

July 31, 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 RESPONSE TO LICENSING BOARD'S ORDER OF
JULY 20, 2006, REQUIRING ANSWERS TO INQUIRIES AND THE PROVISION
OF DOCUMENTS; MOTION TO EXTEND TIME FOR ANSWERING CERTAIN
INQUIRIES AND FOR RECONSIDERATION REGARDING ONE OF THE INQUIRIES

INTRODUCTION

On July 20, 2006, the Licensing Board in this proceeding issued an Order in which it required the Staff to provide answers to eighty-eight questions and produce documents related to the Board's review of the Staff's Final Safety Evaluation Report (FSER) before noon on August 11, 2006.¹ In response to this Order, the Staff is providing answers to 85 of the questions at this time,² seeking to extend the time for answering three questions, and seeking reconsideration of a portion of Inquiry Number 88.

BACKGROUND

On April 17, 2006, the Licensing Board issued an order requesting documents and briefings from the Applicant and the NRC staff related to the mandatory portion of the Board's review of the application of Exelon Generation Company, LLC (Exelon) for an early site permit (ESP) for its existing Clinton nuclear power station site near Clinton, Illinois, for the possible

¹ Order (July 20, 2006) (unpublished).

² This response provides the Board with the documents requested in its inquiries; copies will be sent to persons on the service list by U.S. Mail on August 1st, 2006.

construction of one or more new nuclear reactors.³ The Staff filed a motion for reconsideration,⁴ which the Board granted in part and denied in part,⁵ whereupon the Staff petitioned the Commission for interlocutory review,⁶ having requested and been granted by the Board a stay of the Board's Order pending resolution of the Staff's petition.⁷

On July 20, 2006, at which time the petition for review was pending before the Commission, the Board issued an order propounding eighty-eight inquiries and requests for production of documents. On July 26, 2006, the Commission issued a Memorandum and Order granting the Staff's petition and ordering the Boards in Exelon ESP and SERI ESP to tailor their orders "to promote efficiency and avoid imposing unnecessarily burdensome or duplicative efforts on the NRC staff."⁸

DISCUSSION

As stated above, the Staff is providing answers to the majority of the Board's questions at this time. However, because of the unavailability of Staff reviewers and contractors who prepared the FSER sections relating to geology, seismology and geotechnical engineering, The Staff will not be able to provide complete answers to certain of those questions by August 11, 2006. Further, the Staff submits that Inquiry 88, which requires the Staff to "identify in a written table to be delivered to the Board, subsection- by-subsection, each asserted fact or technical

³ Licensing Board Order (Request for Documents and Briefings) (April 17, 2006) (unpublished).

⁴ Motion for Reconsideration (April 27, 2006).

⁵ Order (May 3, 2006) (unpublished).

⁶ NRC Staff Petition for Interlocutory Review of the Licensing Board's May 3, 2006 Order (May 26, 2006).

⁷ NRC Staff Motion for Stay (May 8, 2006); Licensing Board Order (Granting Motion to Stay (May 9, 2006) (unpublished).

⁸ *Exelon Generation Company, LLC* (Early Site Permit for the Clinton ESP Site); *System Energy Resources, Inc.* (Early Site Permit for the Grand Gulf ESP Site), CLI-06-220, 64 NRC ___, slip op.at 2, (July 26, 2006).

conclusion expressly referenced in a subsection entitled 'Technical Information of the Application' that was NOT verified by the staff together with a brief explanation as to why that matter was not verified," is inconsistent with the Commission's direction in its Memorandum and Order in

CLI-06-20. Specifically, the Staff believes the inquiry is precluded by the Commission's statement that

"[a] 'mandatory hearing' Board must narrow its inquiry to those topics or sections in Staff documents that it deems most important and should concentrate on portions of the documents that do not on their face adequately explain the logic, underlying facts and applicable regulations and guidance. It serves no purpose for the Staff to produce volumes of documents and information supporting facts and conclusions that are of small importance and are beyond dispute."

CLI-06-20 at 8. The Staff, therefore, respectfully requests reconsideration of that inquiry.

WHEREFORE

For the reasons discussed above, the Staff requests the Board to extend the dates for providing answers to Inquiries 43, 49 and 50 until August 18, 2006, and to withdraw its Inquiry 88 or, in the alternative, amend it in accordance with the Commission's direction to the Board in CLI-06-20.

Respectfully submitted,

/RA/

Ann P. Hodgdon
Counsel for the NRC Staff

Dated at Rockville, Maryland
this 31st day of July, 2006

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CERTIFICATE OF SERVICE

I hereby certify that copies of the "NRC STAFF RESPONSE TO LICENSING BOARD'S ORDER OF JULY 20, 2006, REQUIRING ANSWERS TO INQUIRIES AND THE PROVISION OF DOCUMENTS; MOTION TO EXTEND TIME FOR ANSWERING CERTAIN INQUIRIES AND FOR RECONSIDERATION REGARDING ONE OF THE INQUIRIES" in the captioned proceeding have been served on the following through electronic mail, with copies to follow by deposit in the NRC's internal mail system as indicated by a single asterisk, or through electronic mail, with copies to follow by deposit in the U.S. Mail, first class, as indicated by a double asterisk, this 31ST Day of July, 2006:

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Attachment A

**CLINTON ESP
FSER INQUIRIES**

Q#	Page	Section	INQUIRY
1	1-9	1.7	<u>Summary of Combined License Action Items.</u> How did the staff ensure that COL action items identified by the applicant in the SSAR are all included and consistent with the COL action items discussed in this section and Appendix A.2. Also for completeness, this section should reference Appendix A.2, COL Action Items Table.
			<u>Response</u> A review of the type described in this question was not performed. Because COL action items constitute information requirements but do not form the only acceptable set of information addressed in the final safety analysis report, the staff did not identify an exhaustive list of COL action items. Instead, as stated in section A.2 of this report, "The staff identified . . . COL action items with respect to individual site characteristics in order to ensure that particular significant issues are tracked and considered during the review of a later application"
2	2-7	2.1.3.1	<u>Population Distribution.</u> The applicant estimated the population distribution within a 50-mile radius of the proposed ESP site based on the most recent U.S. Census data. Then population estimates up to 2060 were projected. How did the staff determine, and what is their evaluation of, the basis for the applicant's population projection?

Q#	Page	Section	INQUIRY
			<p><u>Response</u></p> <p>The 2nd and 3rd paragraphs on page 2-9 of the FSER (NUREG-1844) discuss that the staff compared the applicant's population data by comparing them with US Census Bureau internet data. The staff also reviewed the population projection data provided by the applicant to year 2060, based on year 2000 census data. The applicant used population projections for 2010 and 2020 for each county provided by Illinois State University. Based on these data, the applicant estimated the expected population change rates (percent change) between 2000 and 2010 and between 2010 and 2020 for each county. The applicant then assumed that the expected population change rate for the four 10-year increments between 2020 and 2060 would be similar to the estimated population change rate between 2010 and 2020. These population rates were then applied using U.S. Census Bureau data from 2000 to each census block within a county. Population forecasts for each sector were calculated by assuming an even distribution of population throughout the census block. The applicant estimated transient population using the same growth percentages. The staff considered this applied assumption by the applicant reasonable in calculating the population projections to year 2060. The staff also reviewed and considered appropriate the bases, sources and calculations of transient populations provided by the applicant and addressed in 3rd paragraph on page 2-9.</p>
3	2-12	2.21	<p><u>Nearby Industrial, Transportation, and Military Facilities.</u> What is the 6-mile radius circle in Fig. 2.2.1-1?</p> <p><u>Response</u></p> <p>Figure 2.2.1-1 was provided by the applicant in its ESP SSAR in order to illustrate the identified industrial facilities in the vicinity of the proposed site. The purpose of the 6-mile radius in the figure is for visual convenience. Staff review procedure, as described in the Standard Review Plan (NUREG-0800, Section 2.2.1-2.2.2, III. Review Procedures) specifies hazardous activity identification within eight kilometers (5 miles) of a plant. A 6-mile radius is a reasonable measure considering that a specific plant location is not available at the time of the ESP application. It assures that the 5-mile criterion can be met when a specific plant design is to be evaluated for the proposed site.</p>
4	2-18	2.2.3.4	<p><u>Nearby Industrial, Transportation, and Military Facilities.</u> The staff "concludes that the site location is acceptable." However, the staff identified, in other parts of Section 2.2, a number of areas wherein the staff will review and evaluate impacts at the COL stage. Did the staff mean to state that the site location is acceptable subject to satisfactory results of those reviews? If so, provide an appropriate amendment to the FSER identifying all such conditions to this approval.</p>

