

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

DOCKETED 01/18/07
SERVED 01/18/07

ATOMIC SAFETY AND LICENSING BOARD

Before Administrative Judges:

Alex S. Karlin, Chairman
Dr. Richard F. Cole
Dr. Thomas S. Elleman

In the Matter of

DOMINION NUCLEAR NORTH ANNA, LLC

(Early Site Permit for North Anna ESP Site)

Docket No. 52-008-ESP

ASLBP No. 04-822-02-ESP

January 18, 2007

ORDER

(Issuing Safety-Related Questions)

Pursuant to our January 4, 2007, second revised scheduling order (SRSO), the Board hereby issues its written questions related primarily to safety to Dominion Nuclear North Anna, LLC (Dominion) and the NRC Staff (Staff) concerning Dominion's application for an early site permit for two nuclear reactors proposed to be located adjacent to Lake Anna in Louisa County, Virginia. Our questions are set forth in Attachment A.

As specified in the SRSO, Dominion and the Staff shall each file their answers to the questions set forth in Attachment A on or before February 8, 2007. Each party should input their answer to each question into the appropriate column on the electronic copy of Attachment A. The answer to each question should identify the individual who is attesting to the answer and (separately) identify the subject matter expert(s) or individual(s) who were consulted or involved in preparing the answer.¹ The answer to each question also should identify any

¹ Such identification should include the name, title, and employer of the person. The parties do not need to identify lawyers who were consulted for purposes of legal advice.

document that is relied on as important support for the answer.² In addition, legal questions need not be answered in the electronic copy of Attachment A, but should be answered separately and individually in a single brief or legal memorandum signed by counsel with citations to relevant legal authority.

In order for the answers to be incorporated into the record of this proceeding and relied on by the Board in its decision making, each party's answers (other than the briefs responding to legal questions) should be submitted in exhibit form, under oath or affirmation, so that they are suitable for receipt into evidence without the necessity of the personal appearance of each expert or individual.³ Likewise, if a party wishes a document cited in support of an answer to be included in the record, the document will need to be submitted and admitted as an exhibit. The exhibits can either be provided now, or when party submits its testimony at a later date.⁴

The Board notes that most of its questions can be answered in a relatively straightforward manner. Many questions merely ask for copies of calculations or analyses that Dominion or the Staff have already performed. Other questions are definitional (the definitions will assist us in writing and supporting our decision), ask for explanation of specific statements in the Safety Evaluation Report (SER), or raise apparent inconsistencies. Virtually all questions are specific and tied to the SER and its underlying documents.

² Such identification should include the title, subject, date, relevant page number, and (if applicable) the ADAMS number of the document.

³ See, by analogy, 10 C.F.R. § 2.1207(b)(2), specifying that, in Subpart L proceedings, written testimony is to be received into evidence in exhibit form.

⁴ Except where the Board has specifically requested a document or analysis or where a party deems an exhibit necessary to the understanding of its answer, we encourage each party to submit most of its proposed exhibits later, when it submits its case in its written testimony. This will allow the parties to create and organize their exhibits, testimony, and evidence, and build the record to support their positions, in a more organized and accessible manner. Likewise, the curriculum vitae and any other information supporting the expertise of any person identified as an expert witness may be submitted later, with their written testimony.

The Board encourages Dominion and the Staff, where appropriate, to coordinate their answers and avoid duplication. However, all of the questions on Attachment A, even those relating to the nature and adequacy of the Staff's review, are addressed to both the Staff and Dominion and should be answered by each (even if only to say that you have no responsive information) unless you agree on a joint response.

At the request of the Staff, the Board has scheduled a prehearing conference in this matter on January 25, 2007, at 2:00 PM EST. The purpose of the prehearing conference is to expedite this proceeding by allowing the parties to obtain clarification of the scope or meaning of any of our safety-related questions so they can answer them fully, fairly, and promptly on February 8, 2007. The parties are encouraged to begin preparing and drafting their answers now, and not wait until after the prehearing conference, as it will not serve as a ground for an extension.

It is so ORDERED.

FOR THE ATOMIC SAFETY
AND LICENSING BOARD⁵

/RA/

Alex S. Karlin, Chairman
ADMINISTRATIVE JUDGE

Rockville, Maryland
January 18, 2007

⁵ Copies of this order were sent this date by Internet e-mail transmission to counsel for the licensee, Dominion Nuclear North Anna, L.L.C. (Dominion) and counsel for the NRC Staff.

