 These soils will be required to be
15 either be removed or replaced or improved.
16 Dr. Clifford Munson, reviewer of the geology,
17 seismology, and geotechnical engineering portion
18 of this ESP site, will discuss the staff's
19 conclusions later in the presentation.
20 Regarding site meteorology, Mr. Brad
21 Harvey, the meteorology reviewer for the ESP
22 site, will discuss the staff's conclusions later
23 in the presentation.
24 Regarding accident analysis, Mr. Jay
25 Lee, a senior health physicist with the NRC, will

1 discuss the staff's accident analysis review for
2 this site later in the presentation.
3 And regarding emergency planning,
4 Mr. Robert Moody will discuss the staff's review
5 of emergency planning as it applies to this ESP
6 site later in this presentation.
7 10 CFR Parts 52 and 100 that apply to
8 an ESP do not require an ESP applicant to provide
9 specific design information at the time that the
10 ESP application is made. However, some design
11 information may be required to address 10 CFR
12 Section 52.17(a)(1) which calls for, quote, an
13 analysis and evaluation of the major structures,
14 systems, and components of the facility that bear
15 significantly on the acceptability of the site
16 under radiological consequence evaluation factors
17 identified in Section 50.34(a)(1).
18 Q. This slide is provided to show the
19 relationship of the early site permit within the
20 new reactor licensing process. As you can see,
21 the ESP output is a set of site characteristics.
22 To develop those site characteristics the staff
23 needed some design information. Because the
24 licensee had not identified a specific design,
25 they provided a list of postulated design

1 parameters referred to as the Plant Parameter
2 Envelope.
3 Design characteristics will differ
4 depending upon the design selected. In this case
5 I have represented three design -- different
6 designs each with different characteristics.
7 When different designs are considered
8 together, there would be a limiting set of design
9 parameters that would envelope or bound the
10 selected designs.
11 This describes the Plant Parameter
12 Envelope, or PPE, that may be used the early site
13 permit application. The ESP application states
14 that the PPE is a set of design parameters that
15 are expected to bound the characteristics of a
16 reactor, or reactors, that might later be
17 deployed at the site. This means that the design
18 characteristics of potential designs would be no
19 more demanding from a site suitability
20 perspective than the bounding design parameters
21 listed in the PPE tabulation.
22 The complete set of plant parameter
23 values describes the site facility interface.
24 The staff reviewed PPE values -- the PPE values
25 and found them to be reasonable and identified

1 certain PPE values as bounding parameters, ones
2 that necessarily depend on a site characteristic.
3 JUDGE BARATTA: Could I interrupt you?
4 THE WITNESS: Sure.
5 JUDGE BARATTA: How did you determine
6 that they were reasonable? Could you walk me
7 through the process that you used?
8 THE WITNESS: Perhaps I should turn to
9 one of my reviewers who could describe their
10 process and how they did this while they were
11 doing their review.
12 Would you be willing to do that to
13 answer his question for me, Brad?
14 BRAD HARVEY: Brad Harvey,
15 meteorological review.
16 In my case I just look at the PPEs
17 that may have an impact on any of the site
18 characteristics that I was preparing for
19 inclusion in the early site permit, and actually
20 in my case there weren't any PPE values that were
21 really applicable, because the applicant made
22 conservative assumptions, and in particular doing
23 the accident dispersion analysis assuming that
24 all releases are at ground level, and there was
25 no definitive building size set to zero to

1 calculate the effects that would affect
2 atmospheric dispersion.
3 JOELLE STAREFOS: Thank you, Brad.
4 Did that answer the question?
5 JUDGE BARATTA: Yes.
6 JUDGE ABRAMSON: Have any of your
7 folks looked at the radiological releases from
8 the various plant designs that the applicant
9 used?
10 JOELLE STAREFOS: Jay, would you be
11 willing to address that, please?
12 JAY LEE: Again, my name is Jay Lee.
13 I'm the senior health physicist.
14 Is your question meant during normal
15 operation you meant the accident?
16 JUDGE ABRAMSON: I'm looking at the
17 accident releases that define the Plant Parameter
18 Envelope.
19 JAY LEE: Yes, your question is how we
20 arrived at such PPE values to be acceptable?
21 JUDGE ABRAMSON: Yes. How did you
22 determine those were reasonable values?
23 MR. LEE: Okay. Applicant reviewed
24 seven reactor designs: five light water reactors
25 and two gas cooled reactors, and the applicant

1 provided preliminary primarily the source term
2 for the AP1000 and ABWR.
3 Like the applicant stated this
4 morning, they did have a couple of source for
5 ESBWR and ACR700 just for LOCA, loss of coolant
6 accidents, so those were the study point.
7 So what the staff did was we look at
8 the each of seven reactor designs where
9 information is available. First we look at the
10 advanced boiling water reactor which is certified
11 that all information were there.
12 Second, we also look at the
13 Westinghouse AP1000 reactor. We had all design
14 information, certified information are found in
15 the documents, and we have those informations.
16 For the third reactor, ESBWR, which is
17 currently in our specific view a standard reactor
18 design certification review we do have all
19 documented information on hand.
20 At the time when the applicant
21 prepared their SSAR they had preliminary
22 information on this ESBWR source term, but we had
23 more information after that.
24 Then for the fourth reactor -- excuse
25 me, fifth reactor which IRIS, International

1 Reactor Innovative & Secure this is Westinghouse
2 reactor. It's one thousand megawatt which is
3 smaller reactor.
4 We didn't have a pre-application
5 meeting with Westinghouse. We did have some
6 preliminary information from Westinghouse. The
7 applicant may not have that information, but NRC
8 based on this pre-application meeting we did have
9 some preliminary information on the source term.
10 The remaining two gas cooled reactors,
11 the one of them is gas turbine modular helium
12 reactor, this is graphite modulated helium
13 cooled, six hundred megawatt reactor, we had --
14 NRC staff had experience with the review of four
15 A-frame gas cooled reactors several years back,
16 so we did have in our file the source term
17 information.
18 JUDGE ABRAMSON: I'm sorry. You did
19 or you did not?
20 JAY LEE: Did. We did have. And then
21 last the reactor is PBMR, which is pebble bed
22 modular reactor. This is also graphite modulated
23 and helium cooled, only 400 megawatt.
24 This particular reactor design we did
25 have again pre-application meeting with a vendor.

1 We had several meetings. Also, we did have
2 preliminary information regarding source term and
3 the releases from this design. These are all
4 preliminary non-documented information, so these
5 are then we had all the accident source term we
6 had at hand, so we heavily relied on the two
7 reactor designs, just like EPIC, the ABWR and the
8 AP1000, which we reviewed, accepted, certified,
9 and they are documented in the NUREG reports that
10 they are available in ADAMS in NRC website.
11 So these are based on our
12 determination how these PPE values are reasonable
13 and acceptable, but, however, I would like to --
14 if you don't mind, I would like to read you on
15 the record one paragraph I wrote regarding this
16 particular PPE value. I'd like to read this for
17 the record.
18 While the staff has not reviewed the
19 specific designs other than ABWR and the AP1000
20 in detail, the staff believes that any conclusion
21 drawn regarding the site acceptability based on
22 AP1000 and ABWR designs are likely to be valid.
23 For the other reactor designs, the
24 applicant has considered whether or not such a
25 design, such a design meant other than AP1000 and

1 ABWR. Such designs are in fact bounded by this
2 DBA analysis will be subject to staff's review
3 during its consideration of any COL or
4 construction permit application that might be
5 filed with respect to construction and operation
6 of our reactor design at the proposed ESP site.
7 So responding to your question that we
8 gathered the information as much as we can, and
9 with that available data we concluded that
10 proposed PPE values are acceptable for evaluating
11 sites with availability for the ESP site.
12 JOELLE STAREFOS: May I correct that?
13 Actually, it's a reasonable site for the proposed
14 site. And, if I may, let me give a little
15 discussion of how this PPE works.
16 JUDGE ABRAMSON: Let me just ask a
17 question before you go down that path. I want to
18 make sure I understand what you're saying. You
19 looked at the certified designs for the AP1000
20 and ABWR?
21 JOELLE STAREFOS: Yes.
22 JUDGE ABRAMSON: And you looked at the
23 source terms for those?
24 JAY LEE: Right.
25 JUDGE ABRAMSON: And having looked at

1 that, what did you do to reach the conclusion
2 that what was proposed by the applicant was
3 reasonable? You got some numbers from these two
4 certified designs.
5 What did you do to reach the
6 conclusion? What's the next step? How did you
7 get from A to D which is that the numbers
8 proposed by the applicant were reasonable?
9 MR. LEE: There's two steps involved.
10 The first step is certification review itself.
11 We did review AP1000.
12 JUDGE ABRAMSON: Yes, we understand
13 that. You've done the review. You've got some
14 numbers.
15 Now, how do you get to the -- from the
16 fact that you've got some numbers based on your
17 own review that you've looked at to the
18 conclusion that what the applicant proposes, the
19 numbers proposed by the applicant are reasonable?
20 JAY LEE: We just perform the
21 independent -- the confirmatory evaluation, how
22 the licensee derived from certified numbers to
23 their number using site specific atmospheric
24 dispersion factors.
25 For example in case of the AP1000 they

1 simply used the ratio of site characteristic --
2 excuse me, site specific atmospheric dispersion
3 factors over postulating atmospheric dispersion
4 factor in a certified design control document, so
5 this is strictly just a ratio, and we checked
6 their ratio value.
7 JUDGE ABRAMSON: So you confirmed
8 their computation?
9 JAY LEE: Yes. That computation is
10 rather simple. It's just simply --
11 JUDGE ABRAMSON: I understand. We
12 understand. Thank you.
13
14 CONTINUED TESTIMONY OF JOELLE STAREFOS:
15
16 THE WITNESS: Your Honor, if I may
17 follow-up on what I was discussing, we didn't do
18 a determination of acceptability of the PPE. Our
19 determination we used professional judgment to
20 determine whether or not those PPE values were
21 reasonable, and I'll hopefully clear that up on
22 my next slide, if I could move forward?
23 JUDGE BARATTA: Before you go on to
24 that, though, I thought your last bullet there
25 where it said the staff identified certain PPE

1 values as bounding parameters, I thought the PPE
2 itself was bounding.
3 THE WITNESS: I think this again maybe
4 goes back to the interpretation of the word
5 bounding and what that really means here.
6 In this case the term bounding means
7 that those particular PPEs have been identified
8 in Appendix A to the FSER and identified as being
9 very pertinent and necessary to the site
10 characteristics that we've determined and in this
11 case identified as site characteristics.
12 There are in this case three PPEs that
13 are listed in a table and then there's two other
14 additional figures that are in the back as PPE
15 values that we consider bounding. Those would be
16 necessary down the road to make sure that they
17 bound a reactor design that comes in under COL
18 application because the site characteristic is
19 tied so closely with it, and so in fact we did
20 identify that as a bounding PPE value.
21 JUDGE ABRAMSON: So there are some
22 elements of the Plant Parameter Envelope that are
23 not relevant for determination at the COL stage
24 even though they're part of the envelope? In
25 other words, you expect them to have no bearing

1 whatsoever on the COL application?

2 THE WITNESS: Let me turn briefly to

3 this next slide, and I'll walk through a little

4 discussion of how we see the design

5 certification, early site permit, and combined

6 license working together here.

7 Basically, as I said earlier, the

8 early site permit we're determining what those

9 site characteristics are here in this process, in

10 the FSER that's been issued by the staff.

11 Those design parameters, or PPE, are a

12 reasonable set of values that we -- since we

13 didn't have a particular design certification and

14 an approved set of design characteristics which

15 would have been the output of a design

16 certification review, we estimated what -- or we

17 accepted what the licensee estimated to be a

18 bounding set of values.

19 As long as they were a reasonable set

20 of values, we would confirm later in the combined

21 license space whether or not the design

22 certification characteristics, the design

23 characteristics that will be identified in the

24 Final Safety Analysis Report -- or evaluation

25 report, excuse me, Your Honor, Final Safety

1 Evaluation Report for a specific approved design
2 or design -- certified design, and we will take
3 those values and compare them to what the design
4 parameters are. If the design parameters in this
5 case envelope what those design characteristics
6 are coming out of the design certification
7 review, we know that that design can be put on
8 that site.
9 And, likewise, our site
10 characteristics have been identified in the early
11 site permit, and in a combined license space
12 we'll take those site characteristics and we'll
13 compare those to what I'll call site parameters
14 that were generally determined to be reasonable
15 during the design certification process, because
16 there were certain siting issues or items that we
17 were interested in that supported our
18 determination of design certification.
19 So later when we get into this
20 combined license portion of the review, we'll
21 have a design certification that will be
22 presented in this case with an ESP -- a site
23 permit or an ESP set of documents, and those
24 comparisons will be made at combined license.
25 Now, also in COL space we'll look at

1 the overall arching, the overarching set of
2 requirements that the NRC has to find to allow a
3 plant to operate or to license a plant, and we'll
4 look at that overarching set, and we'll look back
5 at any other previously approved work that's been
6 done that can be pulled up and considered already
7 acceptable.
8 What we're doing here in the early
9 site permit portion of this licensing review is
10 we're identifying the siting portions of that
11 license that we can look at now separate and
12 distinct from what needs to be done with the
13 design, so as you could tell with our FSER when
14 you look at it, it looks as if it skips chapters
15 and later this portion of the SSAR that the
16 applicant has submitted will be supplemented for
17 the remaining portions in combined license space
18 and we'll ensure that that -- the Site Safety
19 Analysis Report is complete and adequate to be
20 licensed and determinate as the design basis for
21 that plant in the future going forward, and what
22 the applicant will do would be to submit their
23 SSAR and refer back to issues that have been
24 already addressed or resolved in early site
25 permit period and refer to items that have been

1 resolved in a design certification, and they will
2 ensure that it supplements -- that they
3 compliment or supplement those reviews with the
4 remaining set of information that's necessary to
5 meet all of our regulations and licensing for a
6 combined license.
7 Does that help a little bit?
8 JUDGE ABRAMSON: Well, other than
9 giving us something we already knew. Carry on.
10 JUDGE BARATTA: I think your choice of
11 words there, looking at what's in the appendix
12 there, the use of bounding is what was confusing.
13 I think what we're really talking
14 about is, like I say, the particularly relevant
15 parameters that have a large impact on whether or
16 not the site is suitable. I think that's what
17 you're referring to as bounding, and as I'm
18 looking at them they are things such as the water
19 temperature and amount of water that's required
20 which obviously would relate to the site.
21 I think it was just terminology that
22 was an issue there.
23 Thank you.
24 THE WITNESS: Okay. Please let me
25 introduce Mr. Goutam Bagchi who will present the

1 conclusions of the staff's hydrology review.

2

3 GOUTAM BAGCHI

4 called as a witness, after having been first duly

5 sworn, testified as follows:

6

7 THE WITNESS: Good afternoon, my name

8 is Goutam Bagchi. I'm a senior level adviser in

9 the Office of Nuclear Reactor Regulation.

10 The Pacific Northwest National

11 Laboratory assisted the staff in the hydrology

12 review, and this is the reason why Mr. Lance Vail

13 is sitting on my right, and I wanted to recognize

14 him so that any detailed issues that I might not

15 be able to answer I would be assisted by

16 Mr. Vail.

17 I'm going to discuss the regulatory

18 criteria, the hydrologic setting that is

19 important for the site suitability determination,

20 the staff review activities in the hydrology area

21 and staff conclusions in the Clinton early site

22 permit application.

23 The regulatory criteria that apply

24 here are described in this slide, and I have

25 given a little more detail. This is because

1 hydrology behavior is identified here.

2 Item 5 on the first bullet deals with

3 the type of cooling systems intakes and outflows

4 related to the facility, and item 6 deals with

5 seismic, meteorological, geological, and

6 hydrological considerations. Maybe some of these

7 details the board doesn't need to go through,

8 then I will skip the details on this slide.

9 JUDGE ABRAMSON: I think we can find

10 the regulations. Thank you.

11 THE WITNESS: This is a broad overview

12 of the primary elements of the hydrologic setting

13 that the staff looked at: site elevation and

14 flooding hazard, upstream and downstream

15 reservoirs, hydrologic characteristics that

16 affect the plant design, that involve the maximum

17 flood elevation and coincident wave action. This

18 can lead to inundation and flooding of equipment

19 and so forth.

20 Ultimate heat sink adequacy related to

21 sediment deposition and icing, this can lead to

22 reduction in volume of the ultimate heat sink;

23 creation of some kind of an ice dam upstream and

24 then aquatic upstream of the plant and can affect

25 the safety caused by icing.