Q#	Page	Section	INQUIRY
			<p><u>Response</u> In Section 2.2 of the FSER the staff identified the need for assessing design-specific interactions that could arise between the nearby existing unit and any new units that may be constructed on the proposed site. In the absence of a specific new unit design and its geographic placement in relation to the existing unit, it is not feasible to identify specific hazards that may be introduced by the proximate co-location of the existing and new units. Examples of potential hazards may include site proximity missiles (e.g., turbine missiles), as well as accidental airborne chemical (toxic) or radiological releases. In the absence of specific design details, including plant location and orientation, these types of interface hazards cannot be evaluated at the ESP stage. However, hazards of this type had been addressed satisfactorily for the existing unit, such that it is reasonable to expect that they also can be evaluated and, if need be, accommodated for a new unit. On this basis, the staff found the proposed site to be acceptable in conjunction with the need for additional review and evaluation at the COL stage.</p>
5	2-28	2.3.1.3	<p><u>Meteorological Characteristics.</u> Deliver to the Board three copies of the PPNL technical evaluation report upon which the staff based its conclusion that “the applicant’s design-based tornado site characteristics are acceptable.”</p>
			<p><u>Response</u> The PNNL report “Technical Evaluation Report on Design Basis Tornadoes for the Clinton ESP Site” can be found at ADAMS Accession No. ML043370309. Three copies are provided.</p>
6	2-29	2.3.1.3	<p>The staff concludes that “the applicant’s 48-hr PMWP site characteristic value of 16.6 inches of water is acceptable” based upon the staff’s approximately 10% higher estimate, which the staff concludes is “most likely the result of” the fact that the staff used a smaller drainage area (10 square-mile vs 296 square-mile). This reduction by a factor of nearly 30 in drainage area led the staff to only a 10% larger PMWP. Explain in depth how the staff found these results comparable and compatible with those of the applicant.</p>

Q#	Page	Section	INQUIRY
			<p><u>Response</u></p> <p>The staff derived its 48-hr PMWP value of 18.2 inches of water using the information presented in NUREG/CR-1486, Hydrometeorological Report (HMR) No. 53, "Seasonal Variation of 10-square-mile probable maximum precipitation estimates, United States East of the 105th Meridian." This report, dated April 1980, was prepared by the Hydrometeorological Branch, Office of Hydrology, National Weather Service. HMR No. 53 is the latest document containing Seasonal Variation of the PMP for most of the eastern two-thirds of the Continental United States. NOAA defines the PMP as "theoretically, the greatest depth of precipitation for a given duration that is physically possible over a given size storm area at a particular geographical location at a certain time of the year."</p> <p>The weight of the 48-hr 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 - three copies are provided). The staff believes that combining the weight of the 48-hr PMWP with the 100-year snowpack is a very conservative design assumption and expects that the COL applicant that references the 48-hr PMWP site characteristic will satisfactorily demonstrate that the 48-hr 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. Consequently, the staff found its 48-hr PMWP results comparable and compatible with the applicant's results.</p>
7	2-33	2.3.1.3	<p>The staff states that if in the future the ESP site is no longer in compliance with the terms and conditions of the ESP vis-a-vis climactic conditions, the staff "will seek to modify or impose requirements on the site." Where is this documented as a permit condition or COL Action item? If it is not, explain why not. In addition, we note that at least some of the climatic data are very old - for the period from 1936 to 1975 (<u>see</u> p. 2-30). Explain why more recent data is not available or, if it is, explain why it was not used.</p>

Q#	Page	Section	INQUIRY
			<p><u>Response</u></p> <p>The concern that the ESP site may no longer be in compliance with the terms and conditions of the ESP vis-a-vis climatic conditions at the COL stage is not documented as either a permit condition or COL Action Item. The SER states that if in the future the ESP site is no longer in compliance with the terms and conditions of the ESP, the staff will seek to modify the ESP or impose requirements on the site in accordance with the provisions of 10 CFR 52.39, "Finality of Early Site Permit Determinations." §52.39(a)(2) allows a petition to be filed that alleges either that the site is not in compliance with the terms of the early site permit or that the terms and conditions of the early site permit should be modified to assure adequate protection of the public health and safety. Also, under the proposed revisions to 10 CFR 52.6, "Completeness and Accuracy of Information," §52.6(b) requires every early site permit licensee to notify the Commission of information identified by the licensee as having a significant implication for public health and safety or common defense and security.</p> <p>The Korshover reference, "Climatology of Stagnating Anticyclones East of the Rocky Mountains, 1936-1975," was used by the staff to provide a qualitative description of the high air pollution potential information based on US EPA studies and is listed as a reference document in Section 2.3.1 of RS-002. The site's actual atmospheric dispersion site characteristics are based on 2000-2002 onsite meteorological data as discussed in SER Sections 2.3.4 and 2.3.5.</p>
8	2-34	2.3.1.4	<p>The staff states that it also reviewed the applicant's PPE values (referring to the Applicant's SSAR Section 1.3) and finds them to be reasonable. The staff goes on to state that it "did not perform a detailed review of these parameters." Provide the staff documents wherein the referenced (not-detailed) review is documented and the staff's conclusions that the PPE values are reasonable is explained. If no such document exists, provide a written explanation of the facts underlying and the logic supporting this staff conclusion.</p> <p><u>Response</u></p> <p>In reference to page 2-34, no specific staff document exists that documents the staff's conclusions that the PPE values are reasonable. NRR review standard RS-002, Processing Applications for Early Site Permits, provides guidance that "[e]ach staff reviewer should determine whether the PPE values are sufficient to support the review, and that the PPE values are not unreasonable for consideration in the staff findings to comply with 10 CFR Part 52, Subpart A." (ADAMS Accession No. ML040700236 - three copies of page 16 are provided.)</p>

Q#	Page	Section	INQUIRY
9	2-35	2.3.2.1	<p><u>Local Meteorology.</u> The staff states that the applicant made a qualitative comparison between temperature/humidity data for the years 1972-77 and 2000-02, concluding that the two datasets were compatible. What is the staff's assessment of the validity of the comparison and the applicant's conclusion, how does that comport with the statements in the second paragraph of Sec 2.3.2.3 regarding a shift in the data being possibly caused by the creation of Clinton Lake, and how are these shifts incorporated into the staff's conclusions regarding the use of this data?</p>
			<p><u>Response</u> Although the staff has not reviewed the details of the applicant's 1972-1977 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 $\pm 0.5^{\circ}\text{C}$ per RG 1.23).</p> <p>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 $\pm 0.1^{\circ}\text{C}$ 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. Nonetheless, the licensee used the 2000-02 data set to characterize the current site conditions and 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.</p>
10	2-39	2.3.2.3	<p><u>Local Meteorology.</u> Supply information on flooding and other effects from the 14.25 inches of rain in one day (May 8, 1961) at Clinton sufficient for the Board to comprehend the staff's conclusions.</p>

Q#	Page	Section	INQUIRY
			<p><u>Response</u></p> <p>The staff's conclusion in Section 2.3.2.4 states that the applicant's identification and consideration of the meteorological characteristics of the site and surrounding area meet the requirements of 10 CFR 100.20(c) and 10 CFR 100.21(d). §100.20(c) 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 precipitation) must be identified and characterized. §100.21(d) states that the physical characteristics of the site (including meteorology and hydrology) 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. The staff estimated the local intense precipitation rate for the ESP site to be 18.15 in./h and identified this value as a Site Characteristic in Section 2.4.2.3 of the SER. The local intense precipitation site characteristic of 18.15 in./h clearly bounds the highest recorded 1-day precipitation total of 14.25 inches of rain and will be used to mitigate impacts of local site flooding based on grading and drainage design at the COL stage. Note that SER Section 2.4.2 provides additional information pertaining to identifying and evaluating floods at the site.</p>
11	2-44	2.3.4.1	<p>Site-specific χ/Q values for 0-2 hours are probably conservative because the highest value for the 16 directional sectors is chosen and then compared with another computation (value equaled or exceeded 5 percent of the total time). The code then uses the larger of the two values. The calculation is not clearly described, but it seems biased toward high values if there is much variability among the directions. Describe and define this bias.</p> <p><u>Response</u></p> <p>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."</p>

Q#	Page	Section	INQUIRY
12	2-47	2.3.4.3	The staff made an independent evaluation and “obtained PAVAN results similar to that of the applicant.” Supply enough of the staff’s numerical results to enable the Board to assess this matter.
			<u>Response</u> A comparison of the applicant’s and staff’s short-term (accident release) diffusion estimates is provided in Table 1 at the end of this document.
13	2-50	2.3.5.1	Explain the categories in the headings of Table 2.3.5-1 (depleted or not, decay or not).
			<u>Response</u> <ul style="list-style-type: none"> • 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 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. • D/Q Values are deposition factors used to evaluate dry deposition of radioiodine and particulates for the ground plane exposure and food pathways.
14	2-52	2.3.5.3	The staff made an independent evaluation. Supply enough of the staff’s numerical results to enable the Board to assess this matter.
			<u>Response</u> A comparison of the applicant’s and staff’s long-term (routine release) diffusion estimates is provided in Table 2 at the end of this document.
15	2-50 to 52	2.3.5.2	<u>Long Term Diffusion Estimates.</u> The staff identified a number of regulations and regulatory guidance which should have been identified and complied with by the applicant but, impliedly, were not. Are these failures encompassed by COL Action Item 2-3-3 and the statement at the end of section 2.3.5.4 that “[a]ny COL or CP applicant will need to confirm”? If not, how were these failures dealt with?