Attachment A: North Anna ESP Safety Inquiries

#	Document Page	Document Section	Inquiry	Answer (Including Author, sme, and key documents)
Site Characteristics				
1	SER 1-3	SER Section 1.2	What is the expected high water level of Lake Anna and how does it compare with the lakeside property line elevation of land owned by Lake Anna residents?	
2	SER 2-3	SER Section 2.1.1.3	Does the Applicant, Dominion Nuclear North Anna LLC, currently have any right, title, or interest in the proposed ESP site?	
3	SER 2-4, 2-5, 2-6	SER Section 2.1.2.1	The Applicant appears to have no authority and control over the exclusion area. The Applicant states that it will “purchase or lease the site from Virginia Power and ODEC” and goes on to predict what the terms of the lease will provide. What arrangements or documentation do you have with the current owner of the ESP and NAPS sites that it will agree?	
4	SER 2-8	Application Section 2.1.3.1, ACRS March 2005 Transcript	The ACRS has criticized NRC for failing to incorporate changing knowledge into meteorological calculations, such as considering global warming in the projection of severe storms. Is this general criticism not also appropriate for population predictions where an aging population's desire for a rural environment and a desire to be near a lake could be strongly influencing factors that alter population growth?	
5	SER 2-8, Application 2-2-5	Application Section 2.1.3.1	Growth projections 60 years into the future appear primarily based upon year 2000 census numbers and a standard future growth model. It is important to have reasonably accurate numbers for future populations to evaluate population dose calculations and emergency plan evacuation times.	

#	Document Page	Document Section	Inquiry	Answer (Including Author, sme, and key documents)
			A. Given the importance of this information, why were not alternate methods for estimating growth explored? Historical growth could be determined from growth rates in school enrollments, growth rates in automobile registrations, or increases in property registrations. Why has little attention generally been paid to historical growth rates?	
			B. If the proposed modeling method for population growth works, why has the Applicant not demonstrated this by taking census data from around the 1940s and showing that the present population is predicted?	
			C. Given the long period of extrapolation for population growth, shouldn't some effort be made to establish error bars for future growth predictions?	
6		Application Section 2.1.3.4	The growth predictions in this section seem counter-intuitive in that the percentage growth rates decrease with increasing time. The ten-year growth rate averages 3.5%/yr. from 2000 through 2010 but drops to 1.7%/yr. between 2030 and 2040. This trend continues, dropping to about 1.4%/yr. for the period 2040-2065. Has this behavior been exhibited in any past periods? What explanation can be offered for a decreasing future growth rate?	
7	SER 2-17	SER 2.2.3.1	Couldn't the 8,500 gallon gasoline truck or equivalent make delivery closer than 1.5 miles? What about deliveries to the plant?	
8	SER 2-14, 2-17	SER Section 2.2.1.1-2.2.3.1	The SER states that there are train tracks 5.5 miles away from the site; a train could create a far larger explosion than a tractor trailer on the interstate. Does the extra half mile beyond the 5-mile radius of interest mean this risk should not be considered at all?	
9	SER 2-19	SER Section 2.2.3.3	The SER states that the Staff "independently reviewed possible hazards posed by the existing NAPS units." Please describe what hazards the Staff reviewed and the results of the Staff's review.	