1 Groundwater elevation, that's relevant
2 to buoyancy and underground water intrusion
3 concerns, groundwater pathways, consideration of
4 radioactive contamination due to passage through
5 groundwater pathways.
6 Local site area flooding, that's
7 related to the local intense precipitation.
8 Flooding -- that's another flooding source.
9 The staff activities included the site
10 visit to become familiar with the site, specific
11 conditions that bear on the site safety, and
12 independent staff verification analyses also
13 included the reservoirs upstream of the site,
14 near the site, lake icing, the Clinton Lake
15 watershed area, probable maximum precipitation,
16 local probable maximum precipitation, probable
17 maximum flood, waves induced by sub-aerial
18 landslides like slope failure in this case; low
19 water level -- drought conditions and forced and
20 induced evaporation.
21 The staff conclusions are that the ESP
22 site grade elevation is above the maximum
23 flooding elevation. There is reasonable
24 assurance of the adequacy of the ultimate heat
25 sink if one is needed for the selected reactor

1 design.

2 Hydrologic site characteristics have

3 been identified. Hydrology permit conditions are

4 specified. Ms. Starefos went over there.

5 Hydrologic COL action items are identified, and

6 applicable regulations have been met.

7 Thank you.

8 JUDGE ABRAMSON: Let me ask you a

9 question about your final slide, Mr. Bagchi.

10 THE WITNESS: Yes, sir.

11 JUDGE ABRAMSON: Under the hydrologic

12 permit conditions you've indicated that it's a

13 permit condition that the hydraulic gradient is

14 towards the radwaste facility. That's a permit

15 condition that's imposed?

16 THE WITNESS: It is a permit condition

17 that is imposed, Your Honor, because the

18 hydraulic gradient already exists that way. We

19 wanted to make sure that any potential release of

20 any radwaste not come back to the lake.

21 JUDGE BARATTA: The discussion that I

22 saw really centered on the facility itself, the

23 radwaste facility. It did not mention any inner

24 connection with the power block, for example,

25 such as piping which might transport radwaste.

1 Is it anticipated that there would be such
2 piping?
3 THE WITNESS: There would be no piping
4 for radwaste going through the site.
5 JUDGE BARATTA: Going from the power
6 block to the --
7 THE WITNESS: From the power block.
8 JUDGE BARATTA: So all of the radwaste
9 would be transported in containers from the other
10 areas of the plant to the treatment facility
11 then?
12 THE WITNESS: That is my
13 understanding. The radwaste facility design must
14 preclude release of any kind. It's designed in
15 such a way that it is a design that is high
16 elevation and so on, but, anyway, permit
17 condition is such that that is precluded, and
18 it's feasible.
19 JUDGE BARATTA: Well, I -- when
20 reading through the -- it seemed like that
21 applied to the treatment facility itself. It did
22 not apply to any systems that might be used to
23 transport the liquid radwaste to that facility.
24 That's what I get -- became concerned about.
25 Now, I thought typically at plants

1 such as this there is piping that carries liquid
2 waste from one location of the plant to the
3 treatment facility, and I didn't see anything
4 addressed dealing with that. That's what --
5 THE WITNESS: With a permit condition
6 like that the design has to be such that they're
7 all in an area where such a transport would not
8 lead to a release. For example, AP1000, it's all
9 within the nuclear avenue.
10 JUDGE BARATTA: I still don't see that
11 from what's in the SSAR and what's in the --
12 JUDGE ABRAMSON: Well, the question is
13 what is the meaning of the permit condition?
14 You're telling us that the permit condition in
15 this case will require that there be no mechanism
16 that permits hydrologic transmission of radwaste
17 away from the radwaste facility. Is that
18 accurate?
19 THE WITNESS: That is accurate, Your
20 Honor.
21 JUDGE ABRAMSON: No mechanism.
22 JUDGE BARATTA: All right. I don't
23 see it, but...
24 JUDGE ABRAMSON: When we write our
25 ruling on this we'll interpret that permit

1 condition to be exactly that.

2 Does the applicant have any comment on

3 this?

4 MR. FRANTZ: No, I would have to

5 confer with my experts before I can comment.

6 JUDGE ABRAMSON: Maybe you can do that

7 sometime and get back to us.

8 MR. FRANTZ: Yes.

9 THE WITNESS: If there are no other

10 questions, Your Honor, the next presenter --

11 JUDGE ABRAMSON: I'm sorry. I think

12 that Dr. Baratta may have one more. Let's give

13 him a second.

14 JUDGE BARATTA: Give me a second here.

15 Why don't you go on?

16 JUDGE ABRAMSON: Okay. Let's move on.

17 THE WITNESS: The next presentation is

18 by Dr. Clifford Munson on geology, seismology,

19 and geotechnical engineering.

20

21 CLIFFORD MUNSON

22 called as a witness, after having been first duly

23 sworn, testified as follows:

24

25 THE WITNESS: I'm Dr. Clifford Munson

1 of the Office of Nuclear Reactor Regulation, and
2 I was the principal reviewer of the geology,
3 seismology, and geotechnical engineering sections
4 of the Exelon ESP application.
5 I will first cover the applicable
6 regulation and regulatory guidance and then
7 describe the staff's review of the geology,
8 vibratory ground motion, site subsurface
9 materials, and the staff's main conclusions in
10 these areas.
11 10 CFR 100.23 describes the geologic
12 and seismologic siting criteria. Part C of
13 100.23 requires an evaluation of the geological,
14 seismology, and engineering characteristics ever
15 the site and region, and Part D of 100.23
16 requires the determination of the safe shutdown
17 earthquake ground motion for the site.
18 Part D of 100.23 also requires the
19 determination of the potential for surface
20 deformation at the site.
21 Guidance for meeting 10 CFR 100.23 is
22 provided in Regulatory Guide 1.165,
23 identification and characterization of seismic
24 source and determination of safe shutdown
25 earthquake ground motion.

1 The staff evaluated the description of
2 the regional, geologic history, structure, and
3 tectonics, and concluded that the applicant
4 provided a thorough description and
5 characterization of the potential seismic
6 sources.
7 The staff also evaluated the
8 description of the local site geology including
9 the applicant's survey of local streams for
10 evidence of soil liquefaction which may indicate
11 the possibility of a pre-historic moderate to
12 large earthquake.
13 The staff concluded that the
14 applicant's investigation was thorough and
15 adequately demonstrated the absence of
16 significant evidence for a local pre-historic
17 earthquake.
18 The staff reviewed in detail the
19 applicant's seismic source models for the three
20 large area seismic source zones which are the New
21 Madrid Seismic Zone, the Wabash Valley Seismic
22 Zone, and the Central Illinois Seismic Zone.
23 For each of these source zones the
24 staff ensured that the applicant used the more
25 recent magnitude estimates, recurrences, and

1 ground motion models to develop the site seismic
2 hazard. The staff also reviewed the adequacy of
3 the controlling earthquakes for the site as well
4 as the site response analysis.
5 To determine the safe shutdown
6 earthquake ground mocks or SSE the applicant used
7 ASCE standard 43-05 Entitled Seismic Design
8 Criteria For Structures, Systems, and Components
9 in Nuclear Facilities.
10 In order to thoroughly review this new
11 approach the staff formed an advisory task group
12 of senior geophysicists and civil engineers from
13 the NRC offices of NRR, research, and NMSS, and
14 took an additional six months of review time.
15 The task group evaluated the model and
16 assumptions underlying the approach including a
17 detailed derivation of the factors used to
18 develop the SSE. The staff also focused on the
19 adequacy of the performance goal and performed an
20 independent confirmation of the SSE.
21 The staff visited the Clinton ESP site
22 to observe the geotechnical field investigations.
23 Once we received the ESP application, the staff
24 reviewed the properties of the subsurface soil
25 and rock and verified the adequacy of the field

1 investigations and laboratory testing. The staff
2 also confirmed the similarity between the
3 subsurface material underlying the Clinton Power
4 Station and ESP site.
5 In conclusion, the staff found that
6 the applicant provided a thorough
7 characterization of the regional and local
8 geology and seismology. We found that the
9 applicant appropriately characterized the seismic
10 sources for the SSE. The staff concluded that
11 ASCE standard 43-05 provides an acceptable
12 alternative to Regulatory Guide 1.165 for
13 determining the SSE. The ESP site is acceptable
14 from a geological and seismological standpoint,
15 and the applicable regulations have been met.
16 As a point of clarification, the staff
17 notes that as pointed -- as identified by the
18 board, figure 2 in Appendix A of the SER is an
19 earlier version of the horizontal and vertical
20 SSE. The correct horizontal and vertical SSE is
21 shown in figure 2.5.2-16 of the SER -- of the
22 FSER, and so this figure will be corrected for
23 any further use.
24 JUDGE ABRAMSON: Well, we'd like to
25 observe and note for the staff that the section

1 in the FSER on seismology was very well done.
2 It's an example that the staff should use in
3 future SERs.
4 THE WITNESS: I will now introduce
5 Brad, Mr. Brad Harvey, who will cover the site
6 meteorology.
7
8 BRAD HARVEY
9 called as a witness, after having been first duly
10 sworn, testified as follows:
11
12 THE WITNESS: Hello, my name is Brad
13 Harvey. I am a physical scientist in NRC's
14 Office of Nuclear Reactor Regulation. I was
15 responsible for the review of site meteorology.
16 The NRC reactor siting regulation, 10
17 CFR Part 100, discusses two types of
18 meteorological site characteristics that should
19 be identified: one, climatic site
20 characteristics and; two, atmospheric dispersion
21 site characteristics.
22 Regarding climatic site
23 characteristics 10 CFR 100.20(c)(2) requires that
24 the meteorologic characteristics that may have an
25 impact upon plant design such as maximum probable

1 wind speed and precipitation are be identified.

2 Likewise, 10 CFR 100.21(d) states that

3 site characteristics must be evaluated and

4 established such that potential threats from the

5 physical characteristics for the site will pose

6 no undue risks to the facility to be located at

7 the site.

8 Regarding the atmospheric dispersion

9 site characteristics 10 CFR 100.21(c) requires

10 that atmospheric dispersion site characteristics

11 be established in order to demonstrate that:

12 one, radiological dose consequences of postulated

13 accidents meet regulatory criteria at the

14 exclusion area boundary and at the outer boundary

15 of the low population zone; and, two,

16 radiological effluent limits associated with

17 normal operation can be met for any individual

18 located off site.

19 Five types of climatic site

20 characteristics were identified for inclusion in

21 the Clinton early site permit: ambient

22 temperature and humidity, basic or straight line

23 wind speed, tornado, winter precipitation, and

24 ultimate heat sink.

25 The ambient air temperature and

1 humidity site characteristics include maximum and
2 minimum dry bulb temperatures and maximum light
3 bulb temperatures. These site characteristics
4 will be used at the COL stage to evaluate the
5 adequacy of the design of heating, cooling, and
6 humidity control systems.
7 The staff verified the ambient air
8 temperature and humidity site characteristics by
9 comparing the resulting values with design
10 criteria published by the National Climatic Data
11 Center.
12 The basic or straight line wind speed
13 site characteristic will be used at the COL stage
14 to evaluate the adequacy of the design of
15 buildings and other structures to resist wind
16 loads. The staff verified the straight line wind
17 speed site characteristics by comparing the
18 resulting value with design criteria published by
19 the American Society of Civil Engineers.
20 The tornado --
21 JUDGE ABRAMSON: Help me understand
22 this. You're characterizing the site by saying
23 here's a wind speed, and then you're comparing it
24 to a design criteria. It seems to me to be a
25 disconnect.

1 Shouldn't you be comparing it to some
2 data rather than to a design characteristic?
3 THE WITNESS: The site characteristics
4 that we're proposing will eventually be used for
5 design, adequacy of design.
6 JUDGE ABRAMSON: Yes, but how do you
7 verify that you've got the right wind speed that
8 you're using as a site characteristic? That's
9 the question.
10 THE WITNESS: The American Society of
11 Civil Engineers has published in their standard
12 AEI/ASCE 702, minimum design loads for building
13 and other structures, basically what they call a
14 basic wind speed which is based on data that
15 they've reviewed throughout the continental U. S.
16 JUDGE ABRAMSON: Is it applied to the
17 Clinton area?
18 THE WITNESS: Yes, it is.
19 JUDGE ABRAMSON: So you looked at the
20 ASCE information, and in that information there
21 is something unique or that helps you decide
22 what's the appropriate wind speed to consider for
23 the Clinton area?
24 THE WITNESS: Correct, yes. There is
25 a map of contours with wind speeds throughout the

1 continental United States.

2 JUDGE ABRAMSON: I see. Thank you.

3 THE WITNESS: The tornado site

4 characteristics include a tornado wind speed

5 along with associated maximum pressure drop and

6 maximum rate of pressure drop. These site

7 characteristics will be used at the COL stage to

8 evaluate the ability of certain buildings and

9 other structures to resist tornado loads. The

10 staff performed an independent analysis to

11 confirm the tornado site characteristics.

12 The winter precipitation site

13 characteristics consist of the one hundred year

14 return period snow pack in a 48 hour probable

15 maximum winter precipitation. These site

16 characteristics will be used at the COL stage to

17 evaluate the adequacy of the design of building

18 roofs to resist snow loads.

19 The staff verified the winter

20 precipitation site characteristics by comparing:

21 One, 100 year return period snow pack values with

22 design criteria published by the American Society

23 of Civil Engineers; and, two, the 48 hour

24 probable maximum winter precipitation with

25 probable maximum precipitation data published by

1 the National Weather Service.

2 The ultimate heat sink site

3 characteristics --

4 JUDGE BARATTA: Could I stop you at

5 that point?

6 THE WITNESS: Sure.

7 JUDGE BARATTA: I think I agree with

8 your conclusions that you state in your testimony

9 here, but there's one point that I don't see how

10 it follows from that, and I'm looking at pages 14

11 and 16 of the staff testimony with respect to the

12 winter precipitation and snowfall, and on page

13 14 about two-thirds of the way down the page it

14 says that the probable maximum winter -- the 48

15 hour probable maximum winter precipitation site

16 characteristic will satisfactorily demonstrate

17 that the 48 hour probable maximum winter

18 precipitation is 16.6 inches of water or 18.2

19 inches of water could neither fall nor remain

20 entirely on top the added season snow pack under

21 roofs.

22 Now -- okay, I think what you're

23 saying there is really that -- and this is what

24 my question is. Is that on page 16 in

25 Appendix A(3) which gives the 100 year snow pack

1 and 48 hour probable maximum winter precipitation
2 values that those must be used by the applicant
3 in evaluating the roof designs at the COL stage.
4 THE WITNESS: Correct.
5 JUDGE ABRAMSON: So really what you're
6 saying is you will meet that by requiring them to
7 meet that. Is that in essence?
8 THE WITNESS: I believe so, yes.
9 JUDGE BARATTA: Because it confused me
10 when I read it, and I think that -- and that is
11 correct what you're saying is by establishing
12 those two numbers, the 24.4 inches that appears
13 in Appendix A(3) for the 100 year snow pack and
14 the 48 hour probable maximum winter precipitation
15 of 16.6 inches, that then becomes a design
16 requirement for the rooftops.
17 THE WITNESS: That's an extreme
18 environmental load. That's correct.
19 JUDGE BARATTA: Okay. Thank you.
20 THE WITNESS: The ultimate heat sink
21 site characteristics will be used at the COL
22 stage to evaluate the adequacy of the design of
23 the mechanical draft cooling tower ultimate heat
24 sink which if needed for the chosen -- excuse me,
25 the ultimate heat sink site characteristics will

1 be used at the COL stage to evaluate the adequacy
2 of design of a mechanical draft cooling tower
3 ultimate heat sink which if needed for reactor
4 design.
5 These site characteristics are
6 meteorological conditions resulting in: one,
7 minimum water cooling during any one day and five
8 day period; and, two, maximum evaporation during
9 any consecutive 30 day period.
10 The staff performed an independent
11 analysis to confirm the ultimate heat sink site
12 characteristics.
13 New types of atmospheric dispersion
14 characteristics were identified for inclusion in
15 the Clinton early site permit: One, short-term
16 atmospheric dispersion estimates for accident
17 releases; and, two, long-term atmospheric
18 dispersion routine release.
19 JUDGE BARATTA: Could I back you for a
20 second? I was confused on that previous point
21 with respect to the ultimate heat sink.
22 Did you make -- there's a statement
23 that says the COL or CPF, and this appears on
24 page 28 of the testimony, it says the COL or CPF
25 applicant conclusively establish that any water

1 cooled ultimate heat sink that may be required or
2 selected for the ESP facility will be designed
3 denying the maximum 30 day water makeup
4 requirement not exceeding 87 acre feet.
5 Is that a permit condition?
6 THE WITNESS: I'm going to refer this
7 to Goutam Bagchi. That's part of his testimony.
8 JUDGE ABRAMSON: Okay. I'm sorry.
9 GOUTAM BAGCHI: I need to go and look
10 at the Safety Evaluation Report, whether or not
11 this is a COL action item.
12 JUDGE BARATTA: Okay. If you could
13 then get back to us later on. I apologize for
14 interrupting.
15 MR. HARVEY: No problem. Two types of
16 atmospheric dispersion site characteristics were
17 identified for exclusion in the Clinton early
18 site permit: Short-term atmospheric dispersion
19 estimates for accident releases and long-term
20 atmospheric dispersion estimates for routine
21 releases.
22 The short-term atmospheric dispersion
23 site characteristics are conservative estimates
24 that are used to help demonstrate that the
25 radiological dose consequences of postulated

1 accidents meet regulatory dose criteria at the
2 exclusion area boundary and out of boundary of
3 the low population zone.
4 The long-term atmospheric dispersion
5 site characteristics are annual average estimates
6 that are used to help demonstrate that the
7 radiological effluent release limits associated
8 with normal operation can be met for any
9 individual located off site.
10 The staff performed independent
11 analyses to confirm both the short-term and
12 long-term atmospheric dispersion site captures
13 using three years of on site meteorological data
14 collected by the applicant.
15 The staff also performed a qualitative
16 review of the on site meteorological data
17 collected by the applicant. Concluded the
18 applicant's data were adequate to represent site
19 atmospheric dispersion conditions.
20 In conclusion, the staff found that
21 appropriate meteorological site characteristics
22 have been identified which meet regulatory
23 applicable regulations.
24 GOUTAM BAGCHI: Your Honor, may I
25 answer the question?