Q#	Page	Section	INQUIRY
			<p><u>Response</u> 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.</p> <p>For example, the staff found that the applicant should have identified Appendix I to 10 CFR 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 Appendix I by characterizing long-term atmospheric transport and diffusion conditions to estimate the radiological consequences of routine releases of materials to the atmosphere. Nonetheless, as discussed in SSAR Section 11, the staff found that the applicant met the regulatory requirements of Appendix I by demonstrating that it would control, monitor, and maintain gaseous effluents at ALARA levels in accordance with the effluent design objectives set forth in Appendix I.</p> <p>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 assumptions by treating all releases as ground-level releases.</p>
16	2-66	2.4.1.3	<p><u>Hydrologic Engineering.</u> The staff states that it determined that 50 ft horizontal clearance between CPS and ESP piping was acceptable. Why? Is this point made moot by the staff's statement that "DSER permit Conditions 2.4-1 and 2.4-2 are not necessary because COL Action Item 2.4-1 is sufficient." If not, how is this matter resolved?</p>
			<p><u>Response</u> The staff wanted to ensure that any future construction activity at the ESP site does not interfere with the existing operating nuclear power plant. The 50 feet dimension was based on staff judgment that there will be a safe distance (about 3 times the diameter of the largest existing buried pipe) to the construction line. This would provide adequate separation for construction activity. See answer to Q #1 for staff criteria to determine the need for a construction permit.</p>
17	2-75	2.4.2.3	<p>Change 1-minute² to 1-mi² in the last paragraph.</p>
			<p><u>Response</u> The Board's comment is correct.</p>

Q#	Page	Section	INQUIRY
18	2-79	2.4.2.3	The table labeled “SER Table 2.4.14-1” does not appear to exist. (see last full paragraph).
			<u>Response</u> The Board’s comment is correct. The table label should read Table 2.4-7.
19	2-91	2.4.3.3	According to the text on p. 2-90, Fig. 2.4-8 is for outflow only. The caption of the table should be corrected.
			<u>Response</u> The hydrograph shows the flow time history and includes inflow as well as outflow from the reservoir.
20	2-104	2.4.5.4	<u>Probable Maximum Surge and Seiche Flooding.</u> The staff “concludes that the applicant partially conforms to GDC 2.” Is this meant to be an endorsement? If not, what is the remedy? What is the upshot of only partial compliance?
			<u>Response</u> At the ESP stage the applicant is required to provide seismic characteristics of the site (10 CFR Part 52.17(a)(1)(vi)). The standards for review of the application are 10 CFR Part 50 and 100 as they apply to applications for construction permits (10 CFR Part 52.18). Full compliance with GDC 2 can only be accomplished at the completion of design phase (COL or design certification). NUREG-1844, Executive Summary, page xv, footnote 3, specifically addresses partial compliance with GDC 2. Three copies of NUREG-1844 page xv are provided.
21	2-107	2.4.6.4	Again the staff states that “the applicant partially conforms to GDC 2.” Is this also meant to be an endorsement? If not, what is the remedy?
			<u>Response</u> Please see response to Q #20.
22	2-109	2.4.7.1	<u>Ice Effects.</u> The staff states “the applicant will revise the SSAR to include additional information on ice depth.” Has this been done? Was it part of the revision provided in response to RAI 2.4.7-4? If so, what is the staff’s assessment of the additional information and compliance of the revised section of the SSAR? If it has not been done, when is it expected and when is the staff’s evaluation thereof expected? Is this addressed by the applicant’s commitment to “consider ice sheet effects at the COL stage”? (See p. 2-108).
			<u>Response</u> Yes. Please see page 2-122 bottom paragraph.
23	2-113	2.4.7.2	What is the “second item above” mentioned in the 2 nd last line?

Q#	Page	Section	INQUIRY
			<u>Response</u> Please insert the following text “. . .could be protected from icing by design considerations (e.g., return of a portion of low grade heat to the intake at sites where icing has not been severe). Design measures are only applicable for review for a complete design.”
24	2-115	2.4.7.3	What is the relevance of Fig. 2.4-12? <u>Response</u> See page 2-114 2 nd paragraph from bottom.
25	2-123	2.4.7.3	Provide the documentation that memorializes the staff statement that “[t]hese design issues will be reviewed by the Staff at the COL stage”? <u>Response</u> The staff review at the ESP stage is directed to the determination of site characteristics that are adequate and sufficient for a future design within the envelope of the plant parameters proposed by an ESP applicant. When a complete design application is submitted, NRC review will be conducted in accordance with the standard review plan, applicable regulatory guides and NRC regulations in 10 CFR Part 50 to ensure that the proposed design is in full compliance with the site characteristics specified in the site permit. The statement quoted in this question simply acknowledges the NRC review process.
26	2-128	2.4.8.1	<u>Cooling Water Canals and Reservoirs.</u> The applicant stated that the overtopping of the dam would occur for a duration of 2.5 hours. How did the staff confirm this duration? <u>Response</u> The dam is not safety related. The lag time for overtopping the dam has no safety consequence.
27	2-128	2.4.8.1	<u>Cooling Water Canals and Reservoirs.</u> “The applicant stated in the SSAR Section 2.4.8.1.3 that the ESP facility requires no changes to the auxiliary spillway.” How did the staff confirm this statement? <u>Response</u> The safety related water supply does not depend on the design of the auxiliary spillway.
28	2-129	2.4.8.1	<u>Cooling Water Canals and Reservoirs.</u> The applicant concluded that “the compacted soil-cement layer would protect the submerged UHS dam and baffle dike.” How did the staff confirm this statement?

Q#	Page	Section	INQUIRY
			<p><u>Response</u> Use of soil-cement material and compacted backfill, and locating them on competent layer (Illinoian till) for protecting water retaining structures, constitute standard civil engineering practice. The design review, construction and inspection of the UHS dam and baffle dike were all carried out for the existing operating plant. Please see page 2-138, near the bottom of 3rd paragraph for the reason to close the issue.</p>
29	2-132	2.4.8.1	<p><u>Cooling Water Canals and Reservoirs.</u> The applicant stated the velocities over the crest and toe of the submerged UHS dam is an unnecessary detail for an ESP and that the section would be revised to delete discussion. Since excessive water velocity over an obstruction can lead to erosion of the structure, a discussion of these velocities would seem very pertinent to the acceptability of the UHS under adverse water conditions. Why did the staff agree?</p>
			<p><u>Response</u> The staff SER is presented in three parts: the .1 part deals with technical information contained in the application and the RAIs issued; the .2 part describes the regulatory criteria; and the .3 part provides the staff technical analysis. In the .3 part, the staff provides the reasons for closing the open issues and describes the technical analysis and independent evaluations performed.</p> <p>The reason that the staff agreed is provided on page 2-138, near the bottom of 3rd paragraph.</p>
30	2-137	2.4.8.3	<p><u>Cooling Water Canals and Reservoirs.</u> Explain more fully why a “depth-averaged model may not be conservative” (see last full paragraph).</p>
			<p><u>Response</u> Paragraphs 1 and 2 on page 2-138 provide a fuller discussion and the reason for closing the issue.</p>
31	2-138	2.4.8.1	<p><u>Cooling Water Canals and Reservoirs.</u> The estimate of the makeup needs for the UHS is given as 87 ac. ft. by the applicant. Later the applicant states that the ESP facility NHS may use either dry cooling in combination with wet cooling, or only wet cooling. Did the staff verify that the makeup needs would still be only 87 ac. ft. with a wet cooled NHS?</p>
			<p><u>Response</u> NHS is a non-safety function. Please see page 2-172, full paragraphs 2 and 3 for a more detailed explanation.</p>