#	Document Page	Document Section	Inquiry	Answer (Including Author, sme, and key documents)
10	SER 2-26	SER Section 2.3.1.1	The potential for freezing in the UHS water storage facility is apparently measured through the number of degree-days below freezing. Why is this a relevant parameter to establish either rate of freezing or a volume of ice?	
11	SER 2-27	SER Table 2.3.1-6	Considering flow requirements and the evaporative losses from cooling towers in UHS systems, and the design requirements of providing cooling water for normal operation, anticipated operational occurrences, safe shutdown, cooldown (first 30 days) and long term cooling for periods in excess of 30 days during adverse natural conditions, please explain why this doesn't rule out the use of wet cooling towers for UHS system. Doesn't this look like a situation for dry cooling or the need to qualify Lake Anna for supplying the necessary water?	
12		SSER 1 Section A-1, Permit Condition 3.	This permit condition specifies the use of dry cooling during normal operation for a fourth proposed unit. Since the ESP specifies an option of partial evaporative cooling for Unit 3 but only dry cooling for Unit 4, is this Permit Condition really intended for Unit 3? If water flow conditions allow the use of evaporative cooling, why wouldn't this be a preferred mode of operation since plant efficiency is improved?	
13	SER 2-27	SER Table 2.3.1-6	Please describe the rationale, criteria, and procedures used in the preparation of Table 2.3.1-6, "Applicant's Proposed Ultimate Heat Sink Meteorological Site Characteristics."	
14	Application 2-2-40	Application Section 2.3.1.3.2	The probability of a tornado strike with rotational wind speeds of 260 mph is cited as only 1×10^{-7} but the general probability of a tornado strike is considerably higher: 6×10^{-5} . Can these higher probability tornados produce consequential damage at a plant site? Please provide evidence to confirm this response.	

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15	SER 2-31	SER Section 2.3.1.3	Data from NSSL on tornado frequencies is quoted in units of "days per year for a tornado threat within 25 miles." This would appear to be a reasonably meaningless parameter. Does a value of .05 mean that there is one chance in 20 per year of a tornado with the reference wind speed being within 25 miles of the plant? If these numbers can be considered to be tornado probabilities, then how do these numbers relate to the much lower tornado frequencies referenced above?	
16	SER 2-34	SER Table 2.3.1-7	What is the effect of including the Staff's proposed regional climatic site characteristics as ESP site characteristics in Appendix A.3? Don't these characteristics simply describe the site climate? What is the effect if the list of climate characteristics is incorrect, or needs to be updated at the time of any COL application? If the COL application occurs 20 years after the ESP is issued, is the intervening 20 years of meteorological data to be ignored?	
17	SER 2-46, Application 2-2-61	SER Section 2.3.4, Application 2.3.4.2	X/Q values for different accident exposure intervals were calculated by taking a yearly average X/Q and employing a logarithmic interpolation to obtain values for shorter exposure intervals such as 2 hours, 8 hours, 72 hours, etc. See RG 1.111. While this may be a reasonable approach, it does not necessarily represent the highest values of X/Q. Why shouldn't error limits be ascribed to X/Q to confirm that higher values are possible? In lieu of error limits, why not cite probabilities for true values lying below the quoted values?	
18	SER 2-48		Table 2.3.4-1 provides the X/Q values "@ EAB" and "@ LPZ." The former is a specific location - the boundary. The latter is an area - the zone within a 6 mile radius. Please explain whether all LPZ values are the average for the LPZ or are at its outer boundary.	

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19	Application 2-2-45	Application 2.3.1.3.6	The frequency of lightning strikes at the plant site appears to have been obtained by determining the annual lightning strikes over a larger area and scaling these numbers to a site area of 0.068 square miles. Isn't this overly simplistic? Doesn't lightning occur between points of appropriate electrical potential which can be influenced by building height and conductivity to ground?	
20	Application 2-2-61	Application 2.3.4.2	Measured wind directions and velocities were combined to generate X/Q values at specific locations. The bounding case was apparently a wind direction and velocity with a probability of greater than 0.5% and the highest calculated X/Q. Since the bounding case does not reflect the highest value of X/Q that is possible for a given site, shouldn't the calculated X/Q values in the Application and the SER carry error limits that better reflect the true values that are possible?	
21	Application 2-2-61	Application 2.3.4.3	Bounding X/Q values for different release intervals were apparently obtained by calculating yearly average X/Q values and using a logarithmic extrapolation to obtain values for shorter release times. As cited above, this approach may be reasonable but it does not represent the highest possible X/Q values for a given accident exposure duration. The scientific community deals with this type of problem by including error limits for calculated values when higher values are possible. Why shouldn't this also be done in a regulatory environment?	
22	SER 2-51	SER Section 1.2.5	Why is it acceptable to exclude the known, normal releases from Units 1 and 2 from a calculation of population doses during normal operation? An answer that simply says this is consistent with regulatory policy is not regarded as acceptable.	
23	Application 2-2-59	Application 2.3.4.1	Why is there no discussion of the effect of possible inversions that could trap radioactive materials near the ground and increase X/Q values?	