1 JUDGE BARATTA: Sure.

2 GOUTAM BAGCHI: COL action 2.4-8

3 addresses that.

4 JUDGE BARATTA: Okay. Thank you.

5 BRAD HARVEY: I would now refer to

6 Jay Lee who will describe his review of the

7 accident analysis portion of the Clinton early

8 site permit application.

9

10 JAY LEE

11 called as a witness, after having been first duly

12 sworn, testified as follows:

13

14 THE WITNESS: Again, my name is Jay

15 Lee, and I'm a senior health physicist in the

16 Office of Nuclear Reactor Regulation.

17 I reviewed radiological consequence

18 analysis of accidents in Chapter 3 of the

19 applicant's Site Safety Analysis Report, and I

20 prepared Chapter 5 -- excuse me, Chapter 15

21 external analysis in the staff's Final Safety

22 Evaluation Report.

23 The governing regulation or regulatory

24 requirements for the radiological consequence

25 evaluation are in 10 CFR Part 50.34(a)(1). The

1 10 CFR Part 52.17 which is contents of ESP
2 applications specifically refers to 10 CFR Part
3 50.34(a)(1), and Part 100.
4 10 CFR Part 50.34 specifies the
5 radiation dose limit at the exclusion area
6 boundary and in the low population zone.
7 10 CFR Part 100.21 also specifies radiological
8 consequence evaluation factors. They are the
9 same, identical as 10 CFR Part 50.34(a)(1)
10 specified.
11 The staff's evaluation of radiological
12 consequence included the five subject areas as is
13 shown on the slide there in the five areas.
14 First: reactor accident source terms,
15 selection of a design-basis accident,
16 design-specific dispersion factors, site-specific
17 atmospheric dispersion factors, and of course
18 radiological consequence evaluations.
19 The first item, the reactor accident
20 source terms, the third item, design-specific
21 dispersion factors, and fourth item,
22 site-specific atmospheric dispersion factors are
23 inputs to the radiological consequence
24 evaluations.
25 The accident source terms are defined

1 and expressed as the timing and the release rate
2 of the fission products to the environment from
3 the proposed ESP site as a result of a postulated
4 design-basis accident.
5 Staff considers design specific
6 dispersion factors are not part of a source term.
7 The applicant did not select a particular reactor
8 design. Instead the applicant used a surrogate
9 reactor design to develop a design-basis source
10 term as we already discussed, covered earlier.
11 The surrogate reactor designs that the
12 applicant used are the ABWR and AP1000 designs.
13 The applicant stated that it selected these two
14 reactor designs because they are previously
15 certified and have recognized basis for
16 postulated accident analyses.
17 The staff found that the source term
18 PPE values from these two reactor designs were
19 sufficient to support site suitability reviews.
20 These are based on: One, they were consistent
21 with design certification information that staff
22 reviewed and found to be acceptable.
23 They are also consistent with the
24 staff's experience from operating reactor
25 licensing reviews; and the third they were

1 consistent with the staff's preliminary
2 information or limited review experience we had
3 with ACR700 and ESBWR, and gas cooled high
4 temperature reactors.
5 Therefore, consequently, the staff did
6 find source term PPE values are reasonable as we
7 discussed a little bit earlier.
8 The second item is a selection of a
9 design-basis accident. The staff found that the
10 applicant selected design-basis accidents are
11 consistent with the design-basis accident list
12 and analysis presented in the standard review
13 plan NUREG-0800, and Regulatory Guide 1.183 --
14 Regulatory Guide 1.183 title is Alternative
15 Radiological Source Terms For Evaluating
16 Design-Basis Accident At a Nuclear Power Plant
17 issued in July 2000.
18 Therefore, staff concluded that
19 applicant proposed an acceptable design-basis
20 accident selection for evaluating the compliance
21 of a proposed ESP site with the dose consequences
22 evaluation factors specified in 10 CFR Part
23 50.34(a)(1).
24 The third item, design specific
25 dispersion factors, these dispersion factors or

1 so-called chi/Qs are postulated values or they're
2 reference values selected by reactor vendors.
3 In the case of the AP1000 Westinghouse
4 selected these dispersion factors. In the case
5 of ABWR, GE selected these values.
6 They do have not have a site.
7 Therefore, they had to have a postulated
8 dispersion factors for the future COL applicant
9 or ESP applicant to meet, and this design
10 specific dispersion factors are PPE values.
11 Staff independently verified the
12 postulated dispersion factors used by the
13 applicant with those in the certified design
14 control documents and in the final SERs prepared
15 by staff for the design certification.
16 JUDGE ABRAMSON: Let me ask you about
17 those dispersion factors. You're saying here --
18 advising us that the dispersion factors for these
19 certified designs were picked from the design
20 certification.
21 THE WITNESS: Vendor.
22 JUDGE ABRAMSON: From the vendor, from
23 the design certification, but is not dispersion a
24 function of the local atmospheric conditions?
25 THE WITNESS: It is in the case of a

1 site specific atmospheric dispersion factors, but
2 their numbers are not based on, for example,
3 meteorological data.
4 JUDGE ABRAMSON: I understand that.
5 What I'm asking you is when you're looking at a
6 site and you looked at this site for approval,
7 this is an ESP application, did you look at the
8 actual atmospheric conditions at this site and
9 see how they compared to what the applicant used
10 which it got from these two design
11 certifications?
12 THE WITNESS: Yes, that's my fourth
13 item. I discussed the site specific atmospheric
14 dispersion factors.
15 Our staff performed an independent
16 confirmatory analysis of applicant's site
17 specific atmospheric dispersion factors and found
18 that applicant's atmospheric dispersion factors
19 are acceptable.
20 The staff reviewed in accordance with
21 guidance provided in the new standard 002 and in
22 accordance with Regulatory Guide 1.145 and that
23 there were no deviations, departures, or
24 exceptions from the guidance.
25 Therefore, staff found site specific

1 atmospheric dispersion factors measured proposed
2 by the applicants were acceptable.
3 JUDGE ABRAMSON: Okay. Now you've
4 done two pieces. You've looked at the design
5 specific and said here's some design specific
6 numbers that the vendor gave us, and those were
7 used to develop the PPE.
8 Now, you've looked at the site
9 specific numbers, and you've looked at the staff
10 site specific numbers and confirmed that what the
11 staff -- I'm sorry, what -- the applicant site
12 specific numbers you've confirmed them
13 independently.
14 Now, you've got two different sets of
15 numbers. You've got numbers that came from the
16 vendors, and you've got numbers that came from
17 the site. What did you do with them?
18 THE WITNESS: We're comparing them and
19 see how the applicant used them.
20 JUDGE ABRAMSON: Okay.
21 THE WITNESS: And that they -- as I
22 said earlier, they took the ratio in conjunction
23 with the radiological dose consequences in the
24 certified design document to calculate site
25 specific doses.

1 JUDGE ABRAMSON: I'm not sure I'm
2 understanding what you're advising us. You have
3 a site specific dispersion factor which you've
4 confirmed from local conditions. Is that
5 correct?
6 THE WITNESS: Yes.
7 JUDGE ABRAMSON: And you have -- so
8 how does that relate, if at all, to the design
9 specific dispersion factors? How did the two
10 interplay? What did you do with these two
11 different sets of numbers?
12 JAY LEE: We compared them, and the
13 site specific -- the atmospheric dispersion
14 factor should fall within design specific
15 dispersion factors selected by vendor.
16 JUDGE ABRAMSON: I see. And you found
17 that they did?
18 JAY LEE: Yes.
19 JUDGE ABRAMSON: Thank you.
20 JAY LEE: For the radiological
21 consequence evaluations staff evaluated
22 radiological consequences of design-basis
23 accident in order to determine whether a new
24 reactor unit could be built at the ESP site
25 without undue risk to the public health and

1 safety as required by 10 CFR Part 52.17 and
2 10 CFR Part 100.
3 JUDGE HETRICK: Excuse me, Mr. Lee.
4 JAY LEE: Yes.
5 JUDGE HETRICK: This morning I asked
6 about internal versus external accident
7 initiators, and I realize the question arose from
8 the Environmental Impact Statement, but I
9 wondered if you had an opinion about my question.
10 JAY LEE: No, I do not. We do not
11 review external and internal event and of course
12 RS-002 or any other standard review plan do not
13 require to look into that part, and I have no
14 opinion to offer at this time.
15 JUDGE HETRICK: I'll hope for a chance
16 to discuss this in the hearing tomorrow. Thank
17 you.
18 JUDGE ABRAMSON: Or later today.
19 JAY LEE: In conclusion then, the
20 staff concluded that proposed distance to the EAB
21 which is approximately .64 miles from the reactor
22 and that the low population zone which is about
23 approximately two and a half miles from reactor,
24 LPZ outer boundary of the proposed ESP site are
25 adequate to provide reasonable assurance that

1 radiological consequences of design-basis
2 accidents would be within the dose consequence
3 evaluation factors set forth in 10 CFR 50.34 A 1
4 for the proposed ESP site.
5 Therefore, the staff further concluded
6 that the applicant demonstrated the suitability
7 of the proposed ESP site in terms of risk to the
8 public health and safety; and, two, the applicant
9 complied with requirements in 10 CFR Part 52.17.
10 This concludes my presentation. If
11 you don't have any questions, I'd like to
12 introduce Mr. Bob Moody for his presentation on
13 emergency plan.
14
15 ROBERT MOODY
16 called as a witness, after having been first duly
17 sworn, testified as follows:
18
19 THE WITNESS: Good afternoon. Am I
20 close enough? I'm Robert Moody, senior emergency
21 preparedness specialist in the Office of Nuclear
22 Security and Incident Response, and I'm
23 responsible for the review of emergency planning
24 for the proposed site.
25 My review involved -- my review

1 involved two main areas: Physical
2 characteristics unique to the proposed site that
3 could pose significant impediments to the
4 development of emergency plans and the optional
5 major features plan submitted by the applicant.
6 The physical characteristics portion
7 of my review included two parts: The review of
8 the preliminary evacuation time estimate analysis
9 performed by the applicant for the plume exposure
10 pathway emergency planning zone which is a radius
11 of about approximately ten miles around the site.
12 I also looked at the applicant's
13 submittal to provide contact and arrangements
14 with state, local, and federal agencies with
15 emergency preparedness responsibilities.
16 Regarding the major features plan that
17 was provided by the applicant I determined that
18 the description of the emergency planning zones
19 described in the application to be acceptable,
20 the emergency planning zones being the plume
21 exposure pathway emergency planning zone which is
22 approximately a ten mile radius around the site
23 and the injection pathway -- injection exposure
24 pathway emergency planning zone which is a radius
25 of approximately 50 miles around the site.

1 I determined that 13 of the 14
2 planning standards contained in supplement 2 to
3 NUREG-0654, the guidance document that I used,
4 were acceptable.
5 The planning standard that was not
6 acceptable relates to emergency facilities and
7 the descriptions of two facilities, specifically
8 the operation support center and the technical
9 support center. These facilities will receive a
10 detailed review at the COL stage.
11 In summary, I concluded that no
12 significant impediments to the development of
13 emergency plans were identified. In addition, 13
14 of the 14 planning standards that I reviewed were
15 acceptable. In addition, the staff will review
16 the complete and integrated emergency plans for
17 the proposed site at the COL stage. We have a
18 lot more work to do.
19 That concludes my presentation.
20 JUDGE BARATTA: Okay. You said
21 it's -- in your testimony it's unnecessary to
22 track that issue with respect to the emergency
23 facilities at the ESP -- in the ESP?
24 THE WITNESS: Yes, I did.
25 JUDGE BARATTA: Okay. You do say,

1 though, someplace in there that it is an open
2 item, I guess?
3 THE WITNESS: It's not addressed as an
4 open item either. Basically what we said and the
5 Safety Evaluation Report indicates that the
6 regulations will require the submittal of a
7 complete and integrated plan at the COL stage. I
8 could give you the reference, if you would like.
9 JUDGE ABRAMSON: Well, I guess the
10 question is what credit do they get for the major
11 features that they've -- for whatever it is, 13
12 or 14, or however many major features that they
13 have now got your approval on?
14 THE WITNESS: That information will be
15 considered at the COL stage. They will be given
16 full credit for that information.
17 JUDGE ABRAMSON: For the fact that
18 they have defined the features and put some
19 detail on the definitions?
20 THE WITNESS: That's correct.
21 JUDGE ABRAMSON: And as to the one
22 that isn't approved, it's just not approved, so
23 that's got to be dealt with completely?
24 THE WITNESS: That will be completely
25 looked at again at the COL stage.

1 JUDGE BARATTA: I'm not taking issue
2 with you not acting on that. I'm just trying to
3 make sure that what's unresolved is clear, and
4 what is resolved is clear. That some of these --
5 because it did get translated into open items or
6 action items, that's quite clear.
7 In other cases it's not, and that's
8 where it gives me some concern.
9 THE WITNESS: We will use the
10 information in the early site permit in my safety
11 evaluation at the COL stage when they submit
12 their integrated plans.
13 JUDGE BARATTA: So essentially what
14 you're saying is -- I think we heard from the
15 applicant that at the COL stage they're going to
16 have to go page by page through the SER and the
17 EIS and identify those items as opposed to having
18 a consolidated listing of items that still need
19 to be addressed?
20 THE WITNESS: That's true. We will be
21 -- instead of using Supplement 2 as our criteria,
22 we'll be using the regulations in Appendix
23 10 CFR Part 50 Appendix E and 50.47, so we'll be
24 using a higher standard.
25 JUDGE BARATTA: Okay.

1 THE WITNESS: I'd like to turn the
2 proceedings back to Ms. Starefos for a summary.
3 JOELLE STAREFOS: Thank you.
4 The NRC staff conclusions are as
5 follows: The staff concludes that the EGS/ESP
6 site characteristics comply with the requirements
7 of 10 CFR Part 100 reactor site criteria with the
8 limitations and conditions proposed by the staff
9 in this SER for inclusion in any ESP that might
10 be issued.
11 The staff concludes that taking into
12 consideration the site criteria contained in 10
13 CFR Part 100 a reactor, or reactors, having
14 characteristics that fall within the parameters
15 for the site and which meets the terms and
16 conditions proposed by the staff in this SER can
17 be constructed and operated without undue risk to
18 the health and safety of the public.
19 And the staff concludes that issuance
20 of the requested ESP will not be inimical to the
21 common defense and security or to the health and
22 safety of the public.
23 Thank you.
24 JUDGE ABRAMSON: Any questions?
25 Dr. Hetrick? Dr. Baratta?

1 JUDGE BARATTA: Not at this time.

2 JUDGE ABRAMSON: Let me suggest then,

3 it's approximately 2:35. We not waste the rest

4 of the afternoon. Why don't we take -- how long

5 will it take the applicant to get ready to start

6 on the NEPA related presentations?

7 MR. BESSETTE: We can be ready in 15

8 minutes.

9 JUDGE ABRAMSON: Fine, let's take 15

10 and come back to work.

11 (At this point a short recess was

12 taken.)

13 JUDGE ABRAMSON: Let's go on the

14 record. We'll resume with the applicant's

15 presentation on the three NEPA questions.

16 MR. FRANTZ: Judge Abramson, before we

17 begin the board had a question before the recess

18 on whether or not the applicant had a position on

19 the one condition regarding the gradient of the

20 groundwater and its applicability to the building

21 and potentially to other facilities and piping.