Q#	Page	Section	INQUIRY
32	2-147	2.4.10.1	<u>Flooding Protection Requirements.</u> The FSER indicates that the staff requested (in RAI 2.4.10-1) that the applicant discuss differences in the methods it used to determine certain design wind speeds, including a 67 mph speed that was apparently not discussed (a response from the applicant on this speed is not mentioned in this section at all). How did the staff address this failure and why was it acceptable?
			<u>Response</u> As described in response to Q #29, the staff explanation is provided in the .3 section. Please see page 2-148 and note that the staff used a wind velocity of 100 mph for its independent calculation of wind runup. Please see Table 2.4-7 for the wind wave value of 6.4 ft.
33	2-149	2.4.11.1	Explain “dividing by 0.7 to conservatively adjust the forced-evaporation rate” (2 nd last paragraph).
			<u>Response</u> As described in response to Q #29, the staff explanation is provided in the .3 section. The 0.7 factor is an adjustment for 100% load factor. This is a conservative assumption related to the existing CPS unit. On page 2-156 staff discusses the conservative assumptions made in its independent analysis of low water condition. Staff has identified COL Action Item 2.4-11 for plant shutdown protocol that needs to be established during a COL review.
34	2-151	2.4.11.1	Explain or give a reference for the statement that “normal operation would be at a concentration ratio higher than four” (2 nd last paragraph).
			<u>Response</u> As described in response to Q #29, the staff explanation is provided in the .3 section. The concentration factor referred to by the applicant is related to concentration of impurities in the cooling tower basin. During accident and during normal conditions the impurities concentration factor will be no more than 4 times that in the lake. Please note the staff independent calculation, and the COL Action Item 2.4-11 on Page 2-156.
35	2-161	2.4.12.3	Should “dry” be inserted before “cooling system for the ESP facility” (start of 4 th line 3 rd paragraph)?
			<u>Response</u> Yes.
36	2-162	2.4.12.3	Should “be” be changed to “by” in line 1?
			<u>Response</u> Yes.

Q#	Page	Section	INQUIRY
37	2-166	2.4.13.3	Clarify “maximum embedment depth from the PPE.” Is something missing here? (last full paragraph).
			<u>Response</u> Yes, please add “is 140 ft (elevation of 595 ft).”
38	2-173	2.4.15.2.2	Clarify apparent confusion about UHS heat loads (paragraph 3). Compare with page 2-174 (last paragraph).
			<u>Response</u> Correction: page 174, last paragraph should read “UHS load during shutdown is. . . .”
39	2-193	2.5.1.1.2	Explain “swallow-holes” (last paragraph).
			<u>Response</u> A swallow hole is a place where water disappears or sinks underground. A swallow hole implies nearly instantaneous water loss into an opening at the bottom of a sinkhole or karst valley.
40	2-197	2.5.1.3.1	Explain “rupture sets” (1 st paragraph).
			<u>Response</u> The term “rupture set” refers to multiple earthquakes occurring within a short time interval within the same seismic fault zone. For the case of the New Madrid seismic zone, the applicant modeled six different rupture sets. Each rupture set contains three separate earthquakes occurring on three different faults within the New Madrid seismic zone over a short time interval. The applicant modeled different earthquake magnitudes for the earthquakes within each rupture set and assigned an overall weight to each rupture set. As a result, each occurrence of a large earthquake within the New Madrid seismic zone is modeled as the rupture or faulting of three individual earthquakes on three separate faults within the seismic zone.
41	2-210	2.5.2.1.4	<u>Vibratory Ground Motions</u> . Explain more fully the concept of “deaggregation of the PSHA results” (last paragraph).
			<u>Response</u> Probabilistic seismic hazard analysis (PSHA) determines the mean annual rate of ground motion exceedance at a particular site based on the aggregate risk from potential earthquakes of many different magnitudes occurring at many different source-to-site distances. The rate of ground motion exceedance computed in a PSHA, therefore, is not associated with any particular earthquake or source-to-site distance. The deaggregation procedure determines the most likely earthquake magnitude and source-to-site distance for different mean annual rate-of-exceedance levels. For example, deaggregation of the Clinton ESP hazard curve at the 10 ⁻⁴ mean exceedance level shows that an earthquake with a magnitude of 6.5 at a source-to-site distance of 83 km is the dominant contributor to the hazard at this exceedance level.

Q#	Page	Section	INQUIRY
42	2-214	2.4.2.1.5	<p><u>Vibratory Ground Motions.</u> The discussion of Fig. 2.5.2-3 in the last paragraph seems to be inconsistent with the data in the figure. For example, which bar corresponds to the high-frequency controlling earthquake, and which three bars correspond to the high-frequency deaggregation earthquakes? How is the low-frequency data to be interpreted?</p> <p><u>Response</u> Figure 2.5.2-3 represents the fractional or percentage contribution of each magnitude-distance combination bin at a particular exceedance level. Although the largest single percentage contribution (highest bar) for the high frequency (average of 5 and 10 Hz) ground motion at the 10^{-4} exceedance level is from a magnitude 7-7.5 earthquake at a distance of 300-400 km, this does not represent the controlling earthquake. The controlling earthquake is determined by summing the percentage contribution for each magnitude range and determining an overall value. An example of how the controlling earthquakes are determined from the deaggregation results is provided in Appendix C of RG 1.165, "Identification and Characterization of Seismic Sources and Determination of Safe Shutdown Earthquake Ground Motion."</p> <p>The three deaggregation earthquakes represent low, medium and high earthquake magnitudes for a particular deaggregation. The approach for determining the deaggregation earthquakes is to use three magnitudes, one at the mean deaggregation event, one higher or lower representing the non-dominant source, and a third representing the dominant source. Weights on the magnitudes are assigned so that the non-dominant source receives its appropriate weight, and weights for the mean magnitude and dominant source are assigned so that the mean of the three magnitudes equals the mean magnitude calculated from the deaggregation of the hazard. A description of the procedure for determining the deaggregation earthquakes as well as examples are provided in Section 6 of NUREG/CR-6728, "Technical Basis for Revision of Regulatory Guidance on Design Ground Motions: Hazard- and Risk-consistent Ground Motion Spectra Guidelines."</p> <p>The controlling and deaggregation earthquakes are calculated in order to determine the overall local site ground motion amplification to several different earthquakes ranging from smaller local events to larger distance events.</p>

Q#	Page	Section	INQUIRY
43	2-216	2.5.2.1.5	<u>Vibratory Ground Motions - Site Response Analysis.</u> How were the “pairings” of the 60 randomized velocity profiles with the 60 sets of randomized shear modulus and damping curves performed? Describe the facts and logic underlying the staff’s evaluation of those pairings. What is the mathematical foundation for the use of an arithmetic mean of 60 individual response spectral ratios, what facts underlie the evaluation, and what was the staff’s logic in assessment of that approach?
			<u>Response</u> Additional time is needed to provide this response.
44	2-220 et. seq.	2.5.2.1.6	<u>Safe Shutdown Earthquake.</u> Provide a brief summary of the differences between the currently accepted methodology and the different “performance based” approach used by the applicant, describing the facts which underlie the staff’s assessment of this new approach and outlining, in bullet form, the logic of the staff’s conclusion that this methodology is acceptable. The Board seeks a concise summary here - do not merely regurgitate the content of this section (which, we note, includes a derivation of this approach). Why does the staff believe that an assumed beta of 0.4 [page 2-235] is acceptable? How does the conclusion that the objective is satisfied for a mean 10exp-5 frequency follow from the observation that “10exp-5 annual frequency of core damage from seismic events corresponds to 50% of U.S. nuclear power reactors where a full seismic PRA has been done”? (See pp. 2-238 - 239) Why is this an appropriate standard? Provide a concise statement of facts and logic supporting the staff conclusion in clause (4) on p. 2-240 that the “target 10exp-5 annual performance goal results in a plant that is as safe as the plants currently operating.” Explain how that conclusion comports with the earlier statements to the effect that it corresponds to 50% of currently operating plants. Explain how the response to the foregoing questions correlates with the discussion on pp. 2-263 -268.
			<u>Response</u> Section 2.5.2.1.6 provides a description of the performance-based approach including a derivation of the underlying equations and model parameters; however, it does not contain the staff evaluation of the performance-based approach. The staff evaluation of the performance-based approach is provided in Section 2.5.2.3.6. Section 2.5.2.3.6 provides an evaluation of the target performance goal, model parameters (i.e., beta), and other modeling assumptions.
45	2-235	2.5.2.1.6.1	Should the reference to Equation 2.5.2-15 be a reference to 2.5.2-11 (3 rd line below 2 nd equation)?
			<u>Response</u> The reference is incorrect; it should be to Equation 2.5.2-19.