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24	SER 2-52	SER Section 2.3.5.1	Please provide a regulatory or other authoritative definition of the following terms: "undepleted no decay," "undepleted/2.26 decay," and "depleted/8:00 decay."	
25	SSER A-18	SSER Appendix A	Why is the D/Q for the nearest vegetable garden on A-18 of the SEP Supplement 6×10^{-9} while the comparable value in Table 1-1 on 1-2 of the Draft EIS appears to be a factor of ten different at 6×10^{-8} ?	
26	SER 2-53	SER Table 2.3.5-1	The Applicant states that no milk exposure pathway for isotope ingestion was considered because no cows or goats used for milk consumption were found adjacent to the plant. Given that milk is a high exposure transport path for some isotopes and the fact that the Applicant is trying to look ahead for a period of up to 60 years, shouldn't this exposure pathway be evaluated?	
27	SER 2-55		Legal Question: The SER states that any COL or CP applicant referencing the SER dispersion calculations for routine releases "should verify that the specific release point characteristics, specific locations of receptors of interest used to generate the ESP routine release atmospheric dispersion site characteristics bound the actual values provided at the COL or CP stage" and makes this COL Action Item 2.3-3. The SER also states that this will be a site characteristic in any ESP. What happens if, at the COL stage, the release point characteristics or locations of receptors are not as specified in the ESP? Would a contention at the COL stage, alleging that the actual values are different from those used at the ESP stage, be admissible?	

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28	SER 2-56	SER Table 2.3.5-2 and Application Table 2.7-14 thru 20	These tables give X/Q and D/Q values for normal and accident conditions for different locations. The table of isotopes upon which these calculations appear to be based contain fission products only. Why weren't Co-58, Co-60, Mn-54 and the other activation products that exist outside the reactor fuel included in these calculations?	
29	SER 2-56	SER Table 2.3.5-2 and Application Table 2.7-14 thru 20	Tritium is an isotope that is both produced external to the fuel and capable of diffusing through the fuel cladding. Test wells at nuclear plants can show relatively high concentrations of tritium. Why is there no mention of this isotope in either the environmental or dose sections of the SER or Application?	
30	SER 2-56	SER Table 2.3.5-2	The section on seismic impacts in the Application and SER presents detailed information on calculations, tests, and measurements—even to the extent of including field notes in the Application. In contrast, almost no information is given relative to the assumptions used for calculation of X/Q or dose. For the case of "normal" plant releases:	
			A. What percentage of failed fuel was assumed for the reactor core?	
			B. What coolant leakage through the steam generator was assumed for PWRs and what condenser leakage for BWRs?	
			C. What leakage rates were assumed for pumps and seals?	
			D. What concentrations of activation products were assumed?	
			E. What release rates were assumed from the waste processing facilities at the plant?	
31	SER 2-56	SER Table 2.3.5-2	If the Applicant chooses a reactor type different from the AP1000 or ABWR reference designs, will they be held to the X/Q values presented in the Application or will they be allowed to present new values?	

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32	SER 2-59	SER Section 2.4.1.1	The non-safety related cooling water need for all four units is 121 cubic feet per second. Wouldn't this value vary significantly with time of year?	
33	SER 2-60	SER Section 2.4.1.1	The SER states that "However, if the dry cooling tower system contains a secondary cooling water loop..." The above sentence seems to imply a make-up water need for the dry cooling tower on Unit 4. Do dry cooling towers require any make up water?	
34	SSER 2-6	SSER Section 2.4.1.3	A natural evaporation rate from the lake was assumed to be 5.6 in./mo. Wouldn't this value vary significantly with season? Why is 5.6 the selected value?	
35	SSER 2-6	SER Section 2.4.1.3	The Staff estimates that lake level would drop only 2 feet in 49 days which reflects a balance between evaporative loss and new flow into the lake (not given for the calculation). Wouldn't this conclusion be strongly dependent on the time of year since water influx can vary significantly?	
36	SSER 2-6	SER Section 2.4.1.3	There does not appear to be any discussion of water leakage from the UHS into groundwater. It would seem possible that this could be a route for some transfer of radioactivity into the environment. (For example, tritium in BWR coolant transferring to the UHS through condenser leakage). Should this release path be considered in the SER?	
37	SER 2-71	SER Table 2.4.2-1	Please explain exactly what the entry of the value 18.3 under PMP depth (in.) means?	
38	SER 2-77 & 2-78	SER Tables 2.4.3-1	These tables list the PMP values for various size watersheds including North Anna for durations of 6 hour increments. Can the value of 18.2 (no units identified) in Table 2.4.3-2 be interpreted as 18.2 inches water depth accumulation in Lake Anna during the first 6 hours of the storm (an average rate of slightly over 3 inches per hour)? If not, what does it signify?	