22 We would have no problem with

23 expanding that permit condition to include other

24 piping leading into the radwaste building or

25 other buildings with the liquid radwaste or a

1 condition that says either we have that gradient
2 or we show we have other design features that
3 would preclude a release of radioactive --
4 JUDGE ABRAMSON: That would be useful.
5 Perhaps you can send us a note when we get back
6 to that effect, just how you think it might
7 possibly be phrased, what sort of condition, and
8 you talk with the staff about it and make sure it
9 works for them?
10 MR. FRANTZ: Yes, we will. Thank you.
11 JUDGE ABRAMSON: Thank you.
12 MR. FRANTZ: Our environmental case
13 will be presented by Paul Bessette who will
14 introduce our next witness.
15 MR. BESSETTE: Judge Abramson, We're
16 ready to call Tamar Cerafici to begin our
17 environmental testimony.
18
19 TAMAR CERAFICI
20
21 called as a witness, after having been first duly
22 sworn, testified as follows:
23
24 BY MR. BESSETTE:
25 Q. Ms. Cerafici, could you please state

1 your full name for the record?

2 A. Tamar Jergensen Cerafici.

3 Q. Could you state who your employer is

4 and your current position?

5 A. I'm currently a senior environmental

6 specialist with CH2M Hill.

7 Q. And do you have the following pre-file

8 testimony before you, pre-file testimony of Tamar

9 Jurgensen Cerafici on required environmental

10 findings?

11 A. Yes, I do.

12 Q. Mr. Kuyler, could you provide copies

13 to the court reporter? We've previously provided

14 copies through filings to the board and the NRC

15 staff.

16 Ms. Cerafici, was this testimony

17 prepared under your profession and control?

18 A. Yes, it was.

19 Q. Does this testimony include a

20 statement of your professional qualifications?

21 A. Yes, it does.

22 Q. Do you have any additions,

23 corrections, or modifications to this testimony?

24 A. No, I do not.

25 Q. Is this testimony true and correct?

1 A. Yes, it is.

2 Q. Do you adopt this written testimony as

3 your testimony in this proceeding?

4 A. Yes, I do.

5 MR. BESSETTE: Mr. Chairman, I ask

6 that this testimony be received into evidence and

7 incorporated into the record as if read.

8 JUDGE ABRAMSON: Let it be so.

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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
EXELON GENERATION COMPANY, LLC	)	ASLBP No. 04-821-01-ESP
(Early Site Permit for the Clinton ESP Site)	)	October 17, 2006

PREFILED TESTIMONY OF TAMAR JERGENSEN CERAFICI ON REQUIRED ENVIRONMENTAL FINDINGS

I. INTRODUCTION

Q. Please state your name.

A. My name is Tamar Jergensen Cerafici.

Q. Who is your current employer and what is your current position?

A. My current employer is CH2M HILL, a contractor for Exelon Generation Company, LLC (EGC or Exelon). My current position is Senior Environmental Specialist.

Q. Please summarize your professional qualifications.

A. Since 2001, I have been a Senior Environmental Specialist for CH2M HILL. I provide environmental and regulatory consulting services for nuclear permitting and licensing projects. I have been focusing on nuclear permitting and licensing regulations for the last five years. I have experience in developing and evaluating environmental impact statements under the National Environmental Policy Act (NEPA): from 2001 through 2003, I was a primary author and supported the development of an EIS for the U.S. Forest Service, and from 2004 through 2005, I authored the regulatory and compliance

portions of an Environmental Assessment under Bahamian law for a liquefied natural gas facility in the Bahamas. Since late 2005, I have been an author and assistant project manager for Environmental Reports that will support Combined Operating License Applications in North Carolina and other states. In 2006, I was appointed as a special faculty member of the Hofstra University School of Law, and from 1994 to 2004 I taught environmental law as an affiliate faculty member in the University of Idaho's graduate program in environmental science. I practiced general litigation and environmental law in the states of Idaho and Utah from 1989 to 2001. I have authored several papers and presentations on the environmental and regulatory implications of siting and managing new nuclear facilities in the United States and abroad. A copy of my professional qualifications is attached.

Q. On whose behalf are you testifying?

A. I am testifying on behalf of the Applicant, EGC.

Q. Please describe your involvement in the Early Site Permit (ESP) Application.

A. I assisted Exelon in preparation of the Environmental Report starting in 2001, and my involvement continues to the present time. I am the author of several sections of the Environmental Report, and was actively involved in final reviews of the entire application. That involvement has further included interaction with the NRC Staff (the Staff) during alternative site audits and requests for additional information. I have been active in reviewing many aspects of the ESP Application, including revisions to the Site Safety Analysis Report (SSAR) and the Environmental Report. I have also assisted Exelon with responses to contentions filed in this matter.

Q. What is the purpose of your testimony?

A. The purpose of my testimony is to provide a brief description of the Site Redress Plan and Environmental Report (ER), including a description of the applicable regulatory criteria. My testimony also describes the ways in which the Staff's Environmental Impact Statement (EIS) documents their review of the ER and Site Redress Plan, and how we believe the EIS (1) fully complies with the requirements of Section 102(2)(A),(C), and (E) of the National Environmental Policy Act (NEPA) and subpart A of 10 C.F.R. Part 51; (2) appropriately considers and evaluates the environmental factors contained in the record of the proceeding; and (3) 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.

II. SITE REDRESS PLAN

Q. What is the purpose of the Site Redress Plan?

A. 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, construction of temporary access roads, etc.; 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, non safety-related plant 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.

Q. Are there any prerequisites to conducting such site activities for the EGC ESP facility?

A. Yes. Prerequisites that must be fulfilled before performing such activities include: (1) 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); (2) coordination of the movement of the existing Clinton Power Station (CPS) protected area boundary, as required; (3) movement, demolition, or ownership transfer of existing CPS buildings and structures within the EGC ESP site; and (4) 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).

Q. When would the Site Redress Plan be implemented?

A. The Site Redress Plan would be implemented if site-preparation activities were performed and the ESP were to expire. 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. Under the Site Redress Plan, areas that were permanently disturbed would be stabilized and contoured to conform to surrounding areas.

Q. What were the results of the NRC Staff's review of the Site Redress Plan?

A. 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(c)(1) and as described by EGC are bounded by the environmental impacts for construction of the entire facility as analyzed in the EIS. 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.

Q. Are there any restrictions on implementing the site pre-construction activities authorized by 10 C.F.R. § 50.10(e)(1)?

A. Yes. Prior to site pre-construction activities, EGC must secure a number of permits related to hydrologic impacts, including Clean Water Act (CWA) permits from the U.S. Army Corps of Engineers and state agencies. Prior to conducting any activity pursuant to the ESP, EGC must submit a copy of its CWA 401 certification issued by the IEPA, or the agency's determination that no 401 certification is required. 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.

III. ENVIRONMENTAL REPORT

A. Purpose and Contents of the Environmental Report

Q. Briefly describe the ER.

A. As required by 10 C.F.R. Part 51 and 10 C.F.R. § 52.17(a)(2), EGC submitted an ER. The ER was developed using the format and content guidance provided in the "Environmental Standard Review Plan" (NUREG-1555). The ER discusses the existing environment at the site and in the vicinity; provides a bounding description of a nuclear

plant using the Plant Parameter Envelope; summarizes environmental impacts of construction and operation and considers appropriate mitigation measures; and reviews alternatives.

Q. Briefly outline the contents of the ER.

A. The ER contains the following principal sections: (1) an Introduction to the ER, (2) Environmental Description, (3) Plant Description, (4) Environmental Impacts of Construction, (5) Environmental Impacts of Station Operation, (6) Environmental Measurement and Monitoring Program, (7) Environmental Impacts of Postulated Accidents Involving Radioactive Materials, (8) Need for Power, (9) Alternatives to the Proposed Action, and (10) Environmental Consequences of the Proposed Action.

Q. Describe the regulatory criteria applicable to the ER.

A. 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"

Q. Does the ER comply with these criteria?

A. Yes. The ER fulfills the regulatory requirements listed above.

Q. Does the ER assess impacts based on a specific power facility design?

A. No. 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, as described in "Prefiled Testimony of Eddie R. Grant on Required Safety Findings."

B. NRC Review of the Environmental Report

Q. Briefly describe the NRC review of the ER.

A. 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. 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, issued a draft EIS, and requested public comments on the draft EIS. 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. That Review Standard draws from the previously published NUREG-0800, "Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants," and NUREG-1555, "Environmental Standard Review Plans."

Q. How were public comments addressed by the NRC?

A. The NRC considered the public comments related to the environmental review received during the scoping process and the draft EIS. These comments and NRC responses are provided in Appendix D and Appendix E of the EIS, respectively.

Q. Describe how the NRC categorized the level of significance of environmental issues.

A. 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). 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. Mitigation measures were considered for each environmental issue and are discussed in the appropriate sections.

Q. Were any issues excluded or deferred in NRC's review of the ER?

A. For some matters, such as need for power and the cost-benefit analysis, EGC elected not to provide information, as is permitted by 10 C.F.R. § 52.17(a)(2). 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 combined license (COL) applicant referencing the ESP would need to provide additional

environmental information on those matters. The ER and the EIS also do not address severe accident design mitigation alternatives (SAMDAs). Evaluation of SAMDAs is dependent upon design information that is generally not available at the ESP stage. However, the design certifications do include an evaluation of SAMDAs, as discussed in 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 C.F.R. § 52.79(a)(1).

Q. How did the EGC ESP organization support the NRC Staff's review of the ER?

A. In the course of the Staff's review, the EGC ESP organization responded to four separate environmental related requests for additional information (RAIs) that included approximately fifty subparts. To support the Staff's environmental analysis, Exelon arranged meetings between the Staff and outside agencies and parties, such as Illinois Power transmission representatives. These efforts continued during the environmental review through teleconferences and subsequent meetings so that the Staff could ask clarifying questions. Exelon also supported Staff tours of the Clinton site.

Q. Please provide your opinion regarding the review performed by the NRC Staff.

A. The Staff used its detailed guidance in NUREG-1555 to structure its review; the Staff asked numerous RAIs and held meetings to elicit more detailed information from EGC; and the Staff conducted independent inspections and reviews. In my opinion, the review performed by the NRC Staff was systematic, comprehensive, and probing.

IV. ENVIRONMENTAL ISSUES

Q. Briefly describe the environmental issues that must be addressed under Section 102(2)(A), (C), and (E) of NEPA, Subpart A of 10 C.F.R. Part 51, and NUREG-1555.

A. The ER and EIS must address the affected environment, site layout, construction impacts, operation impacts, fuel cycle impacts, transportation impacts, cumulative impacts, alternatives, and other factors.

A. The Affected Environment

Q. What aspects of the site location are described in the ER and EIS?

A. 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. The site is located on man-made Clinton Lake. 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.)

Q. What aspects of land use are described in the ER and EIS?

A. 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 were assumed to be used. Land use within the region is also primarily agricultural, with the exception of the population centers of Springfield, Bloomington-Normal, and Champaign-Urbana.

Q. What aspects of demography are described in the ER and EIS?

A. 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. The City of Clinton, with a population of 7,485 as of the 2000 U.S. Census, lies approximately six miles west of the site. 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.

Q. What aspects of meteorology and air quality are described in the ER and EIS?

A. 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.

Q. What aspects of geology are described in the ER and EIS?

A. 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.

Q. What aspects of radiological environment are described in the ER and EIS?

A. 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).

Q. What aspects of hydrology, water use, and water quality are described in the ER and EIS?

A. 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).

Q. What aspects of ecology are described in the ER and EIS?

A. 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.

Q. What aspects of socioeconomics are described in the ER and EIS?

A. 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. 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. 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.

Q. What aspects of historical and cultural resources are described in the ER and EIS?

A. 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. The IHPA may require cultural resource studies prior to construction, depending on construction location.

Q. What aspects of environmental justice are described in the ER and EIS?

A. 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. 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 is 11.3 percent. Concentrations of low-income and minority populations are present in the larger cities in the region, such as Champaign-Urbana, Decatur, and Springfield.

B. Site Layout

Q. What aspects of the PPE are described in the ER and EIS?

A. 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 EGC developed a set of bounding plant parameter values for the ESP application. The PPE values are listed in Table 1.4-1 of the SSAR. At the construction permit (CP) or COL stage, EGC will need to verify that the actual characteristics for the selected reactor are bounded by the PPE. 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).

Q. What aspects of the cooling system are described in the ER and EIS?

A. EGC proposed a cooling tower system for normal cooling, and a second mechanical draft cooling tower system as the ultimate heat sink (UHS), as appropriate. 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 leading to the CPS discharge. Radioactive and nonradioactive plant effluents will be discharged in such a manner as to comply with applicable Federal and State requirements.

Q. What aspects of the anticipated power transmission system are described in the ER and EIS?

A. 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. This would probably result in some additional environmental impacts. Once a COL applicant has applied to the Federal Energy Regulatory Commission (FERC) for large-generator interconnection, a transmission analysis may be required under 18 C.F.R. Part 35 and the State's AmerenIP Open Access Transmission Tariff. AmerenIP owns the transmission lines, and is the transmission provider in Illinois. Once the transmission owner receives a request for an interconnection, it performs the evaluation on the behalf of its customer, the COL applicant. This process is explained in detail in the EIS.

C. Construction Impacts

Q. Describe the scope of analysis of construction impacts at the proposed site?

A. 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. The EIS also investigates potential mitigation of adverse impacts.

Q. How do the ER and EIS address the impacts of construction on land use?

A. 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. 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.

Q. How do the ER and EIS address the impacts of construction on meteorology and air quality?

A. ER § 4.4.1.2 analyzes the impacts of construction on meteorology 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. Such impacts would be minimized by compliance with applicable regulations, permitting requirements, and through good operating practices. Thus, such impacts are expected to be temporary and limited in magnitude. The EIS concludes that the impacts from both construction activities and related transportation activities would be SMALL.

Q. How do the ER and EIS address the water-related impacts of construction?

A. 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. 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. 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. 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. Thus, the impacts of construction activities on water use would be SMALL, localized, and temporary. 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.

Q. How do the ER and EIS address the ecological impacts of construction?

A. 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. 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. If new rights of way are required, habitat and terrestrial ecosystem impacts could range from SMALL to LARGE. The amount of disturbance during plant construction would be determined at the time of a CP or COL application. Construction impacts to wildlife, including threatened or endangered species, would be negligible if any, due in part to compliance with regulations and permitting requirements. Aquatic impacts, such as the loss of some shoreline habitat and the temporary displacement of some aquatic species, would be SMALL. 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 plant construction.

Q. How do the ER and EIS address the socioeconomic impacts of construction?

A. 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. Demographic impacts are expected to be SMALL, because most workers will come from the region. Other adverse socioeconomic impacts would be SMALL, except potential MODERATE impacts on roads and housing. Upgrading the existing rail line could mitigate the impact on roads, and market-driven mitigation should be sufficient to address housing impacts. 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.

Q. How do the ER and EIS address the impacts of construction on historic and cultural resources?

A. 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.

Q. How do the ER and EIS address the environmental justice impacts of construction?

A. 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.

Q. How do the ER and EIS address the nonradiological health impacts of construction?

A. 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. Occupational risks can be minimized by adherence to NRC, Occupational Safety and Health Administration, state, and local requirements. 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. The EIS evaluated all nonradiological health impacts as SMALL, with no additional mitigation warranted.

Q. How do the ER and EIS address the radiological health impacts of construction?

A. 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. The estimated doses are well within the NRC's exposure limits, and thus these impacts would be SMALL.

Q. How do the ER and EIS address measures and controls to limit adverse impacts during site preparation and construction activities?

A. Section 4.6 of the ER discusses measures to minimize adverse impacts during construction. The potential impacts and mitigation measures are discussed 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.

D. Impacts of Operation

Q. Describe the scope of analysis of the impacts of operation at the proposed site?

A. 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. The EIS also investigates potential mitigation of adverse impacts.

Q. How do the ER and EIS address the impacts of operation on land use?

A. 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. Impacts along anticipated transmission rights-of-way would include routine vegetation maintenance and the clearing of temporary maintenance

access roads. The EIS concludes that land use impacts would be SMALL, and additional mitigation would not be warranted.

Q. How do the ER and EIS address the impacts of operation on meteorological and air quality?

A. 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. 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. 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. The impacts from pollutants discharged during infrequent operation of auxiliary equipment and from the transmission lines would likewise be SMALL.

Q. How do the ER and EIS address the water-related impacts of operation?

A. 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. EGC and the Staff independently evaluated these water use impacts. 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. EGC's commitment to keep combined discharges from CPS and the ESP facility within the bounds of the existing permit would ensure that water quality impacts remain SMALL.

Q. How do the ER and EIS address the ecological impacts of operation?

A. 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. Ecological impacts of transmission line right-of-way management such as vegetation control, electromagnetic fields, and bird collisions would be negligible. 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. Further, the impact to available aquatic habitat could be MODERATE in low-water years. 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. Operations will not impact any critical habitats, and the impacts to listed species, including the bald eagle and Indiana bat, will be negligible. 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.

Q. How do the ER and EIS address the socioeconomic impacts of operation?

A. 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. 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. Drought impacts could be mitigated if necessary by changing the way the proposed new unit is operated. Housing impacts would be mitigated over time through market forces. 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 impacts could be beneficial and LARGE.

Q. How do the ER and EIS address the impacts of operation on historic and cultural resources?

A. 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. Mitigation would only be warranted if there is a discovery of cultural resources.