Q#	Page	Section	INQUIRY
46	2-194 2-244 2-275 2-292	2.5.1.2 2.5.2.2 2.5.3.2 2.5.4.2	These sections regarding regulatory evaluation state no conclusion by the staff regarding whether or not the applicant has complied with the relevant regulation. Provide a concise statement of facts and the logic of the staff assessing whether or not the applicant has complied with all relevant regulations and regulatory guidance in this part of the application.
			<u>Response</u> The “Regulatory Evaluation” sections of the SER list only the pertinent regulations used by the staff for its evaluation and not the staff conclusions as to whether the application meets the regulations. Staff conclusions regarding whether or not the applicant has complied with the relevant regulations are provided in Sections 2.5.1.3 and 4, 2.5.2.3 and 4, 2.5.3.3 and 4, 2.5.4.3 and 4.
47	2-259 2-252	2.5.2.3.3	On p 2-252, the staff “concurs with the applicant’s decision to increase the maximum magnitude distributions of the WVSZ and central Illinois source zone” whereas on p. 2-250, after noting that the applicant had so concluded, the staff stated that it “considers the applicant’s maximum magnitude range and weighting are appropriate for the WVSZ.” Reconcile these statements.
			<u>Response</u> The applicant increased the maximum magnitude distributions for both the Wabash Valley and the central Illinois seismic zones for its PSHA from that used by the 1986 EPRI-SOG PSHA. The staff evaluated these maximum magnitudes and concluded that they adequately represent potential maximum earthquakes for these two seismic zones. The staff asked an RAI about the maximum magnitude distribution used for the central Illinois seismic zone and determined that the applicant’s response was adequate.
48	2-253 2-254	2.5.2.3.3	The staff states that “the estimates of uncertainty or variability about the median ground motion predictions are considerably higher for recent ground motion attenuation relationships” compiled by EPRI compared to its original study, and therefore, the applicant decided to use the updated model. Explain how the staff assessed this increased uncertainty and the logic of acceptance of this updated model. Explain the relevance to this application of the fact that staff has concluded that Dominion, during the review of <u>North Anna</u> , had adequately resolved staff concerns regarding development by EPRI of new ground motion models for CEUS with respect to the staff’s evaluation of an application for an ESP for North Anna. Concisely describe the facts and logic of any such relevance and the applicability of the staff concerns regarding the North Anna application to this matter.

Q#	Page	Section	INQUIRY
			<p><u>Response</u> The staff did not evaluate the original ground motion attenuation model used for the 1986 EPRI PSHA for its review of the Clinton ESP application. In the mid 1980's, there were only a few attenuation models developed for the Central and Eastern United States (CEUS). Over the ensuing 20 years, several new attenuation models for the CEUS have been developed. The 2004 EPRI ground motion model uses a combination of 13 different CEUS attenuation relationships. The staff focused its review on the 2004 EPRI ground motion model rather than the obsolete 1986 EPRI ground motion model.</p> <p>The staff performed a detailed review of the 2004 EPRI ground motion model for the Dominion (North Anna) ESP application, since its was the first application received by the staff. For the Clinton ESP review, the staff asked only for clarification of the distance conversion method used for the 2004 EPRI ground motion model.</p>
49	2-256	2.5.2.3.5	<p>The staff notes that it found large variability in soil strength and stiffness, and noted that the applicant used a randomized process to make its computations but, because the upper 60 ft will be replaced during construction with fill material, used a single site velocity model. Was the velocity used by applicant for this region representative of the compacted fill material or was it based upon the results of the randomization? Explain the facts and logic of the staff's acceptance of this part of the applicant's computation.</p> <p><u>Response</u> Additional time is needed to provide this response.</p>
50	2-257	2.5.2.3.5	<p>The staff refers to the applicant's description of computation of a range of modulus and damping curves through "a randomization process." Provide a brief description of the "randomization" process and a concise description of the facts and logic underlying the staff conclusions regarding that process.</p> <p><u>Response</u> Additional time is needed to provide this response.</p>

Q#	Page	Section	INQUIRY
51	2-273	2.5.2.3.6.4	Here the staff “rejects the applicant’s conclusion that the ESP site, after the application of the high frequency reduction factors, is suitable for any design based on the RG 1.60 DRS.” In the next section (2.5.2.4), the staff concludes, that the “performance based approach is an advancement.” However, the staff does not conclude that this approach is wholly acceptable. If it is, state so and provide, in brief, the facts and logic undergirding that conclusion (in addition to and expanding upon the general statements already contained in 2.5.2.4). In addition, the staff made no mention in its conclusions of the rejection mentioned above, and, without giving any supporting logic, concluded that the proposed ESP site is acceptable from a geologic and seismologic standpoint and meets the requirements of 10 CFR 100.23.” Provide a brief discussion of the facts and logic supporting that conclusion.
			<u>Response</u> For its review of the Exelon ESP, the staff only evaluated the site-specific Safe Shutdown Earthquake ground motion (SSE) through a review of the applicant’s PSHA, site response analysis, and the performance-based approach. The staff did not evaluate the suitability of the site for a particular reactor design, as represented by the RG 1.60 design response spectrum (DRS). Once the COL applicant selects a specific reactor design, then the staff will evaluate whether its DRS envelops the site-specific SSE. The performance-based approach is used to determine the site-specific SSE and has no relevance to the DRS. The staff determined that the performance-based approach provides an acceptable approach for determining the site-specific SSE.
52	2-290	2.5.4.1.8	<u>Stability of Subsurface Materials and Foundations.</u> Explain “blowcount procedure” here, rather than referring to a Reg. Guide.
			<u>Response</u> The term “blowcount” refers to the applicant’s use of the Standard Penetration Test (SPT) blowcount procedure. This procedure is used for all site explorations to determine the strength and stability of the subsurface soil layers.
53	2-295	2.5.4.3.2	Explain “Atterberg Limits” (center of page).
			<u>Response</u> Atterberg Limits are a series of tests which are used to give empirical information on the soils reaction to water. This information is of a qualitative nature and determines the plastic limit, the liquid limit, the plasticity index and linear shrinkage of the materials. The Atterberg limits relate to the moisture contents of cohesive soils corresponding to empirical defined boundaries between states of consistency (liquid, plastic, solids) of the fraction of soil passing the 425 micron sieve.

Q#	Page	Section	INQUIRY
54	2-297	2.5.4.3.2	Are these EPRI curves (last paragraph) the same ones shown in Figures 2.5.4-2 and 2.5.4-3? (See the discussion on page 2-280.)
			<u>Response</u> Yes. The text on page 2-297 refers back to Figure 5-21 from SSAR Appendix A, which is reproduced in the SER as Figure 2.5.4-3.
55	2-300	2.5.4.3.2	Explain the following statement: "...the staff concludes that the low laboratory- to field- S-wave velocity ratios are not significant."
			<u>Response</u> Site soil shear wave velocities are generally measured by geophysical methods at the site. Shear wave velocities can also be measured in the laboratory using samples of the site soils. The staff determined that, in general, there was adequate agreement between the two different approaches. However, measurement of the shear wave velocity for a few of the site soil samples differed from the on-site geophysical measurements. The applicant acknowledged that this difference indicated that the soil samples were disturbed either in transport or at the laboratory. The staff found that the disturbance of a few soil samples was not significant.
56	2-303	2.5.4.3.8	Explain "earthquake drains" (last line and first line of following page).
			<u>Response</u> Earthquake Drains are a liquefaction mitigation technique for loose cohesionless soils. Earthquake Drains are large-flow capacity synthetic vertical drains, installed with a vibrating mandrel into loose sands and silty sands. The vibratory installation densifies the soils, increasing their cyclic shear resistance, while the drain provides a path for the rapid dissipation of earthquake-generated excess pore pressures.
57	3-3 to 4	3.5.1.6.3	<u>Aircraft Crash Risk</u> . In its technical evaluation of aircraft crash risk, the staff discusses the risk from a series of potential sources, finding each to be below the threshold of 10^{-7} for a DBA. Did the staff treat these risks as entirely separate for DBA requirement purposes, or does table 3.5.1.6-2 indicate otherwise? If so, explain the regulatory and other legal basis for not treating these as additive; and, if not, explain clearly how all the various aircraft crash risks were treated as a group, and, in either case, explain concisely the facts and logic undergirding the staff determination.