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39	SER 2-74	SER Section 2.4.3.1	Applicant investigated the historical storms used in a 1976 study and three additional storms that occurred in February 1979, March 1996, and June 1995. The additional storms were selected because they produced high water levels in Lake Anna. What were the high water levels in Lake Anna as a result of those storms?	
40	SER 2-81	SER Figures 2.4.3-2, 2.4.3-3	Comment- The Figures appear to be reversed.	
41	SER 2-85	SER Section 2.4.1.1	The last paragraph in this section states that the Applicant told the Staff that the UHS would consist of a mechanical draft cooling tower over an underground basin if the selected plant design includes a UHS (emphasis added). Is the UHS not confirmed for any of the steam generation plants? Under what conditions would a proposed plant need a UHS?	
42	SER 2-89	SER Section 2.4.5.1	Applicant concluded that given the short fetch length, surges and waves produced from winds or oscillatory waves alone would not produce water heights greater than the still water level resulting from the PMF. Water heights produced by PMFs are considerable and in any event, wouldn't the surges and waves produced by wind action be additive to the flood-caused high water level?	
43	SER 2-115	SER Section 2.4.10.3	The Staff estimated local, intense precipitation for the ESP site be 18.3 inches/hr based on Table 2.4.2-1. This seems high. What is the basis for this number?	
44	SER 2-138	Table 2.4.14-1	Staff's values for local intense precipitation are shown as 18.3 in./hr and 6.1 in. in 5 minutes. Please identify the source of these data.	
45	SER 2-117	SER Section 2.4.11.1	Staff mentions that the existing units and the proposed units have different lake water levels for shutdown. Hasn't Applicant modified the intake of the existing units to provide for a 242' MSL threshold elevation for shutdown (the same elevation as proposed for the new units)?	

#	Document Page	Document Section	Inquiry	Answer (Including Author, sme, and key documents)
46	SER 2-121	SER Section 2.4.11.3	Staff reports that since the Applicant's minimum water surface elevation site characteristic is lower than the Staff's estimate, the Applicant's value is acceptable. Does this mean that if Applicant had proposed a level below 242', the staff would have accepted that? What criteria did the Staff use in arriving at its decision? Was there any consideration of Lake Anna dockowners?	
47	SER 2-129	SER Section 2.4.13.1	The SER states that the Applicant provided a conceptual hydrological model of the subsurface environment and pathways for releases of liquid effluent to ground and surface waters from the ESP site. Please provide it.	
48	SER 2-130, SER 2-59, SER 2.136	SER Section 2.4.13.1	The SER states that "no site-specific data are available to determine the chemical characteristics of ground water at the ESP site. The applicant assumed that the water quality of the crystalline aquifers in the Piedmont Physiographic Province is representative of the water quality at the ESP site." Given that the NAPS industrial facility has been situated on this site for several decades, the assumption that its groundwater is as pure as background seems inappropriate. Please provide the any data on the chemical or radiological characteristics of the soil, vadose zone, and groundwater (not just the aquifer) on and below the ESP site and portions of the NAPS site in the vicinity (within 600' of the boundary) of the ESP site.	
49	SER 2-132	SER Section 2.4.13.3	Applicant reported that the only observation of piezometric head difference made between the saprolite and the bedrock indicates an upward hydraulic gradient. Please explain what this is and the conditions necessary for it to occur.	