Q. How do the ER and EIS address the environmental justice impacts of operation?

A. 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.

Q. How do the ER and EIS address the nonradiological health impacts of operation?

A. 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. Likewise, the postulated noise levels from the proposed facility would be of small significance. Compliance with applicable regulations and standards will also minimize electromagnetic fields (EMF) and occupational health impacts. The EIS concludes that the impact of thermophilic microorganisms, noise, acute effects of EMF, and potential occupational health risks would all be SMALL. While conclusive information on the chronic effects of EMF is unavailable, current research does not suggest that the impact would be significant.

Q. How do the ER and EIS address the radiological health impacts of normal operation?

A. 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. 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. 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. The EIS also reviews the proposed radiological monitoring program and concludes that the program is adequate.

Q. How do the ER and EIS address the environmental impacts of postulated accidents?

A. 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. 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. Further, the potential consequences of accidents for other designs are expected to be bounded by these designs. 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. 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. 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.

Q. How do the ER and EIS address measures and controls to limit adverse impacts during operation?

A. In Section 5.10 of the ER, EGC provided information on measures and controls to limit adverse impacts during operation. The potential impacts and mitigation measures are discussed 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. 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.

E. Impacts of the Fuel Cycle, Transportation and Decommissioning

Q. How do the ER and EIS address the impacts of the fuel cycle and solid waste management?

A. 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. The EIS concludes that the impacts for light-water reactors would be SMALL, and mitigation would not be warranted. 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.

Q. How do the ER and EIS address the impacts of transportation of radioactive materials?

A. 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.

Q. How do the ER and EIS address the impacts of decommissioning?

A. 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.

F. Cumulative Impacts

Q. How do the ER and EIS address cumulative impacts?

A. Section 7 of 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. 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. In these cases, mitigation measures may be warranted, such as derating or shutdown of the unit.

G. Alternatives

Q. What alternatives are analyzed in the ER and EIS?

A. The ER and EIS analyze the no-action alternative, alternative energy sources, alternative sites, and alternative system designs.

Q. How do the ER and EIS address the no-action alternative?

A. 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. The EIS concludes that, should the ESP be denied, all of EGC's remaining options to satisfy its objectives would have associated environmental impacts.

Q. How do the ER and EIS address energy alternatives?

A. Section 9.2 of the ER discusses energy alternatives, and the same matter is analyzed in § 8.2 of the EIS. The ER and EIS address these alternatives to determine whether they are viable as well as competitive with the energy generated by the new nuclear plant. The reports also consider whether the alternatives meet the purpose and need to build new baseload capacity. 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. Service life extensions are also not reasonable alternatives, because they would not provide additional baseload generation capacity. 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. 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. 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.

Q. How do the ER and EIS address system design alternatives?

A. 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. 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.

Q. How do the ER and EIS address the evaluation of alternative sites?

A. Because EGC proposes to co-locate a new plant with an existing facility, § 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 or former industrial sites were considered not environmentally preferable to the proposed site, because the impact on any non-nuclear site would be greater than that on any site with an existing facility. 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 eliminated three of the existing reactor sites (Byron, Quad Cities, and Dresden) as not having sufficient land for a new facility. The remaining three sites (Braidwood, Zion, and LaSalle County)

were compared with Clinton to determine whether any of the sites was "environmentally preferable" to the Clinton site. EGC chose the Clinton site as the preferred site, in part because no alternative sites were environmentally preferable or "obviously superior." 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. Thus, none of the alternative sites is obviously superior to the proposed site.

Q. Does this approach comply with the approach outlined in NUREG-1555?

A. Yes. Both the ER and the EIS carefully reviewed the candidate site criteria from NUREG-1555. The Staff noted that candidate sites are those sites within the Region of Interest that can be reasonably found and made available for the siting of a nuclear power plant. As described in Section 9.0 of the EIS, the Staff analyzed EGC's proposed site as it compared to other nuclear sites within the region of interest using the two-part analysis provided in NUREG-1555. That is, the Staff first determined whether any of the alternative sites were "environmentally preferable," as described above; if any of the sites were "environmentally preferable," then the Staff would have then determined whether these sites were "obviously superior." Because the Staff concluded that none of the

alternative sites were environmentally preferable to the proposed EGC site, it concluded that none of the alternative sites were "obviously superior" to the Clinton site.

H. Other Factors

Q. Do the ER and EIS address any other factors?

A. Yes. They address unavoidable adverse impacts, irreversible and irretrievable commitments of resources, and the relationship between short-term uses and long-term productivity of the environment.

Q. How do the ER and EIS address unavoidable adverse impacts?

A. 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. 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.

Q. How do the ER and EIS address irreversible and irretrievable commitments of resources?

A. 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.

Q. How do the ER and EIS address the relationship between short-term uses and long-term productivity of the human environment?

A. 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.

V. REQUIRED ENVIRONMENTAL DETERMINATIONS

Q. In your opinion, how have the Staff and EGC complied with the requirements of NEPA Section 102(2)(A)?

A. Yes. 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." 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. 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 and logically documented its conclusions.

Q. In your opinion, has the Staff complied with the requirements of NEPA Section 102(2)(C)?

A. Yes. 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. As shown in the following table, the final EIS addresses each of these five requirements in Section 102(2)(C).

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

NEPA Section 102(2)(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." The Staff has complied with this requirement.

Q. In your opinion, has the Staff complied with the requirements of NEPA Section 102(2)(E)?

A. Yes. 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." Chapter 8 of the EIS considers the no action alternative, energy alternatives, plant design alternatives, and alternative sites. The EIS satisfies the requirements under NEPA with respect to consideration of alternatives.

Q. In your opinion, has the Staff complied with the requirements of Subpart A to Part 51?

A. Yes. 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 C.F.R. §§ 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. As shown in the tables below, these requirements have been satisfied.

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)
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/

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	*See* EIS Appendix B and Appendix E
(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

Q. Do you have an opinion on whether the final balance of conflicting factors contained in the record of this proceeding support issuance of the ESP?

A. Yes. 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.

Q. Do you have an opinion on whether, after considering reasonable alternatives, the ESP should be issued?

A. Yes. 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 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.

Q. Do you have any concluding remarks?

A. 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.

Q. Does this conclude your testimony?

A. Yes.

STATEMENT OF PROFESSIONAL QUALIFICATIONS OF TAMAR JERGENSEN CERAFICI, J.D.

CH2M HILL ♦ 2001 to present ♦ Senior Environmental Specialist
Representative Projects

- **Progress Energy; Task Lead/PM/Lead Regulatory; Starting 2005:** Currently developing first-of-a-kind Combined Operating License Application (COLA) for locating new generation nuclear plants (e.g., AP1000, ESBWR, and USEPR) at various sites in the Southeast. Major tasks include: developing regulatory strategy for application; leading development of Environmental Report and the interface with site safety reports for the application, and shared project management duties. These licenses will be among the first new generating licenses in the United States since 1979.

- **Exelon Generation Company, LLC; Lead Author/Regulatory Analyst; Starting 2001:** provide regulatory interpretation and general application of NRC regulations for a first-of-a-kind Early Site Permit – Leading strategic and regulatory support for Exelon in discussions with NRC staff regarding site safety characteristics (*e.g.* authored successful argument for risk-based PMF calculations). Developed site alternative analysis and provided overall environmental regulatory/legal compliance analysis for the Exelon ESP project, the first Early Site Permit to be submitted to the Nuclear Regulatory Commission.

- **International Confidential Client Due Diligence Project; Lead Regulatory Analyst; Starting 2005:** Provide regulatory analysis for confidential international client's acquisition of major nuclear services firm. Tasks include review of properties and compliance history to identify past and continuing environmental liabilities under the EPA's "all appropriate inquiries" rule; educate purchaser in environmental and nuclear regulatory structure in the United States, provide opinion on level of liability, cost of decommissioning older sites, and legacy liabilities of acquisition. Currently providing analysis and review of the acquisition's environmental management policies. Part of the assignment will include evaluation and development of ISO 14001-compliant systems.

- **Maersk; Lead Regulatory Analyst; 2005-2006:** Provide analysis and support for client's acquisition of long-term lease in the Hurricane Katrina zone. Develop inquiries plan, and perform analysis of potential environmental liabilities.

- **Huntsman Chemical/Graham & Dunn, Client Service Manager analyst; Current (2005-06):** Lead legal/regulatory liaison between counsel for Huntsman Chemical and CH2M HILL to investigate and determine CERCLA liabilities at mine site in southeastern Idaho; duties also include analysis of historical documentation, review of current CERCLA litigation, and development of pre-litigation and negotiation support strategy.

- **Bechtel BWXT-Idaho; Senior Regulatory Analyst, Negotiator for INEEL CERCLA Disposal Facility; 2001- 2004:** Regulatory analysis, prepare operational and construction documentation (including performance assessment and operational plans) for MLLW CERCLA disposal landfill and evaporation pond at the Idaho National Environmental and Engineering Laboratory (INEEL). Provide regulatory support directly to Bechtel BWXT

Idaho, LLC (BBWI, the INEEL site operations contractor) during Agency review of WAG 3 CERCLA compliance documents at the INEEL, negotiating with agencies, interpreting regulations. Regulatory support included a wide range of mixed waste management and compliance issues. Provide lead regulatory support for compliance with DOE Orders and radiological exposure regulations, including DOE O 435.1 (Radioactive Waste Management). Prepared radiological performance assessments, waste management plans, and waste acceptance procedures for mixed low level wastes (hazardous wastes and PCB-contaminated) on a variety of projects at the INEEL.

- **CH2M♦WG Idaho, LLC (CWI), Senior Regulatory and Compliance Analyst; 2005:** Provided due diligence regulatory review and compliance analysis for incoming cleanup contractor, evaluated and suggested compliance strategies for nuclear waste and legacy waste cleanup at the Idaho National Laboratory.

- **Braintree Electric Light Division, Regulatory Analyst; 2004-2005**: Prepare contractual documents, as well as regulatory and legislative analysis for ground-breaking power and desalination plant in Braintree, MA. Duties will include developing regulatory strategy, ways to use existing regulations, developing proposed regulations, liaison with counsel of record.

- **El Paso Energy, Author/Regulatory Analyst, LNG Facility/Power Plant, Bahamas; 2004**. Developed the regulatory strategy sections for the environmental impact report required under Bahamian Law.

- **United States Forest Service; Author/Senior Regulatory Analyst; 2002-2003:** *Salmon-Challis National Forest Noxious Weed Management Program Environmental Impact Statement.* Authored text and developed comparisons tables, background and alternative review for innovative noxious weed control projects throughout Salmon-Challis National Forest. Provided regulatory/analytical review for all phases of the EIS, including alternatives and cumulative effects analyses; prepared comment resolutions.

- **United States Air Force; Regulatory Analyst; 2002-2003:** Provide regulatory assistance on a variety of projects, including development of innovative waste management plans for the US Air Force's decommissioning of Johnston Atoll, and Standards of Practice for cleanup at the U.S. Air Force Base at Kadena, Japan.

Law Practice ♦ 1989 - 2001

1996-2001 **Seventh District Court (Idaho), James C. Herndon, Consulting Attorney.** Provided support for state district court judge, as well as intensive research in environmental and natural resources issues.

1998-2000 **Pike & Smith, Senior Associate.** General litigation practice in federal court, emphasizing environmental and bankruptcy matters. Representative clients include:

Bank of Idaho: Advise regional bank about environmental and brownfields issues arising out of property acquisitions and bankruptcy matters.

Satterfield-Helm Development, Inc.:	Successfully negotiated "fast-track" cleanup plan between a large regional development firm and the Idaho DEQ.

1996-1997 **V-1 Oil Company**: Special environmental counsel for litigation between large southeastern Idaho oil and propane distribution company and EPA/State of Idaho involving alleged leaking underground storage tanks.

1997 **Custer County, Idaho:** As special County Attorney, negotiated roadway and abandonment issues between Custer County and United States Forest Service.

1997-2000 **Lemhi County, Idaho:** Assisted Lemhi County Prosecutor to define access and NEPA issues during 2000 wildfire season for negotiation with property owners and United States Forest Service.

1997 **Jensen Oil Company,** Environmental Consultant/Attorney; successfully developed and implemented plan for EPA approval of innovative tank tightness and monitoring strategy

1994-1995 **Ecology and Environment, Inc.,** In-House Counsel/Consultant. Liaison between DOE Operations Office's Corporate Counsel, Environmental Programs, and contractors at the INEEL. Assisted in facilitation of public meetings and analysis and resolution of public comments on NEPA and CERCLA. Prepared negotiation and regulatory compliance strategies for DOE-ID.

1993-1994 **Cox Ohman & Brandstetter**, Senior Associate. Managed general litigation caseload emphasizing personal injury defense and environmental litigation.

1992-1993 **Beard, St. Clair, Petersen & Sullivan**, Associate. Managed general litigation caseload, including environmental and agricultural litigation.

1990-1992 **Hon. Grant L. Young**, Law Clerk. Provided courtroom support and litigation research for State District Judge.

Academic • 1994 - 2006

2006-2007 **Special Professor of Law, Hofstra University:** Develop International Environmental Law Curriculum for Hofstra's annual Summer Program in Nice, France, in partnership with the University of Nice. Taught and advised approximately 30 students from 18 law schools in the United States and France.

1994-2004 **Professor, Affiliate Faculty, University of Idaho**: Develop environmental law courses, graduate advisor, for graduate program in environmental science; guest lecturer at University of Idaho School of Law.

Professional Organizations	Idaho State Bar – Active Utah State Bar – Inactive American Bar Association (Section on Energy, Environment, and Resources, Chair: Energy Facilities and Siting Committee; past Vice Chair for the following Committees: In-House Counsel Committee; Energy Facilities and Siting Committee; Environmental Litigation and Toxic Tort Committee) National Association of Environmental Professionals, Conference Proceedings Editor

Presentations and Awards	Planning Committee Member, Fall Meeting, 2006, ABA Section on Environment, Energy, and Resources. President's Recognition, National Association of Environmental Professionals, 2005.
Publications	*"NEPA and the New Nuclear World: Challenges, approaches and regulatory innovations for siting and building new commercial nuclear plants."* Presentation and paper for National Association of Environmental Professionals; April 2004. *"Challenges, approaches and regulatory innovations for siting and building new commercial nuclear plants."* A roundtable discussing permitting initiatives, regulatory developments, and new approaches for developing nuclear power in the United States. Presentation for American Bar Association, 32nd Annual Conference on Environmental Law, March 2003.
Education	J.D., J. Reuben Clark School of Law, Brigham Young University (Order of the Barrister), 1988 M.A. (English) University of Utah, 1988 B.A. (English) University of Utah, 1984
Professional Registrations	Admitted To The Bar, ID - 1992 Admitted To The Bar, UT – 1989

1

2 BY MR. BESSETTE:

3 Q. I would then like to mark as

4 Applicant's Exhibit 3 the following slides, Oral

5 Presentation of Tamar Jergensen Cerafici on

6 Required Environmental Findings.

7 Mr. Kuyler, would you provide copies

8 to the court reporter, the board, and the NRC

9 staff?

10 Ms. Cerafici, were these slides

11 prepared under your supervision and control?

12 A. Yes, they were.

13 Q. Are these slides true and correct?

14 A. Yes.

15 Q. Are these slides consistent with your

16 pre-file written testimony?

17 A. Yes, they are.

18 Q. Do you have any additions,

19 corrections, or other modifications that you

20 would like to make to these slides?

21 A. No, I do not.

22 MR. BESSETTE: Mr. Chairman, I ask

23 that the licensing board accept Applicant's

24 Exhibit 3 into the record as evidence.

25 JUDGE ABRAMSON: Are there any

1 objections from the staff?

2 MS. HODGDON: No objections.

3 JUDGE ABRAMSON: Let's see. Exhibit 1

4 we have. We have Exhibit 2 was which --

5 MR. BESSETTE: It was the safety

6 testimony of Mr. Grant. Exhibit 3 is

7 Ms. Cerafici's testimony.

8 JUDGE ABRAMSON: Shall be so admitted.

9 BY MR. FRANTZ:

10 Q. Ms. Cerafici, would you provide with

11 your presentation?

12 A. Yes, thank you, Mr. Bessette, and

13 thank you.

14 My name is Tamar Jergensen Cerafici.

15 I am a senior environmental specialist for CH2M

16 Hill. CH2M Hill was the primary contractor to

17 prepare the environmental report and the safety

18 information.

19 I oversaw the preparation of the

20 environmental report and reviewed analyses by

21 other subject matter experts, and I have been

22 heavily involved in the preparation of a permit

23 for this and the permit application.