Q#	Page	Section	INQUIRY
			<p><u>Response</u></p> <p>The staff identified two types of sources of potential aircraft impact hazards that could not be dismissed by inspection. Specifically, the staff did a screening analysis with respect to the Martin RLA Airport since it is within 5 miles of the proposed ESP site and estimated the probability of an on-site accidental aircraft crash impacting safety-related structures to be about 6×10^{-8} per year. 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, the total probability for the four airways was estimated to be about 4.96×10^{-8} per year. Hence, the total aircraft crash probability for the proposed site was estimated to be about 1.1×10^{-7}. However, the actual probability is judged 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).</p> <p>It also should be noted 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.</p>
58	11-2	11.3.1 and 2	<p><u>Radiological Effluent Release Dose Consequences From Normal Operations.</u> The applicant estimated bounding quantities of radioactive gas and liquid waste that might be discharged to support their capability to comply with 10 C.F.R. Part 20. How did the staff verify the adequacy of these bounding values?</p> <p><u>Response</u></p> <p>The staff did not perform any independent verification of the applicant's estimated bounding quantities of radioactive gaseous and liquid waste to meet the concentration values in Appendix B to 10 CFR Part 20. However, the staff did perform independent calculations of dose to members of the public, using the applicant's source term data, meteorological data, and liquid dispersion data.</p>
59	13-1	13.3	<p><u>Emergency Planning.</u> Throughout this section, there is no mention of the lessons learned from recent studies of the problems experienced with the emergency plans developed for the New Orleans area during Hurricane Katrina. How did the staff ensure that the applicable lessons learned were included in the ESP emergency plan?</p>

Q#	Page	Section	INQUIRY
			<p><u>Response</u> Lessons learned from hurricane Katrina were not considered in the development of the SER. The emergency preparedness information provided by the applicant and the staff's review guidance were developed prior to hurricane Katrina that occurred in August 2005. The application for the ESP was docketed on October 30, 2003, the draft SER for the Exelon ESP was dated February 2005, and the final SER was issued in May 2006. Hurricane Katrina occurred in August 2005.</p> <p>In response to hurricanes Katrina and Rita, a study will be conducted to analyze the mass public evacuations, emergency responder actions. The results of the study of these large-scale emergency response activities will be considered in the future. According to DHS staff, state, tribal, and local governments have not been directed to take any actions based upon lessons learned from hurricane Katrina at this time.</p>
60	13-2	13.3.1.1	<p>Change "Evaluation" to "Evacuation" in Footnote 1.</p> <p><u>Response</u> The Board's comment is correct.</p>
61	13-7	13.3.1.1	<p><u>Significant Impediments to the Development of Emergency Plans.</u> The applicant references a 1993 evacuation time estimate (ETE) that assumes it could take up to 1 hour to assemble school buses to evacuate school children and that some of these buses may be located at the school. Recent trends in school system bus operations have led to the contracting out of bus services to private companies. As a result, a contractor may serve multiple schools or even school districts with the same buses, which might lead to wait times in excess of an hour. How did the staff confirm the validity of this 1-hour assumption?</p> <p><u>Response</u> The staff did not confirm the validity of this 1-hour assumption.</p>
62	13-8	13.3.1.1	<p><u>Significant Impediments to the Development of Emergency Plans.</u> The applicant relies heavily on the 1993 ETE results in the discussion of transport-dependent permanent population. How did the staff confirm the validity of these assumptions in light of the lessons learned from Hurricane Katrina?</p> <p><u>Response</u> Please see response to Q #59.</p>

Q#	Page	Section	INQUIRY
63	13-9	13.3.1.1	<u>Significant Impediments to the Development of Emergency Plans.</u> The applicant stated that the time distribution for mobilization and preparation of the permanent population spans a period of 2 hours. The estimate is based upon the 1993 ETE. How did the staff confirm the continued validity of the estimates in the 1993 ETE as a result of the lessons learned from Hurricane Katrina, particularly for transport dependent and special populations?
			<u>Response</u> Please see response to Q #59.
64	13-11	13.3.1.1	<u>Significant Impediments to the Development of Emergency Plans.</u> The applicant indicates that park and ride shuttles would be used to transport the transient population attending the Pork and Apple Festivals. Did the staff confirm that the buses used for such shuttles are not the same ones used to transport school children? Also, this section gives an estimate of a maximum attendance of 50,000. How did the staff verify that this estimate is valid for the projected time period to 2060?
			<u>Response</u> The staff did not confirm that the busses used for the park and ride shuttles were the same ones used to transport school children. The staff did not verify the projected attendance at the festival.
65	13-14	13.3.2.1	<u>Emergency Planning.</u> The staff cites the content of a letter from the applicant to IDNS notifying IDNS of the applicant's intent to take credit for certain matters set out in certain IPRA volumes, and stating that IDNS Director Ortziger's signature attests to IDNS' awareness of the applicant's position. Does the staff assert that this is legally sufficient? Explain concisely what conclusion the staff has drawn from this letter and how the staff has evaluated this assertion. Was this part of Open Item 13.3-2? If so, how was this resolved? If not, what is the staff's resolution that enabled them to conclude that this Open Item was resolved? (<u>See</u> p. 13-16)
			<u>Response</u> The staff asserts that Mr. Ortziger's letter is sufficient . The attestation by Mr. Ortziger is part of Open Item 13.3-2. One of the purposes of Open Item 13.3-2 was to clarify that the State had authority over certain local governmental agencies within the plume exposure pathway EPZ. The staff resolved the issue by referring to sections of the Illinois statute that establishes IEMA and authorizes it to coordinate the overall emergency management program of the State.

Q#	Page	Section	INQUIRY
66	13-16	13.3.2.3	The staff states that it has “identified in Open Item 13.3-2 that the applicant’s documentation of contacts and arrangements with local government agencies . . . did not address the expanded responsibilities associated with an additional reactor(s) at the Clinton site.” Explain how the applicant’s response is acceptable (given the potential increase in the number of reactors).
			<u>Response</u> In the first sentence of Section 13.3.2.1 the applicant states that the Director for IEMA has acknowledged support for the EGC ESP Emergency Plan. Sections 2.1, “Site Description,” and 2.3.2, “Population Data,” identify the possible presence of one or two additional units.
67	13-42	13.3.3.9.3	<u>Emergency Planning.</u> The staff mentions that the applicant’s response to Open Item 13.3-3 was to the effect that the ESP application addressed major features of the TSC and OSC. The staff found this to be an insufficient response to this Open Item (see p. 13-43). The staff notes that the COL will address any details not included. While this may indeed be factually accurate, what was the staff’s evaluation of this response and does this Open Item remain open or convert to a COL Action Item, or something less specific? If it is a COL action item, why is it not listed in Appendix A.2?
			<u>Response</u> Major Feature H calls for the applicant to describe a TSC, onsite OSC, and EOF, in accordance with the guidance in NUREG-0696. The staff concluded that the applicant did not describe in sufficient detail the facilities and related equipment in support of emergency response for the OSC and TSC. Therefore, the feature was found unacceptable. Since the emergency response facility guidance in NUREG-0696 will be applied during the emergency plan review at the COL stage, it is unnecessary to track this issue in an ESP.
68	13-43	13.3.3.9.4	The “staff concludes that the proposed major feature H is not consistent with the guidance in RS-002 and Supplement 2. Therefore, this feature is unacceptable.” Why did this not give rise to a Permit Condition or a COL Action Item?
			<u>Response</u> Please see response to Q #67.
69	13-59	13.3.3.11.3	Explain in depth the staff’s reason for disregarding the manual RTM-96.
			<u>Response</u> RTM-96 describes how the NRC will respond to a radiological emergency. Guidance used by a federal government to provide oversight of a utility’s response to an emergency is necessarily different from the guidance used by a utility in planning its response.

Q#	Page	Section	INQUIRY
70	13-61	13.3.3. 11.3	What is the “adverse frequency” mentioned in line 1?
			<u>Response</u> This paragraph relates to consideration of normal and adverse weather conditions. “Adverse frequency” refers to the frequency of adverse weather conditions.
71	13-62	13.33. 11.3	Should the words “was needed” in line 2 of the first complete paragraph be deleted?
			<u>Response</u> Yes, “was needed” is not needed.
72	15-2	15.1	Why was Table 3.3-2 of the SSAR not reproduced in this section?
			<u>Response</u> In general, the staff has not reproduced any radiological consequence tables in the SSAR since they are voluminous and readily available in ADAMS (Accession No. ML061100292). Three copies of Table 3.3-2 are provided.
73	15-2	15.1	Should the reference to Table 3.3-2B be to Table 3.3-2A (middle of page)?
			<u>Response</u> Yes. The table number should be Table 3.3-2A instead of Table 3.3-2B.
74	15-3	15.1	Identify the Federal Guidance Reports 11 and 12 cited in the first paragraph.
			<u>Response</u> They are: (1) 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, and (2) Federal Guidance Report 12, “External Exposure To Radionuclides In Air, Water, And Soil (1993),” U.S. Environmental Protection agency and Oak Ridge National Laboratory.
75	15-3	15.1	The first paragraph does not seem to identify which χ/Q values were used for the AP-1000 design. Identify those values.
			<u>Response</u> The applicant used the AP1000 χ/Q values reviewed by the staff and shown in the AP1000 DCD. They are shown in FSER Table 15.3-1, “AP1000 χ/Q values (s/m3)” and in the SSAR Table 3.3-2A, “Ratio of EGC ESP Site short Term χ/Q Values to AP1000 Design Certification (DC) χ/Q Values.”