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50	SER 2-136	SER Section 2.4.13.3	<p>The SER states that “The staff concludes that, because of incomplete knowledge of the subsurface hydrological and chemical properties and the likely composition of the radwaste effluent itself, significant uncertainty exists in the characteristics of radionuclide migration in the subsurface at the ESP site at the time of ESP review. The staff has determined that after the reactor design is selected and additional details related to radwaste tank design and the location within the proposed site are known, appropriate subsurface hydrological characterization can be completed.” The Board has several questions relating to this passage, as follows:</p>	
			<p>A. What prevents the Applicant and Staff from developing more sufficient knowledge [data] on the “subsurface hydrological and chemical properties” at this time? Isn’t this an appropriate part of the ESP assessment?</p>	
			<p>B. What prevents the Applicant and Staff from developing a plant parameter envelope for the “likely composition of the radwaste effluent?” PPE assumptions were made for other liquid effluent releases, thus please explain why it was not done here.</p>	
			<p>C. Absent a baseline delineating the existing chemical and radiological contamination on the site, what measures will be taken to distinguish between any existing contamination from Virginia Power's Units 1 and 2 and Dominion's proposed Units 3 and 4?</p>	
			<p>D. Legal Question: Absent the foregoing information, should an ESP be granted? How does this comport with the Commission’s statement that “where adequate information is not available, early site permits will not be issued?” 54 Fed. Reg. 15372, 15378 (April 18, 1989).</p>	

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51	SER 2-136	SER Section 2.4.13.3	The Staff proposed permit condition 4 would require the permit holder to “design any new unit’s radwaste systems with such features to preclude any and all accidental releases of radionuclides into any potential liquid pathway.” Isn’t this impossible? Please explain how you would interpret and implement such a requirement?	
52	SER 2-146, SER 2-166	SER Section 2.5.1.1.1, 2.5.1.3.2	Please provide a regulatory or other authoritative definition of “capable tectonic source.”	
53	SER 2-148 to 2-161	SER Section 2.5.1.1.1	The Applicant and Staff reject a number of geological hypotheses, including Weem’s tectonic origin for the seven local fault lines (2-148, 2-164) and Marple and Talwani’s research regarding the existence of central and northern segments of the East Coast Fault System (2-161). What are the consequences to the safety of the plant if any or all of these rejected hypotheses are correct?	
54	SER 2-166 to 2-167	SER Section 2.5.1.3.2	The SER states that in 1974 the Staff concluded that “unnamed fault ‘a’ is not a capable tectonic source.” In the SER the Staff concludes that the Applicant has “adequately investigated the possible extension of fault ‘a’ and that “the ESP site has no fault displacement potential.” What does this mean? Please state and explain the Staff’s current conclusion or opinion as to whether unnamed fault “a” is a “capable tectonic source.”	
55	SER 2-168	SER Section 2.5.1.4	The SER states that “These results provide an adequate basis to conclude that no capable tectonic faults exist in the plant area (5 mi) that have the potential to cause near-surface displacement.” Does the Staff so conclude? Or is this merely a statement that, given these results, such a conclusion is possible?	

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56	SER 2-174+	SER Section 2.5.2.1.6	The March 2005 ACRS testimony notes that the site Safe Shutdown Earthquake exceeds the design SSE at high frequencies for the designs that have been certified to date. No mention of this issue occurs in the subsections that deal with seismic issues. What is the significance and current status of this issue?	
57	SER 2-177	SER Section 2.5.2.1.6	The SER states that the determination of a safe shutdown earthquake (SSE) for the site uses a "reference probability." Probability of what?	
58	SER 2-177	SER Section 2.5.2.1.6	The SER states that the Staff "calculated a reference probability level for the 29 nuclear power plant sites in the CEUS; the median reference probability for these 29 sites, using median hazard results, is 10 ⁻⁵ per year." Please provide the results of these calculations.	
59	SER 2-177	SER Section 2.5.2.1.6	Please explain whether there have been any advances in seismic science or data relative to the safety of nuclear power plants since the 29 CEUS reactors were originally sited several decades ago and why it is appropriate to automatically use the median probability from those sites as the benchmark for safety on an ESP that might be issued in 2007 and apply to reactors built perhaps in 2027 or even 2047.	
60	SER 2-178	SER Section 2.5.2.1.6	The Applicant has proposed that the seismic reference probability for the SSE for the ESP be relaxed by a factor of at least 5. Does the Staff agree with this relaxation and if so, why?	
61	SER 2-177	SER Table 2.5.2-1	Table 2.5.2-1 (SSAR Table 2.5-22) compares median and mean values of ground motion acceleration values for the 1989 PSHA model and the Updated PSHA model. The ground motion acceleration values for the mean estimates were higher than the median estimated values. Were all of the sites participating in the sample in the CEUS? How many were in the sample? As regards the mean values, what portion of the sample had acceleration values higher than the mean value at the various frequencies?	