24 The purpose of my testimony today is

25 to provide a brief description of the site

1 redress plan as well as the environmental report
2 along with a comparison of the NRC staff's
3 Environmental Impact Statement in order to permit
4 this panel to make the three environmental
5 findings.
6 So I will be describing throughout
7 this presentation how the NRC staff's
8 Environmental Impact Statement fully complies
9 with the National Environmental Policy Act and
10 10 CFR Part 51.
11 I will also be assisting in testifying
12 on appropriately -- the fact that the NRC staff's
13 Environmental Impact Statement appropriately
14 considers and evaluates the environmental factors
15 and also that the staff considered reasonable
16 alternatives and appropriately determined that
17 the ESP should be issued subject to a permit
18 condition.
19 First, let's look at the site redress
20 plan. Under Part 52 a holder of an ESP with a
21 site redress plan can perform site preparation
22 activities if the activities do not result in any
23 significant adverse environmental impacts that
24 cannot be redressed.
25 These activities can include

1 preparation for construction activities at the
2 site, installation of temporary construction
3 support facilities, excavation for facility
4 structures, the construction of service
5 facilities, and the construction of other
6 non-safety related structures, systems, and
7 components.
8 The objective of our site redress plan
9 was to ensure that we could reconfigure the site
10 to an environmentally stable and aesthetically
11 acceptable condition suitable for non-nuclear
12 uses. In addition, we wanted to account for any
13 pre-existing site conditions and any future
14 non-nuclear uses that could be performed at the
15 site.
16 The NRC staff reviewed the site
17 redress plan in Section 4.11 of the EIS, and the
18 staff concluded that the site preparation
19 activities would not result in any significant
20 adverse environmental impacts that could not be
21 redressed.
22 Now, prior to site preparation Exelon
23 must secure a number of permits particularly
24 related to the hydrologic impact including a
25 Clean Water Act permit from the U. S. Army Corps

1 of Engineer and other state agencies as well as a
2 401 certification from the Illinois EPA or
3 perhaps a determination from that agency that a
4 401 certification is not required.
5 Exelon also submitted an environmental
6 report with its application in 2003. Our
7 obligation as an applicant is, of course, to
8 support the NRC and submit any environmental
9 material related to the staff and consult with
10 the staff in those environmental materials.
11 We discussed in our environmental
12 report the existing environment of the site,
13 vicinity, and region. We looked at a bounding
14 description of nuclear plant values using the
15 Plant Parameter Envelope -- and you've heard
16 Mr. Grant testify to that as well as Mr. Mundy --
17 the environmental impacts of construction as well
18 as those of operation, and we consider
19 appropriate mitigation measures in each of those
20 alternatives.
21 We also looked at the interaction
22 between the proposed site, the proposed plant
23 parameters and the surrounding environment, and
24 finally we looked at alternative energy sources
25 as well as site alternatives.

1 We believe that the ER complies with
2 the following principal regulatory bases: It
3 complies with 10 CFR Part 51 in that we provided
4 the required environmental information to the
5 staff for its review. It also complies with 10
6 CFR Part 52 subpart A in that the contents of our
7 application do meet the requirements for subpart
8 A at 52.17.
9 We also looked at the review standard
10 RS-002. It does deal with processing
11 applications for ESPs, and it incorporates the
12 essentially by reference NUREG-1555 which is the
13 primary standard review plan for environmental
14 reports.
15 And we also, as I mentioned, complied
16 with NUREG-1555. We used that standard as our
17 outline for the environmental report and ensured
18 that all of the review materials, all of the
19 evaluation materials were sufficiently addressed
20 in that standard.
21 Once we submitted the environmental
22 report, the NRC then had an opportunity and an
23 obligation under NEPA and 10 CFR Part 51 to
24 review it. The staff's NEPA obligations include
25 a discussion of the impact of the proposed

1 action.

2 Now, in this case the proposed

3 objection is to grant or deny an early site

4 permit, and so we looked at that as well as the

5 impacts of potential construction and operation

6 of the plant.

7 In addition, the staff must consider

8 mitigation measures, analyze alternatives to the

9 proposed action, and make recommendations on the

10 proposed action.

11 As the NRC prepared its review it

12 certainly had some procedural requirements as

13 well to follow. The NRC staff prepared the

14 Environmental Impact Statement for the permit

15 including a Federal Register notice of intent to

16 prepare an EIS and to conduct scoping, and

17 pursuant to that notice they held a public

18 scoping meeting in Clinton in December of 2003.

19 They also performed site visits. They

20 went to Clinton and alternatives sites in March

21 of 2004. They issued a draft EIS and a request

22 for public comments on that draft in March

23 of 2005.

24 During that process they consulted

25 with federal, state, tribal, and local agencies

1 and also considered public comments, and those
2 comments and consultations are identified in the
3 Appendices D and E of the EIS.
4 The EIS takes an approach or a
5 three-level approach to determine the standard of
6 the significance of the environmental impacts.
7 The staff looked at small, meaning
8 that the environmental impacts are not detectable
9 or are so minor that they will neither
10 destabilize nor noticeably alter any important
11 attribute of the resource. They also looked at a
12 moderate impact which means particularly that the
13 environmental effects are sufficient to alter
14 noticeably but not to destabilize important
15 attributes of the resource.
16 Additionally, they looked at a large
17 impact which means that the environmental effects
18 are clearly noticeable, they destabilize the
19 resource, and they are sufficient to do that,
20 especially to important aspects of the resource.
21 Now, in portions of the EIS you will
22 note that Exelon elected not to analyze certain
23 issues which they are allowed to do in
24 10 CFR Section 52. Exelon did not look at a need
25 for power. They did not perform a cost benefit

1 analysis, nor did they look at any severe
2 accident mitigation design alternatives, or
3 SAMDAs, which are typically addressed in design
4 certification and looked at at the COL stage.
5 These issues are not reviewed in the
6 EIS nor are they resolved at the ESP. As
7 required by 10 CFR Section 52.79(a)(1) the
8 combined license applicant will resolve those
9 issues and consider whether they've been
10 adequately discussed in the ESP.
11 Several general issues are reviewed,
12 and this will highlight and define the rest of my
13 presentation.
14 First, the staff looked at the
15 affected environment which is Chapter 2 of the
16 Environmental Impact Statement. They reviewed
17 the site layout and the Plant Parameter Envelope
18 in Chapter 3. In Chapters 4 and 5 they looked at
19 the impact of construction and operation and
20 reviewed fuel cycle issues in Chapter 6. They
21 also looked at cumulative impacts, alternative
22 analyses and made a summary and some
23 recommendations in Chapter 10.
24 As they looked at the affected
25 environment and as Exelon looked at the affected

1 environment we first looked at the site location
2 itself. The early site permit site is in Dewitt
3 County. It's co-located with the Clinton Power
4 Station, or CPS. The site is located on a man
5 made lake called Clinton Lake, and the lake was
6 built essentially for the purpose to support
7 operation of the Clinton Power Station. Now, the
8 Clinton Power Station is currently one unit, but
9 it was originally planned for a two-unit
10 structure.
11 The environmental report Section 2.2
12 provides the information on land use, and the
13 site vicinity is -- perhaps can help you as we go
14 to the next slide which is slide 12. Slide 12
15 represents the land uses in the area, and as you
16 can note by the brown -- colored brown in the
17 area, that is the color that has been used on
18 this map to designate agricultural use.
19 Agricultural use in the area is approximately 84
20 percent of the -- of the land use.
21 In the site or -- the site is
22 essentially between the two arms of Clinton Lake
23 as shown in the middle of the map. The red
24 designation surrounding the lake area is the
25 vicinity, and there's a broader red dotted line

1 around a large area, and that denotes the region
2 which is approximately 50 miles from the center
3 of the planned site.
4 So getting back to land use, we have a
5 large amount of the land in the mapped area is
6 shown as agricultural. There are some urban
7 areas. You'll note Decatur immediately to the
8 south of the site, the area of Bloomington-Normal
9 which is almost immediately to the north of the
10 site, and then we have Champaign-Urbana which is
11 to the south and east of the site as well as the
12 capitol of Illinois, Springfield, which is to the
13 west and south of the site.
14 Right at the edge of the region we
15 have the larger points of Peoria, Illinois.
16 These are designated on the map as these bright
17 green spots of population, and then as you look
18 in the map a little more closely, there are
19 several smaller points of population throughout
20 the area, but the land use is primarily
21 agricultural or urban in form and in use.
22 The site itself is zoned heavy
23 industrial. Yes, sir.
24 JUDGE HETRICK: Would you point out
25 Decatur once more?

1 THE WITNESS: Decatur is the point --
2 it's a large green section immediately to the
3 south --
4 JUDGE HETRICK: All right.
5 THE WITNESS: -- of the lake. There
6 are some existing line transmission rights-of-way
7 that may be affected later on in the process.
8 That land use may be affected, but it will be
9 temporary.
10 In Section 2.5.1 of the environmental
11 report we discussed our information on
12 demography. We noted that the vicinity is
13 generally sparsely populated. Dewitt is the
14 nearest community. It's a very small community,
15 and it's approximately three miles from the site.
16 Clinton is the nearest community of
17 any size with an approximate population of seven
18 thousand. It's about six miles from the site.
19 JUDGE ABRAMSON: Which way is it from
20 the site? West? East?
21 THE WITNESS: I believe it's west of
22 the site.
23 JUDGE ABRAMSON: So it's that little
24 dot?
25 THE WITNESS: It would be -- I believe

1 it's that dot right there in the immediate -- I
2 have the map here. Yes.
3 JUDGE ABRAMSON: Okay.
4 THE WITNESS: I believe it is right
5 outside of the vicinity, their marcation. It's a
6 small green dot immediately to the west to the
7 lake.
8 JUDGE ABRAMSON: Okay.
9 THE WITNESS: We also looked at
10 meteorology and air quality to get our baseline
11 for the site, and we noted that the ESP site has
12 typical continental climate with moderately cold
13 winters and warm summers. There is some severe
14 weather that can occur, and that's generally in
15 the form of tornados, thunderstorms, hail, snow,
16 and ice. The regional air quality is generally
17 good or moderate on the vast majority of days.
18 Section 2.6 in the EIS in Section 2.4
19 discusses the geological, seismological, and
20 geotechnical information and as noted in this
21 morning's discussions and in the discussions
22 immediately preceding mine the information in the
23 Site Safety Analysis Report is very detailed, and
24 the environmental report essentially summarizes
25 that material.

1 One thing that the staff did note
2 about the site was that engineered fill material
3 would need to be brought in for use in
4 construction.
5 The ER at Section 6.2 describes the
6 existing radiological monitoring plans. Clinton
7 Power Station has a plan in place, and the staff
8 concluded that doses attributable to the Clinton
9 Power Station are a small fraction of the
10 radiation standards as noted in Part 20, Part 50,
11 Appendix I, and in 40 CFR Part 190.
12 ER Section 2.3 looks at the
13 information on hydrology, water use, and water
14 quality.
15 Now, before a new nuclear plant is
16 built Exelon will need to obtain a number of
17 permits relating to hydrology and water quality,
18 and specifically Exelon would need to obtain a
19 National Pollutant Discharge Elimination System
20 Permit, or NPDES.
21 Section 2.4 looks at ecology. We
22 looked at the aquatic ecology as well as the
23 terrestrial ecology and noted that at present
24 there is no critical aquatic or terrestrial
25 habitats located on the site, nor are there any

1 threatened or endangered plant or aquatic species
2 that are known to occur in the vicinity of the
3 site or on any anticipated transmission
4 rights-of-way.
5 Section 2.5 of the environmental
6 report and Section 2.86 of the EIS looked
7 specifically at socioeconomics. We developed our
8 population distribution based on the 2000 census
9 and made the projections to 2060 as you heard
10 this morning based on the methodology used by the
11 Illinois State University.
12 The 2000 census found a population of
13 12,358 within 12 miles of the site sprinkled
14 around that ten mile circle. In the 2060
15 projections estimated a decline of 10,462 within
16 that ten mile -- I should say decline to 10,462
17 within that ten mile radius.
18 ER Section 2.5.3 describes the known
19 historic and archeological resources. There have
20 been some prior studies in this area, and the
21 area for the site of the proposed construction
22 has actually been disturbed already, and the
23 Illinois Historic Preservation Agency noted this
24 but also noted that it may require cultural
25 resource studies before any actual construction

1 occurs.

2 ER Section 2.5 and the EIS Section

3 2.10 looked at information on environmental

4 justice. As noted in the environmental report

5 Dewitt County is 97.1 percent white. There is a

6 small African American community. There are also

7 populations of native American Indians and

8 Hispanic populations.

9 There are between eight to ten percent

10 of the population in a low income or below the

11 poverty line area. Those low income populations,

12 however, are closer into the urban areas. They

13 are not found specifically close to the site but

14 are centered near the more urban areas in the

15 region.

16 Once we had our specific environment

17 identified we then took a look at what the site

18 might -- how the site might appear in a

19 construction situation and an operation

20 situation. Now, the technology and the design

21 for the new plant has not been selected, and we

22 used for our bounding considerations the Plant

23 Parameter Envelope that you heard discussed

24 earlier today.

25 Once they -- there is a reactor

1 selected, the applicant of a COL will determine
2 whether there is any deviation from the PPE or
3 whether that reactor is indeed bounded.
4 We did look at some cooling systems.
5 The Environmental Impact Statement also looked at
6 cooling systems. Those are described in Chapter
7 3.
8 We looked at cooling tower systems for
9 normal cooling. We looked at mechanical draft
10 cooling tower systems for an ultimate heat sink,
11 and we also looked at cooling tower blowdown and
12 any other discharge that would -- that the plan
13 is that it would go through the current and
14 existing CPS discharge canal.
15 Environmental report Section 3.7 and
16 EIS Section 3.3 looked at potential power
17 transmission systems construction and the
18 potential need for it.
19 The existing transmission system
20 generally has excess capacity to handle the
21 output from the new facility. However, there may
22 be some widening of existing rights-of-way
23 necessary to fully use the new transmission.
24 Slide 17 is a representative map of
25 the site layout. It's a little bit different

1 from what you saw in Mr. Grant's presentation,
2 but it essentially highlights the same areas.
3 This large blue block near the center
4 of the plant is the proposed power block area.
5 The smaller blue rectangle to the south -- or
6 south of the site is the normal cooling area.
7 Cooling towers would be in this area here
8 (indicating).
9 We also have an area here that would
10 be a larger or expanded switchyard, and the site
11 that we looked at is essentially bounded through
12 these -- the boundaries are here. They are not
13 demarcated on this map, but they are --
14 essentially follow around the additional new
15 buildings.
16 The water intake is approximately 65
17 feet to the south, about that area (indicating)
18 -- about 65 feet to the south of the existing
19 intake. There is a small blue rectangle or
20 square showing that.
21 With our site layout in mind and our
22 existing environment in mind we are then able in
23 the environmental report to extrapolate some
24 construction impacts from a plant in the -- at
25 the site.

1 So we looked at land use impacts of
2 construction and noted that construction
3 activities except for the transmission would
4 essentially be limited to that site boundary that
5 was shown you.
6 We will work with the potential impact
7 on wetlands or Clinton Lake recreational area,
8 and those reviews will be conducted in accordance
9 with the applicable laws and permits and with the
10 proper consultations.
11 JUDGE BARATTA: Can I interpret you at
12 this point?
13 THE WITNESS: Yes.
14 JUDGE BARATTA: In looking at the
15 construction impacts I really had a lot of
16 trouble with what the staff had to say with
17 respect to housing in the area.
18 As you mentioned earlier, this is a
19 very rural area with literally a few thousand
20 people in the immediate vicinity, and it's not
21 until you get to Decatur that there's a
22 significant, call it if you want, urban
23 population, although that might be a stretch.
24 THE WITNESS: That's correct.
25 JUDGE BARATTA: When you look at

1 building a facility like this, we're probably
2 looking at a thousand or more workers coming in
3 to do this, and I thought the way that the staff
4 treated the impact -- okay, if it's housing, I
5 think it would be more than small or even
6 moderate because of the relative rural nature of
7 the area.
8 They said, well, most of them would
9 travel. Well, where are they going to travel
10 from? Maybe some from here, but more from the
11 Springfield area in which case you would have an
12 impact on the road structure.
13 It's not a show stopper. It's just I
14 really didn't think there was an in-depth
15 analysis of that.
16 What did your assessment show?
17 THE WITNESS: We looked at the
18 population -- existing population, how it was
19 dispersed. We also looked at the nature of
20 employment throughout the region and noted that
21 there were several areas in the urban area such
22 as Decatur, Springfield, Peoria, Bloomington
23 within the region that had a large base of
24 industrial type workers that could come in from
25 these urban areas to work on the plant.