Q#	Page	Section	INQUIRY
76	15-5	15.3.1	<p><u>Selection of DBAs.</u> The applicant stated that the design basis accidents (DBA's) analyzed in the proposed AP1000 and certified ABWR DCD's are expected to bound the DBA's of the other reactors being considered. Explain the rationale used to confirm this statement by the applicant, particularly concerning the fact that the PPE includes not only LWR's but also gas cooled reactors that have significantly different DBA behavior.</p>
			<p><u>Response</u> As the staff stated in Section 15.3.1, the staff believes that any conclusions drawn regarding the site's acceptability based on the AP1000 and ABWR designs are likely to be valid for the other reactor designs the applicant is considering. This is based on the staff's limited review and knowledge of ACR-700 design and Fort St. Vrain gas cooled reactor. Whether or not such designs are in fact bounded these DBA analyses would be subject to the staff's review during any COL or construction application that might be filed with respect to construction and operation of a reactor design at the EGC ESP site.</p>
77	15-7	15.3.4	<p>The first paragraph states that the site-specific χ/Q values (Table 15.3-2) were used for the AP-1000 design. The last paragraph states that the postulated values for the AP-1000 (Table 15.3-1) were used. The latter statement is repeated in the second paragraph on page 15-8. It appears that either approach meets the regulatory requirements, but clarification is needed.</p>
			<p><u>Response</u> The applicant used both the site-specific χ/Q values (Table 15.3-2) and the postulated χ/Q values in AP1000 DCD (Table 15.3-1) for the AP1000 to obtain its ratios. The statements in both paragraphs are correct. The applicant used the ratios of the site-specific χ/Q values to the χ/Q values postulated in AP1000 DCD to demonstrate that the radiological consequence doses at the proposed site meet the requirement of 10 CFR 50.34.</p>
78	17-1 17-16 17-17	17.1 17.7	<p><u>Quality Assurance.</u> Provide to the Board three copies of Inspection Report 0520007/2004001 referred to in this section as describing the results of the staff's QA inspection and forming a large part of the basis for the staff conclusions relating to QA matters.</p>
			<p><u>Response</u> Three copies of the inspection report, dated February 20, 2004, are provided. (ADAMS Accession No. ML040540622)</p>

Q#	Page	Section	INQUIRY
79	17-3	17.1.2	<p>The staff states that “the applicant is not required to develop an organization to comply with the criteria of Appendix B to 10 CFR Part 50.” Similar comments appear in each subsection on Regulatory Evaluation in every section of Chapter 17. Are early site permits exempt from Appendix B? If so, why did the staff submit requests for additional information about quality assurance?</p>
			<p><u>Response</u></p> <p>Currently, under 10 CFR 52, ESP applicants are not required to implement a QA program compliant with Appendix B to 10 CFR Part 50. However, the staff maintains that quality assurance criteria equivalent to Appendix B requirements are applicable to ESP activities, since the subsequent design and construction phases may rely on information developed during the ESP phase. Therefore, the staff requested additional information about quality assurance.</p> <p>An ESP applicant is expected to implement quality assurance measures "equivalent in substance" to the measures described in Appendix B to 10 CFR Part 50. The Office of General Counsel (OGC) interpretation of “equivalent in substance” to Appendix B to 10 CFR Part 50, means that the applicant's QA measures should provide reasonable assurance of integrity and reliability of data that would affect design or construction of SSCs important to safety.</p> <p>In accordance with 10 CFR 52.79(a)(1), if an application for a combined license (COL) references an ESP, it must contain information sufficient to demonstrate that the design of the facility falls within the site characteristics specified in the ESP. If the COL applicant references a certified design and an ESP, and does not request a variance from the ESP in accordance with 10 CFR 52.39(b), the applicant must show that the site parameters postulated for the certified design fall within the parameters specified in the ESP. If the COL applicant submits a custom design (one not certified) or has requested a variance, the site characteristics specified in the ESP could be inputs to that design. In either case, there must be reasonable assurance of the reliability and integrity of data contained in or supporting the ESP application, which in turn supports the COL application.</p>
80	17-4	17.1.3.2	<p>The staff states that it “reviewed several CH2M Hill procedures in detail. Provide a concise discussion of why other procedures were not reviewed in detail, how the staff reached any conclusions regarding those unaudited procedures, and the legal, factual and logical basis for any conclusion the staff reached on those other procedures.</p>

Q#	Page	Section	INQUIRY
			<p><u>Response</u></p> <p>The words “in detail,” as stated in section 17.1.3.2 were not meant to imply that only some of the procedures discussed in the inspection report were thoroughly reviewed. The staff reviewed approximately 45 CH2M Hill documents that are listed in the “documents reviewed” supplemental section of IR 05200077/2004001. These included 17 QA program implementation documents, 7 personnel training documents, and 6 QA program audit documents. The staff reviewed all these documents in sufficient detail to reach the conclusions noted in the report.</p>
81	17-21 17-22 17-23 17-30 17-31	17.8.2 17.9.2 17.10.2 17.14.2 17.15.2	<p>According to the staff, the applicant has asserted the matters in Section 17.8 do not apply to ESP activities. It appears to the Board that only certain ESP activities are exempt from Appendix B. Similar statements are made with respect to Sections 17.9, 17.10, 17.14, & 17.15. Explain these in sufficient depth for Board confirmation.</p>

Q#	Page	Section	INQUIRY
			<p><u>Response</u> The referenced sections refer to the following Appendix B criteria: XII. Identification and Control of Materials, Parts, and Components IX. Control of Special Processes X. Inspection XIV. Inspection, Test, and Operating Status XV. Nonconforming, Materials, Parts, or Components The principal argument is that no Systems, Structures, or Components (SSCs) are involved in the development of the ESP permit. The focus is on design, documentation, personnel qualification, and other applicable quality controls to ensure that information to be used in subsequent phases of design and construction can be relied upon. Each of these specific activities is addressed below.</p> <p><u>Identification and Control of Materials, Parts, and Components</u> The applicant and its subcontractors did not conduct activities important to safety requiring identification and control of materials, parts, and components. Specifically, the development of the ESP application did not involve the installation or use of materials, parts, or components. The NRC staff verified this criterion through observations during the inspection. Therefore, no QA measures were required.</p> <p><u>Control of Special Processes</u> The applicant and its subcontractors did not conduct activities important to safety that required control of special processes. Specifically, the applicant did not perform welding, heat treatment, or nondestructive testing activities during the ESP development process. The NRC staff verified this criterion through observations during the inspection. Therefore, no QA measures were required.</p> <p><u>Inspection</u> The applicant and its subcontractors did not conduct activities important to safety that required control of inspection. Specifically, the applicant did not perform examination, measurements, test of material or products, inspection hold points, inservice inspections, or surveillance of SSCs during the ESP development process. The NRC staff verified this criterion through observations during the inspection. Therefore, no QA measures were required.</p>