1 We also looked closely at the
2 infrastructure of the area, including roads, and
3 noted that the roads were in good shape. There
4 was a good infrastructure there for the purposes
5 of transporting workers to and from the site.
6 We also noted that given the
7 industrial base of the urban areas that there
8 would probably be a preference or reasonably be a
9 preference of the workers to remain where they
10 were, or if they moved into the area that they
11 would be gravitating more towards the larger
12 urban population where rentals were available,
13 where housing was probably more available and
14 that given the level of infrastructure near
15 Clinton that those impacts would not be -- would
16 not have a large effect on the socioeconomic
17 structure of the area around the site.
18 JUDGE BARATTA: On what do you base
19 that, though? That's what I don't see.
20 THE WITNESS: When the -- when we
21 did -- I can't speak to how the staff did it --
22 JUDGE BARATTA: No, I'm asking for
23 your assessment.
24 THE WITNESS: When we looked at it and
25 assessed what the population structures were and

1 how those population issues were developed, we
2 looked at the availability of housing. We looked
3 at the population projections and where those
4 projections were in relation to some of that
5 housing availability and other -- other
6 infrastructure needs and noted that as
7 populations would grow that they would be
8 gravitating towards a more urban population and
9 commuting into a particular work space.
10 JUDGE ABRAMSON: Do you have some
11 historical data that advises you that that's what
12 would happen, not here but elsewhere that leads
13 you to believe that the population would
14 gravitate toward the more developed areas?
15 THE WITNESS: We have the Idaho --
16 excuse me, the Illinois State University study
17 which showed as they began the projections and
18 then as we performed our own projections we noted
19 that the counties with large populations had the
20 largest population increases over the next, say,
21 40 to 50 years.
22 The conclusions that we drew from that
23 was that the population would continue to decline
24 in the rural areas around Dewitt County and
25 throughout the region.

1 JUDGE BARATTA: What I thought Judge
2 Abramson asked, but if he didn't, I will, do you
3 have historical data that supports your position
4 with respect to what the workers -- or
5 prospective workers would do, i.e., staying 50
6 miles away?
7 What I see is that, okay, here we are.
8 We're maybe, what, 20 miles away or something on
9 that order, and that's the closest large
10 population center. The next one would be I think
11 actually Springfield or Champaign-Urbana, which
12 that's not probably -- you probably wouldn't get
13 any workers from that area, because it's not a
14 manufacturing area, so I'm wondering are workers
15 who have to start to work at 6:30 in the morning
16 and get off at 3:30 going to drive those 50
17 miles, or are they going to try to relocate to a
18 trailer city in the area which obviously could
19 have a potential impact if that's what happened?
20 And I draw my observations based upon
21 when Calvert Cliffs was being constructed which
22 at that time was in a very rural area about 50
23 miles from Washington and resulted in a lot of
24 disruption to the local area while it was being
25 built.

1 I don't consider it a show stopper.
2 I'm just questioning the analysis of that.
3 THE WITNESS: I believe that I would
4 need to look at the environmental report to make
5 sure that I'm giving you the most accurate
6 information on that, and I would need to look at
7 the environmental report and would be happy to do
8 that.
9 JUDGE BARATTA: Could you do that?
10 We'll have some time tomorrow. Maybe you could
11 get back to us and really try to provide some
12 insight as to what is the basis for your -- those
13 statements. Okay? Because the staff seems to
14 use those, and I'm a little concerned about the
15 accuracy of those. Anybody's prognostications
16 can be questioned, but what is the basis?
17 THE WITNESS: Yes, and I will look at
18 the environmental report and certainly get back
19 to you.
20 JUDGE BARATTA: Okay. Thank you.
21 THE WITNESS: Okay. Getting back to
22 the construction impacts, of course we looked at
23 the impacts of -- on meteorology and air quality
24 during construction. We noted that sources of
25 potential air pollution would include dust,

1 smoke, engine exhaust from construction vehicles,
2 and perhaps a concrete facility operation.
3 We also noted that the impacts would
4 be minimized by compliance with applicable
5 regulations, permitting requirements, and good
6 operating practices.
7 We noted that the impacts are expected
8 to be temporary and limited in magnitude, and the
9 staff concluded that the impacts would be small.
10 Our next review was in Section 4.2
11 which looked at the information on impact to the
12 water-related resource. We acknowledged and the
13 staff noted that Exelon must secure a number of
14 permits related to hydrological impacts and that
15 water use would include perhaps dewatering during
16 construction which would include excavation, dust
17 abatement, but that impacts on water use and
18 quality would be small, because they would be
19 localized, and they would be temporary.
20 Section 4.3 of the ER and Section 4.4
21 of the Environmental Impact Statement looks at
22 information on ecological impacts, and again as
23 we did in Chapter 2 we looked at aquatic impacts
24 as well as terrestrial and ecology impacts.
25 We noted that construction activities

1 are not expected to adversely affect any on site
2 wetlands, and we also noted that the clean water
3 permitting requirements would require best
4 construction practices and management and
5 mitigation to prevent any damage from storm water
6 and other discharges.
7 We concluded that the impacts of
8 construction activities on terrestrial habitats
9 would be small assuming that any new
10 rights-of-way would not be needed for
11 transmission purposes.
12 The staff also noted that construction
13 impact to wildlife would be negligible due in
14 part to compliance with the regulations and the
15 permitting requirements.
16 The aquatic impacts like a loss of
17 shore line and habitat and temporary displacement
18 of some species would ultimately be small.
19 JUDGE BARATTA: Could I ask a question
20 on that one as well?
21 THE WITNESS: Yes.
22 JUDGE BARATTA: Is the soil in that
23 area prone to erosion? Do you have any idea?
24 Because it would seem that we've heard
25 that in all probability the site where the

1 facility is to be located will actually require
2 removal of a fairly large amount of material and
3 then some sort of engineered fill to be put back
4 in, and what I'm really wondering is what is the
5 likelihood of a lot of the -- a lot of sediment
6 being carried off at the construction site into
7 the lake since that water is then on both sides,
8 and that's why I asked that question.
9 THE WITNESS: We noted in the
10 environmental report that the impacts in
11 sedimentation from construction would be small,
12 and we looked at the soil characteristics in the
13 environmental report.
14 I would need to go to the specific
15 reference in the environmental report to identify
16 the particular soil requirements. However, we do
17 note that ultimately the impacts from
18 construction of the site would be small.
19 JUDGE BARATTA: Right, and I saw that.
20 Again, I was questioning what the basis for that
21 statement was.
22 THE WITNESS: It's based on the
23 description of the soils and the geology of the
24 area.
25 Again, I would want to defer to the

1 environmental report to make sure I was accurate.

2 JUDGE BARATTA: Okay. If you could, I

3 would appreciate that.

4 THE WITNESS: Sure.

5 In Section 4.1 -- 4.4, excuse me, we

6 looked at the information on the socioeconomic

7 impacts, and we've had some discussion on this

8 already but to review what we talked about in the

9 environmental report we noted that there could be

10 some localized impacts on construction such as

11 noise, dust, vehicle emissions, and some

12 additional traffic on local roads, and some

13 population increase due to the housing needs.

14 Demographic impacts are expected to be

15 small, because we assumed that the workers would

16 come from the region and stay in the urban areas

17 around the region.

18 Other impacts would be small except as

19 the staff noted there would be a potential

20 moderate impact on roads and housing simply

21 because of increased use.

22 The staff also noted a beneficial

23 impact due to increased taxes and construction

24 expenditures in the surrounding counties.

25 The environmental report Section 4.1.3

1 addressed the impact on historical and cultural
2 resources, and of course there are no identified
3 traditional cultural properties in the vicinity
4 or at the site and as a result the staff noted
5 and concluded that those impacts would be small.
6 We also discussed the impact of
7 construction on environmental justice issues and
8 concluded that no disproportionately high adverse
9 impacts on low income or minority populations
10 would occur from construction of this plant. The
11 staff noted that the impacts on minority and low
12 income populations would be small, and we also
13 included that impact in our report.
14 Environmental report Section 4.4.1
15 addressed non-radiological health impacts and
16 noted that the applicable permits, regulations,
17 and dust control systems should mitigate any
18 potential air pollution impacts. We also noted
19 that occupational risks are minimized by
20 adherence to NRC, OSHA, state, and local
21 construction safety requirements.
22 The noise impacts will probably be
23 minimal due to the distance to any major off site
24 activities, and the staff concluded that
25 non-radiological health impacts would be small.

1 We also looked at the information on
2 radiological health impacts in the environmental
3 report Section 4.5. We looked at the radiation
4 exposure to construction workers from the Clinton
5 Power Station, and we concluded and the staff
6 also concluded that the estimated doses are well
7 within the NRC's exposure limits, and those
8 impacts would be small.
9 In Section 4.6 we discussed measures
10 to minimize adverse impacts from construction.
11 The staff looked at those in the EIS in Section
12 4.10. We noted that compliance with
13 environmental, federal, state, and local laws,
14 ordinances, and regulations would serve a
15 mitigating function.
16 We also noted that compliance with
17 existing permits and licenses would serve some
18 mitigation. Compliance with existing Exelon
19 processes and procedures as well as incorporation
20 of environmental requirements into our
21 subcontractors' construction contracts would also
22 serve to mitigate impacts from construction.
23 We then looked at the station
24 operation impact in Chapter 5 of the
25 environmental report as well as the staff's

1 review in Chapter 5 of the Environmental Impact
2 Statement. As we did in Chapter 2 and Chapter 4
3 we first looked at impacts on land use, and as we
4 noted that land use impact could include perhaps
5 some new housing within the region and the
6 vicinity as well as transmission rights-of-way
7 impacts that would include routine vegetation
8 maintenance, cleaning and temporary maintenance,
9 access roads, and other such operational issues.
10 The staff concluded that land use
11 impacts would be small. The environmental report
12 Section 5.8.1.3 looked at station operation on
13 air quality. Noted that the impacts would
14 include emissions of heat and moisture from the
15 cooling towers. We also noted that intermittent
16 emissions of pollutants from operations of
17 axillary equipment as well as standby diesel
18 generators would result in some pollution. There
19 might be some small amounts of ozone and nitrogen
20 oxide from transmission lines.
21 The staff concluded that air impacts
22 from station operation would be small.
23 Other operational impacts could affect
24 water, and we looked at in ER Section 5.2 those
25 effects.

1 We noted that increased lake water
2 loss and increased water temperatures might occur
3 due to new cooling towers. We also noted -- or
4 the EIS noted that impacts might be small in
5 normal water years, but they could be moderate
6 in below average precipitation years because of
7 lake level and instream flows.
8 The staff concluded that Exelon would
9 need to coordinate with the Illinois EPA in such
10 circumstances since the IEPA has jurisdiction
11 over those decisions.
12 Exelon committed to keep combined
13 discharging within the bounds of the existing
14 Clinton Power Station NPDES permit, and the staff
15 felt that that would ensure water quality impacts
16 will remain small at the site during operation.
17 ER Section 5.3, 5.4.4, 5.6.1, and
18 5.6.2 talk about some of the ecological impacts
19 from station operation. Terrestrial impacts on
20 local ecology, including those at the cooling
21 towers on Clinton Lake, would be small. We
22 concluded that as well as the staff.
23 The staff also looked at impacts of
24 transmission line rights-of-way. Those
25 operational impacts might include vegetation

1 control, electromagnetic fields and perhaps bird
2 collisions. Those impacts would be negligible.
3 The staff concluded as well that
4 aquatic impacts would generally be small. The
5 staff noted that if best available technology is
6 not used any cooling water intake system might be
7 moderate rather than small. The impact to
8 available aquatic habitat would be moderate in
9 low water years because of the low precipitation.
10 The COL applicant will probably need
11 to provide additional information on the intake
12 structure design. That is not something that we
13 specifically addressed in the environmental
14 report.
15 The staff noted as well that
16 operations will not impact any critical habitat
17 and impacts to listed species will also be
18 negligible during operation.
19 Section 5.8 of the environmental
20 report provides information on socioeconomic
21 impacts. Those impacts of course would include
22 noise, odors, exhaust, and thermal emissions as
23 well as the visual impact of the structures.
24 There might be a small increase in
25 local population, traffic, housing demand, public

1 services, and education.

2 We concluded and the staff noted as

3 well that most of those impacts would be small.

4 The staff noted that there might be

5 moderate aesthetic and recreational impacts due

6 to lower lake water level during severe drought

7 years and moderate housing impacts in Dewitt

8 County from operations. There was also -- would

9 also be a small beneficial economic and tax

10 impact for the surrounding counties.

11 Dewitt County, on the other hand,

12 would receive moderate economic benefits and

13 large tax benefits because the presence -- of the

14 presence of the new plant facility.

15 ER Section 5.1.3 addresses impacts on

16 historic properties and notes that the operation

17 is not expected to have any significant

18 historical or cultural resources impact.

19 We concluded and the staff noted that

20 that impact would be small.

21 Environmental report Section 5.8.3

22 addresses the impact of operation on

23 environmental justice. Based on what we learned

24 from Chapter 2 there was no disproportionately

25 high adverse impacts on low income or minority

1 populations, and we concluded and the staff noted
2 that impacts on minority and low income
3 populations would be small.
4 The environmental report Chapter 7 and
5 the Environmental Impact Statement Section 5.8
6 discusses non-radiological health impacts from
7 operations. We looked at the expected small
8 temperature increase from discharges would not
9 significantly increase abundance of
10 microorganisms. We also postulated that noise
11 levels would be of a small significance based on
12 the location of the site and the facility.
13 The transmission operator would need
14 to comply with applicable regulations and
15 standards to minimize electromagnetic fields,
16 EMFs, and any occupational health impacts.
17 We concluded that the health risks
18 would be small. The staff noted that they would
19 be small as well.
20 Any conclusive information on the
21 chronic effects of EMF is unavailable, but staff
22 noted the current research does not suggest an
23 impact would be significant.
24 In Section 5.4 we reviewed the
25 information on radiological impacts of normal

1 operation. We looked at the combined radiation
2 dose from the Clinton Power Station and any
3 proposed plant and noted that it would be well
4 within 49 CFR Part 190 -- excuse me,
5 40 CFR Part 190, 10 CFR part 20, and 10 CFR Part
6 50, Appendix I.
7 We noted that there would be no
8 observable health impacts on the public, and the
9 staff noted that occupational doses would be
10 within the regulatory limits and health impacts
11 would be small.
12 Environmental report Chapter 7 and the
13 EIS Section 5.10 describes the impacts of
14 postulated accidents using the Advanced Boil
15 Water Reactor as well as the AP1000.
16 The staff noted that -- the staff's
17 review focused on these, and as noted this
18 morning we looked at a broad array of different
19 plant designs. The staff noted that these
20 designs have been analyzed under the design
21 certification process and have specific
22 parameters for their postulated accidents.
23 Staff also noted that environmental
24 risks of accidents would be small compared to the
25 safety goals -- yes.

1 JUDGE HETRICK: The original question
2 was addressed to the staff why does Table 513 of
3 the FEIS include only risks from internally
4 initiated events?
5 MR. BESSETTE: JUDGE HETRICK, we have
6 an exert on severe accidents who is available at
7 this time.
8 JUDGE HETRICK: I beg your pardon?
9 MR. BESSETTE: We have an expert on
10 severe accidents available to answer that
11 question if you would like us to bring him up at
12 this time.
13 JUDGE HETRICK: Let me just ask one
14 short question now. Was that choice of accidents
15 to be analyzed described in Chapter 7 of your
16 environmental report?
17 THE WITNESS: It was provided as part
18 of an answer to a request for additional
19 information and was incorporated into Revision 4
20 of the environmental report.
21 JUDGE HETRICK: Thank you. You were
22 volunteering another witness?
23 MR. BESSETTE: Yes. You had asked
24 earlier additional questions on whether severe
25 accidents included internal and external. If

1 we've answered your question, we do not see the
2 need to bring him up, but we have an expert on
3 severe accidents if you would like to ask
4 additional questions.
5 JUDGE HETRICK: I'm sorry. I'm not
6 hearing you too well.
7 JUDGE ABRAMSON: What Mr. Bessette is
8 saying is that you asked an earlier question
9 about whether external events were included, and
10 they have an expert on severe accidents if you
11 want to ask him something about that. Otherwise,
12 if your question has been answered, they will
13 proceed.
14 JUDGE HETRICK: Excuse me. No, my
15 question has not been answered.
16 MR. BESSETTE: All right. Then we
17 would like to pass that. Jeff Gabor, can you
18 come and act as our witness on severe accidents?
19 JUDGE ABRAMSON: Mr. Gabor, state your
20 name for the record, please. Mr. Gabor, stand,
21 raise your right hand. State your name, please.
22 JEFF GABOR: Jeff Gabor.
23
24 JEFF GABOR
25 called as a witness, after having been first duly

1 sworn, was examined and testified as follows:
2 EXAMINATION CONDUCTED
3 BY: MR. BESSETTE
4
5 Q. Mr. Gabor, could you tell us who your
6 employer is and what your current position is?
7 A. Yeah, I'm a vice-president with ERIN
8 Engineering. We're a consultant to Exelon.
9 Q. Mr. Gabor, earlier in the presentation
10 Judge Hetrick had asked whether the severe
11 accident analysis conducted as part of the
12 environmental report addressed external events as
13 well as internal events. Could you answer that
14 question?
15 A. Yes. The work that ERIN did was to
16 utilize the design certification information for
17 the ABWR and the AP1000. The -- those
18 evaluations were done based on internal event
19 frequencies and internal event risks, so our
20 evaluations focused on internal event risks for
21 those.
22 Historically if we look at the generic
23 EIS for license renewal, for example, you see
24 that a technique is used to multiply the internal
25 event CDF by some multiplier to try to represent

1 external events. It's a pretty common technique
2 that is used.
3 We have some amount of confidence in
4 that based on the limited detailed seismic and
5 fire, primarily, studies that have been done that
6 show a comparable CDF from those risk factors.
7 The scenarios that are created as a
8 result of fires or seismic tend to fit into
9 traditional internal event categories. They
10 don't represent anything unique in terms of a
11 scenario, so, again, we utilized the -- for those
12 reasons we tend to utilize a multiplier, which I
13 believe was mentioned in the NRC's response to
14 your question.
15 JUDGE HETRICK: So my question would
16 now be if indeed external events had been
17 considered, et cetera, the risks would still be
18 well within the safety goals. How do you know
19 that?
20 THE WITNESS: We base that on again
21 the studies that have been done tend to be
22 conservative -- the external event studies that
23 have been done tend to be conservative in nature.
24 They lack the same kind of technical rigor that
25 we use on a traditional internal event PRA, so we

1 know that it's difficult to compare the internal
2 and the external event CDFs side by side, but we
3 do have a sense that those values are
4 conservative, and, again, for the studies that
5 have been done they tend to result in a fairly
6 comparable CDF to the internal event numbers.
7 And, again, since we don't have unique
8 scenarios that are created by those external
9 events, we feel pretty comfortable applying a
10 multiplier and again applying a multiplier of
11 like two or a factor of three to the internal
12 event CDF would indeed still meet the goals.
13 JUDGE ABRAMSON: So our question for
14 you, Mr. Gabor, is what leads you to believe that
15 a multiplier of two or three, i.e., that the CDF
16 from an external event is of comparable size to
17 the CDF for the internal event that would get you
18 to a multiplier of two? What leads you to
19 believe that? That's really where we're going.
20 THE WITNESS: Yeah, in response to the
21 IPEEE generic letter 8820 and the supplement to
22 that, utilities did perform limited scope
23 vulnerability studies, and some of those
24 evaluations have identified or approximated core
25 damage frequency associated with external events,

1 so those are the numbers that lead us to believe
2 since they're on the same order of magnitude as
3 the internal event CDF that using this multiplier
4 would be appropriate, a multiplier of two or
5 three would be appropriate.
6 JUDGE HETRICK: So some of the studies
7 you referred to do involve probability analysis?
8 THE WITNESS: Correct.
9 JUDGE HETRICK: Okay. That's all I
10 have.
11 CONTINUED TESTIMONY OF TAMAR CERAFICI
12
13 MR. BESSETTE: Thank you, Mr. Gabor.
14 Ms. Cerafici, would you continue with your
15 presentation?
16 THE WITNESS: Thank you, Mr. Bessette.
17 Returning to other operational
18 impacts, the environmental report Section 5.10
19 and the EIS Section 5.11 provided information on
20 measures and controls to limit any adverse
21 impacts during operation.
22 The compliance with the applicable
23 laws, ordinances, and regulations to prevent or
24 minimize adverse impacts would be a significant
25 part of our effort to minimize operational

1 impacts, but we would also comply with applicable
2 permit and licensing requirements as well as
3 comply with Exelon's operating procedures.
4 We also note that the EIS concludes
5 that procedures and controls are technically and
6 economically feasible and that they are adequate
7 to avoid or mitigate adverse impact.
8 I should note on slide 28 as well that
9 in the ER Chapter 7 the staff looked at the
10 impacts of postulated accidents, specifically to
11 ABWR and AP1000, and in EIS 5.10 they noted that
12 if non-light water reactor design is chosen, then
13 there would be some further analysis required at
14 the COL stage. That is the staff's conclusion.
15 JUDGE BARATTA: Do you agree with
16 that?
17 THE WITNESS: We looked at -- in the
18 environmental report and in our accident analysis
19 as you heard Mr. Grant discuss this morning, we
20 looked at a number of possible reactor designs as
21 part of the accident analysis, and we identified
22 several potential accidents in -- both in the
23 safety and in the environmental report, and we
24 believe that those -- that there was a bounding,
25 as Mr. Grant testified earlier this afternoon,

1 that those designs are bounded appropriately in
2 the safety report and in the environmental
3 report.
4 Once we looked at the impacts of
5 operation we wanted to review the impacts of fuel
6 cycle transportation and decommissioning.
7 In the environmental report in Section
8 5.7 we looked at the information on the impact of
9 the uranium fuel cycle and looked at fuel cycle
10 impacts in Table S3 of Section -- Part 10 CFR
11 Section 51.51(b).
12 The staff noted that the impacts would
13 be small, and the Environmental Impact Statement
14 concludes that additional review would be
15 required at the COL stage because of any
16 uncertainty associated with non-light water gas
17 cooled reactors.
18 Environmental report Section 5.7
19 addressed transportation of radioactive
20 materials. The staff noted that environmental
21 effects of the transportation were contained in
22 Table S4 to 10 CFR Part 51, and the EIS then
23 adjusted table S4 to account for a difference in
24 reactor output.
25 The staff noted within the EIS that

1 the impacts to transportation would be small, and
2 as noted in the earlier bullet, the EIS concluded
3 that any additional reviews required at the
4 combined operating license stage would need to
5 occur because of the uncertainty associated with
6 gas cooled reactors.
7 The staff looked at the impacts of
8 decommissioning in the environmental report. We
9 noted that the applicant was not required to
10 discuss the impacts of decommissioning at the ESP
11 stage. The Environmental Impact Statement
12 reported that the impacts are expected to be
13 small but that the issue would be addressed in
14 detail at the COL stage.
15 The staff is also required to look at
16 cumulative impacts, and Chapter 7 of the
17 Environmental Impact Statement looked at those
18 potential cumulative impacts.
19 Just briefly I'll go through those.
20 They looked at the cumulative fuel cycle and
21 transportation impacts for non-light water
22 reactors and decommissioning and noted that they
23 would be addressed at the COL stage.
24 For any other areas, the EIS concluded
25 that impacts would be generally small.

1 There are some places that they noted
2 because of the moderate nature in prior
3 discussions that several areas also have a
4 potential for moderate cumulative impact, and
5 that would include a cumulative water use and
6 quality impact for dry years, water intake
7 structure impacts if the best available
8 technology was not used for the intake structure,
9 aquatic environment impacts following dry years,
10 there would be some cumulative impacts from
11 thermal discharge, physical impacts to roads due
12 to heavy truck traffic, and some aesthetic and
13 recreational impacts in severe drought.
14 In these cases there would be
15 mitigation measures warranted, and the staff
16 suggested derating or shutting down the unit
17 which would be as noted reviewed by the IEPA.
18 In Section 9 of the environmental
19 report Exelon reviewed alternatives to the
20 proposed action keeping in mind, of course, that
21 the proposed action is granting or denying the
22 early site permit.
23 The staff looked at the alternatives
24 in Section 8 of their Environmental Impact
25 Statement, and in Section 8.1 they looked at the

1 no action alternative. We also reviewed the no
2 action alternative in the environmental report.
3 As noted, the proposed action is to
4 grant the ESP. The no action alternative means
5 that no early site permit is granted for this
6 site, and if the ESP is denied, then no new
7 construction, no operation of a facility would
8 occur at the site.
9 As a result, those environmental
10 impacts would not occur. However, the no action
11 alternative does not accomplish the benefits of
12 the ESP including early resolution of siting
13 environmental issues, the banking of the site for
14 a future nuclear plant, and a facilitation of
15 future decisions whether to build new plants or
16 not.
17 In the environmental report in Section
18 9.2 we looked at the energy source alternatives.
19 The staff reviewed that in the EIS in Section
20 8.2.
21 The staff and Exelon essentially
22 considered different types of energy source
23 alternatives. They looked at three alternatives
24 that did not necessarily require new generating
25 capacity. For example, conservation, extending

1 the service life and looking at purchased power.
2 The staff and Exelon both noted that
3 conservation is not a reasonable alternative,
4 because the proposed energy alternative, of
5 course, is nuclear power for base load
6 generation.
7 The staff also noted that service life
8 extensions are not reasonable alternatives,
9 because they don't necessarily provide the
10 additional base load generation capacity
11 proposed.
12 Purchased power likely will come from
13 coal, natural gas, or nuclear generation off site
14 and would not avoid the environmental impacts of
15 operation.
16 Other types of economically viable new
17 base load facilities like coal or natural gas are
18 not environmentally preferable, and a combination
19 of renewable sources and non-nuclear sources are
20 not environmentally preferable.
21 The staff also looked at plant design
22 alternatives to the proposed heat dissipation
23 systems. We did not make that review in the ER.
24 However, the staff did look at it in Section 8.3
25 of the EIS. They noted that no information is

1 available on the impact of some of the cooling
2 tower design and so noted that that would have to
3 be reviewed at the COL stage.
4 Specifically they noted the dry
5 cooling towers might need to be reviewed if they
6 are proposed in the COL application. The design
7 alternatives are not required for the ESP, but we
8 just assumed for our purposes that a wet/dry
9 design would be bounding for the site.
10 In Section 9.3 of the environmental
11 report we reviewed the alternative sites in what
12 is known as the region of interest.
13 We concluded that the region of
14 interest for the purposes of this ER was the
15 state of Illinois. The state of Illinois is a
16 large state. It has a large number of nuclear
17 facilities in different environments throughout
18 the state. The state is large enough to handle
19 or have very different environments in which
20 those plants will operate.
21 In addition, there's a single
22 regulatory structure in Illinois from which we
23 can look at the existing plants and the existing
24 sites and determine which site is obviously
25 superior.

1 As part of our site analysis we looked
2 at the greenfield or former industrial site that
3 had not had a power plant on it and noted that
4 the sites -- those sites were not environmentally
5 preferable to an existing site. We also looked
6 at -- noted that the impact on a non-nuclear site
7 would be greater than the impact of building a
8 nuclear power plant on an existing site would be.
9 As a result, we looked six other
10 nuclear sites within the state of Illinois,
11 Byron, Quad Cities, Dresdan, Braidwood, Zion, and
12 LaSalle. We eliminated Byron, Quad Cities, and
13 Dresdan initially for insufficient land. That
14 was a primary criteria in NUREG-1555, and we
15 noted that those facilities were already
16 overbuilt and would not meet our land
17 requirements.
18 The remaining three sites, Braidwood,
19 Zion, and LaSalle, were compared with Clinton to
20 determine whether they were environmentally
21 preferable. We concluded that none of the
22 alternative sites were environmentally preferable
23 and using the staff's two step analysis if it's
24 not going in to determine whether there is an
25 obviously superior site, since none of the sites

1 are environmentally preferable, then Clinton is
2 the obviously superior site.
3 The staff also looked at other factors
4 within the Environmental Impact Statement, and we
5 looked at some of those factors as well.
6 In the environmental report in Section
7 10.1 we discussed the unavoidable adverse impacts
8 from the permit. We noted that there would be no
9 unavoidable adverse impacts from granting the
10 early site permit. We also noted that a new
11 nuclear plant would disturb land, decrease lake
12 level during dry periods, increase use of local
13 services, and result in radiation doses.
14 But the EIS concluded that most of
15 those impacts would be small. The impact of a
16 cooling system on water in low water years would
17 probably be moderate.
18 The environmental report Section 10.2
19 discussed any irretrievable and irreversible
20 commitments of resources, and we noted that the
21 commitment of construction materials like
22 concrete and steel would occur as well as uranium
23 during operation, but we also noted that the
24 commitment is expected to be small in comparison
25 to the availability of the resource.

1 The environmental report Section 10.3
2 evaluated the short-term uses versus the
3 long-term productivity, and we noted that the
4 activities authorized by the ESP are unlikely to
5 adversely affect the long-term productivity of
6 the environment. A full assessment of the impact
7 of construction and operation on long-term
8 productivity would need to be performed at the
9 COL stage.
10 We then looked how the EIS complied
11 with NEPA obligations in support of your
12 environmental finding No. 1. We looked at the
13 EIS in relation to NEPA Section 102.2(a). That
14 requires the federal agencies to utilize a
15 systematic interdisciplinary approach. The NRC's
16 approach closely parallels the requirements for
17 NUREG-1555.
18 The staff utilized the expertise of
19 professional scientists, of engineers, and of
20 social scientists. In addition, the EIS complied
21 with NEPA Section 102.2(e) which requires the
22 federal agencies to evaluate any alternatives.
23 Section 8 of the Environmental Impact
24 Statement is a very thorough review of the
25 alternatives. They look at no action. They look

1 at energy. They look at plant design
2 alternatives and the alternative sites.
3 Slide 36 is a tabular description of
4 what the requirements of NEPA Section 102.2(c)
5 are as well as the EIS Section. The left-hand
6 column, as you see, identifies the evaluation
7 requirements, and the right-hand column
8 identifies sections within the Environmental
9 Impact Statement that we believe complies with
10 Section 102.2(c).
11 Slide 37 looks at the first part of
12 the two-part analysis in 10 CFR Part 51. There
13 are procedural issues in Part 51, and there are
14 also substantive issues in Part 51.
15 Slide 37 describes the procedural
16 issues in a tabular format. The table -- the
17 left-hand column of the table identifies the
18 procedural requirements. For example, issuing a
19 notice of intent to prepare an EIS and so forth.
20 The right-hand column shows where we believe that
21 the staff has conformed with that requirement.
22 Slide 38 goes to the substantive
23 requirements of Part 51. The left-hand column of
24 the table on slide 38 shows the substantive
25 requirements, and the right-hand column shows

1 where we believe that the staff has conformed
2 with the requirement.
3 Part of the board's job is also to
4 balance the conflicting factors, and the staff
5 notes in the Environmental Impact Statement that
6 most of the environmental impacts would be small.
7 They also recognize, however, that there may be
8 some moderate impacts that could be mitigated.
9 The staff notes that the early site
10 permit site is suitable from an environmental
11 standpoint for an ESP facility. The ESP should
12 be issued, as the staff notes, to preserve the
13 option of using the site for construction and
14 operation of the ESP facility.
15 The need for power from the ESP
16 facility and any final cost benefit analysis will
17 be performed at the COL stage.
18 In addition, environmental finding
19 No. 3 requires this board to consider reasonable
20 alternatives. We believe that the staff
21 considered a broad range of reasonable
22 alternatives. The staff looked specifically at
23 the no action alternative noting that it's not
24 preferable, because it would not accomplish the
25 purposes of the proposed action. There are no

1 reasonable alternative energy sources that are
2 both viable and competitive as well as
3 environmentally preferable. They also noted that
4 there are no obviously superior sites to the
5 Clinton ESP site.
6 There was due consideration to design
7 alternatives to reduce the impacts of heat
8 dissipation as well.
9 The ESP does not need any additional
10 conditions to protect these environmental values.
11 In addition, we agree with the staff that the ESP
12 should be issued as recommended in the
13 Environmental Impact Statement.
14 So, in conclusion, our NEPA review
15 conducted of the staff's Environmental Impact
16 Statement shows that the review has been
17 adequate. The environmental report as well as
18 the EIS contain sufficient information to support
19 this board's environmental findings as well as
20 the issuance of an early site permit.
21 The Exelon ESP site is suitable for a
22 nuclear power station bounded by the PPE, and the
23 ESP should be issued subject to the terms and
24 conditions noted in the EIS.
25 That concludes my presentation. Thank

1 you very much.

2 JUDGE ABRAMSON: Thank you.

3 I have a task for staff for tomorrow.

4 We'd like you to look at slides 35 through 40 of

5 this presentation and advise us whether you agree

6 that those slides accurately and completely

7 present the situation as you see it and, if not,

8 tell us where you might disagree with that or

9 where you might see that additions are necessary.

10 If you cannot accomplish that

11 tomorrow, then you can do it in writing within

12 five days of the conclusion of the hearing.

13 Any questions from the board?

14 Dr. Hetrick? Dr. Baratta?

15 JUDGE BARATTA: No.

16 JUDGE ABRAMSON: Okay. At this point

17 we will resume this hearing tomorrow morning at

18 9:00 a.m. We'll adjourn for today. Tomorrow is

19 staff's NEPA presentation.

20 Thank you very much all for coming and

21 for your help with this matter.

22 (Off the record.)

23

24

25

CERTIFICATE

This is to certify that the attached proceedings before the United States Nuclear Regulatory Commission in the matter of:

Name of Proceeding: Exelon Generation Company
Clinton ESP: Mandatory Hearing

Docket Number: 52-007-ESP

Location: Decatur, Illinois

were held as herein appears, and that this is the original transcript thereof for the file of the United States Nuclear Regulatory Commission taken by me and, thereafter reduced to typewriting by me or under the direction of the court reporting company, and that the transcript is a true and accurate record of the foregoing proceedings.

Terri Sommer

TERRI SOMMER
Official Reporter
Neal R. Gross & Co., Inc.