Q#	Page	Section	INQUIRY
			<p><u>Inspection, Test, and Operating Status</u> The applicant and its subcontractors did not conduct activities important to safety that required control of inspection, test, and operating status. Specifically, the applicant did not perform inspections or test of individual items of a nuclear plant during the ESP development process. The NRC staff verified this criterion through observations during the inspection. Therefore, no QA measures were required.</p> <p><u>Nonconforming Materials, Parts, or Components</u> The applicant and its subcontractors did not conduct activities important to safety that required control of nonconforming materials, parts, or components. Specifically, the development of the ESP application did not involve the installation or use of materials, parts, or components. The NRC staff verified this through observations during the inspection. Therefore, no QA measures were required.</p>
82	17-33	17.16.3.2	<p>Provide to the Board copies of all CARs mentioned in this section (of which the staff currently has originals or copies in its possession). The staff notes that the applicant identified deficiencies in QA to CH2M Hill and that CH2M Hill subsequently corrected them (<u>see</u> p. 17-34). The staff also states that the applicant assured the staff that procedural deficiencies had been corrected. The staff then determined that these findings do not have a significant impact and that they had been adequately addressed. The staff does not indicate that it made any effort, beyond asking the applicant, to determine whether or not this is the case. Provide the factual and legal basis for these staff conclusions.</p> <p><u>Response</u> The staff did not maintain copies of the applicant's corrective action reports. The findings related to procedural deficiencies were administrative in nature. Examples of administrative deficiencies noted in the audit were inadequate trending of revised procedures, failure to maintain the document log current, and how old procedures were being maintained. The staff did not identify, by direct observation during the inspection, any significant deviation from proper procedure use by personnel responsible for the development of the ESP application.</p>
83	17-38	17.18.31	<p>Some contractors and subcontractors were not audited "since they were operating under their own previously accepted 10 CFR Part 50, Appendix B, quality processes (e.g. Parsons)." Explain how this exemption is consistent with the obligation of adequate oversight.</p>

Q#	Page	Section	INQUIRY
			<p><u>Response</u> Licensees maintain a data base commonly referred to as the approved suppliers list for providing services associated with an operating plant. Suppliers on the list have been evaluated (audited) and have provided evidence that they meet 10 CFR 50 Appendix B requirements. The staff reviewed the approved supplier's list and found that the contractors and subcontractors not specifically audited for their ESP activities had been audited as required on a periodic basis to maintain their status as being an approved supplier (e.g. Parsons). Therefore, they did not need to be re-audited for ESP activities.</p>
84	17-39	17.18.3.2	<p>The staff concludes that they reviewed the qualifications of the CH2M HILL personnel who performed the audits and concluded that these personnel "appeared to have adequate qualifications." What process was employed by the applicant and/or the staff to check these qualifications? Why is the staff not certain? State the legal basis for acceptability of a superficial check that only enabled the staff to conclude the personnel "appeared" to have the necessary qualifications.</p>
			<p><u>Response</u> The phrase "appeared to have adequate qualifications" was introduced during preparation of Section 17.18.3.2. The inspection report (provided in response to Q #78) states in Section 2.G.b - Audits, "The team reviewed the qualifications of the CH2M HILL personnel that conducted audits. All audit personnel had adequate qualifications." To reach the conclusion stated in the report the staff reviewed the pertinent portions (e.g. work experience, training, testing) noted in CH2M Hill personnel records. The staff would support a change in SER Section 17.18.3.2. that would remove the words "appeared to have adequate qualifications" and replace them with "had adequate qualifications".</p>
85	A-3	A.1	<p>Permit Condition 4: Should the two words "is necessary" at the end be deleted?</p>
			<p><u>Response</u> Yes, "is necessary" is not necessary.</p>
86	A-23	A.4	<p>Should the figure on page A-23 be identified as Fig. 2.4.15 (<u>see</u> p. 2-176)?</p>
			<p><u>Response</u> The Board's comment is correct.</p>
87	A-24	A.4	<p>Should Fig. 2.5.2-16 be an exact copy of the figure on p. 2-243? There are differences in the curves in the two figures.</p>

Q#	Page	Section	INQUIRY
			<p><u>Response</u></p> <p>Yes. The figure on page 2-243 is the correct (updated) one. The figure on page A-24 does not incorporate the open item responses.</p>
88	NA	General	<p>Additionally, the staff should address the following general inquiry prompted by an issue arising on numerous occasions:</p> <p>Throughout the FSER, subsections entitled “Technical Information in the Application” frequently recite, “Section XXX of the Application states that [then asserting some important fact],” and the ensuing subsection entitled “Technical Analysis” in some instances makes mention ONLY of matters which were the subject of RAIs. To indicate the logic of its conclusions, the staff shall identify in a written table to be delivered to the Board, subsection-by-subsection, each asserted fact or technical conclusion expressly referenced in a subsection entitled “Technical Information in the Application” that was NOT verified by the staff together with a brief explanation as to why that matter was not verified. An example requiring such additional information is subsection 2.2.1.1-2.2.2.1: “The SSAR states that the pipeline owner has agreed to notification protocols if propane or other high-volatility substances are moved through the pipeline,” while subsection 2.2.1.4-2.2.2.4 makes no mention whatsoever of these pipeline owner protocols. A counter example, requiring no additional information from the staff would be subsection 2.4.13.1 wherein the FSER states that the applicant’s position is that the high water table results in an inward directed hydraulic gradient. Subsequently in subsection 2.4.13.3, the staff notes that it “requested additional information regarding the likelihood for liquid effluents to reach a surface water body,” and “determined that the applicant should also specify the maximum elevation at which any liquid radioactive waste releases can occur,” in an effort to ascertain the validity of the conclusory statements in the SSAR Section being evaluated, and eventually caused the Staff to add a COL Action Item.</p>

Q#	Page	Section	INQUIRY
			<p><u>Response</u></p> <p>The staff verifies or performs confirmatory analysis with respect to information submitted by the applicant when the information is subject to judgment, interpretation or assumptions made by the applicant. Confirmatory analysis involves verification of information through the staff's exercise of independent assumptions, interpretations or analytic modeling. Verification of factual information (e.g, telephone conversations, letters, e-mail correspondence, etc.) would constitute an audit and is normally not a part of the staff's review process.</p> <p>For example, site hazard analysis involving projection of data (such as air traffic growth) up through the expiration date of an Early Site Permit or an Operating License typically would be subjected to a confirmatory analysis by the staff because usually there are a number of ways of making assumptions and performing analytic modeling in the projection analysis. However, information on currently existing hazard conditions (e.g., current air traffic rates) typically are taken from established sources such as the Federal Aviation Administration or the Department Of Transportation and are not verified. The Board's example of regarding the pipeline owner agreement to notify the applicant of any transport of propane or some other high-volatility substance through the pipeline is viewed to be the latter case. It is a declaration on the part of the applicant under oath or affirmation and normally is not subjected to an audit.</p>

TABLE 1 - Refer to Question #12

**A Comparison of the Applicant's and Staff's
Short-term (Accident Release) Atmospheric Diffusion Estimates**

Source	χ/Q Value (s/m ³)				
	EAB	LPZ			
	0-2 hrs	0-8 hrs	8-24 hrs	1-4 days	4-30 days
Applicant	2.52×10^{-4}	3.00×10^{-5}	2.02×10^{-5}	8.53×10^{-6}	2.48×10^{-6}
Staff	2.56×10^{-4}	2.82×10^{-5}	1.90×10^{-5}	7.98×10^{-6}	2.30×10^{-6}

TABLE 2 - Refer to Question #14

**A Comparison of the Applicant's and Staff's
Long-term (Routine Release) Atmospheric Diffusion Estimates**

Type of Location	Source	χ/Q Value (s/m ³)			D/Q Value (1/m ²)
		Undepleted No Decay	Undepleted 2.26-Day Decay	Depleted 8.00-Day Decay	
EAB	Applicant	2.04×10^{-6}	2.04×10^{-6}	1.84×10^{-6}	1.46×10^{-8}
	Staff	2.1×10^{-6}	2.1×10^{-6}	1.9×10^{-6}	1.5×10^{-6}
Nearest Milk Cow	Applicant	1.10×10^{-6}	1.10×10^{-6}	9.63×10^{-7}	6.76×10^{-9}
	Staff	1.1×10^{-6}	1.0×10^{-6}	9.2×10^{-7}	7.9×10^{-9}
Nearest Goat Milk	Applicant	9.90×10^{-8}	9.72×10^{-8}	7.28×10^{-8}	4.21×10^{-10}
	Staff	1.1×10^{-7}	1.1×10^{-7}	8.4×10^{-8}	4.2×10^{-10}
Nearest Garden	Applicant	1.10×10^{-6}	1.10×10^{-6}	9.63×10^{-7}	6.76×10^{-9}
	Staff	1.1×10^{-6}	1.0×10^{-6}	9.2×10^{-7}	7.9×10^{-9}
Nearest Meat Animal	Applicant	1.10×10^{-6}	1.10×10^{-6}	9.63×10^{-7}	6.76×10^{-9}
	Staff	1.1×10^{-6}	1.0×10^{-6}	9.2×10^{-7}	7.9×10^{-9}
Nearest Resident	Applicant	1.50×10^{-6}	1.49×10^{-6}	1.34×10^{-6}	6.76×10^{-9}
	Staff	1.7×10^{-6}	1.7×10^{-6}	1.5×10^{-6}	7.9×10^{-9}