#	Document Page	Document Section	Inquiry	Answer (Including Author, sme, and key documents)
62	SER 2-177 to 2-201	SER Section 2.5.2.1.6	Applicant used two different methods to determine the ground motion response spectra for the final SSE. The first method, referred to as a performance-based method, was studied by the NRC Staff, who raised several questions and indicated to Applicant that it would need more time and resources to review this new method. Applicant then notified Staff that it would revise its submittal and base the selected SSE on the reference probability approach, in accordance with RG 1.165, indicating that it would retain the performance-based approach as an "alternate and further justification for the final SSE."	
63			In using the reference probability approach, Applicant departed from the recommendation clearly stated in RG 1.165 and used a higher reference probability (5×10^{-5} rather than 1×10^{-5}). In justification of using the higher reference probability, Applicant listed three reasons: (1) higher ground motion estimates from the EPRI ground motion models, (2) shorter recurrence intervals for the New Madrid and Charleston seismic sources, and (3) the use of mean hazard instead of the median hazard. As pointed out in the SER at 2-199, each of these three factors, particularly the first two, increase the overall hazard for the CEUS and specifically for the 29 nuclear power plant sites used to determine the original reference probability. Would the use of a higher reference probability generally result in a lower spectral acceleration value? What would the difference be? Since most of the justification used by the Applicant would tend to increase the overall seismic hazard, how does that justify using a higher reference probability?	
64	SER 2-241	SER Section 2.5.4.3.7	According to Applicant, damping ratios for rock are generally between 0.5 and 4.5 percent. Applicant selected 2 percent for the zone III-V rock based on engineering judgment and experience. The Staff agrees. Why do all the seismic spectra curves in the SER and SSAR use 5% critical damping?	

#	Document Page	Document Section	Inquiry	Answer (Including Author, sme, and key documents)
65	SER 1-5, SSER E-1	SER Section 1.3, 7/18/05 ACRS letter, Appendix E.	Applicant and NRC terminology appear to accept the possible existence of more than two new nuclear units at the North Anna site so long as the total thermal power is below 9000 MW. However, the ACRS letter of July 18 to Chairman Diaz states an ACRS conclusion that "the proposed site, subject to the permit conditions recommended by the NRC staff, can be used for up to two nuclear power units each of up to 4300 MW [4500 MW] without undue risk to the public health and safety." Does the NRC view the ACRS statement as limiting their concurrence only for the condition of two units?	
66	SER 15-4	SER Section 15.3	Why is there no discussion in the Application or the SER related to the planned measurement of radioactive materials in the air, soil and groundwater?	
67	SER 2-231	SER Section 2.5.4.1.6	Why is there such a wide range in the measured Factors of Safety (0.91 to 3.61) for soils in near proximity to each other?	
68	SER 2-234	SER Section 2.5.4.1.10	Applicant has indicated that zone IIA saprolite is not suitable to support any safety-related structure without ground improvement and has proposed techniques to improve subsurface conditions. Soil borings indicate that IIA saprolite is abundant on the existing plant site and the ESP site. <u>See</u> Tables 2.5-29, 2.5-32, 2.5-38 ,and 2.5-40. Construction sections of now abandoned former units 3 and 4, such as intake and discharge piping, containment pad, etc., might be salvaged and incorporated into the proposed new facilities. What actions would be taken to assure that settlement problems associated with certain sections of the existing plant do not occur at the new sites?	

#	Document Page	Document Section	Inquiry	Answer (Including Author, sme, and key documents)
69	SER 2-250	SER Section 2.5.6.1	According to Applicant, the North Anna Dam was designed and constructed to meet the requirements for a seismic Class 1 structure in support of the existing NAPS units. Does this mean that Lake Anna could be used for safety-related water use purposes for the existing units? If so, why was this not also considered for similar purposes with the proposed units?	
70	General		Why isn't it reasonable to use observed ground water flow and settling data for Units 1 & 2 as a predictor for behavior of Units 3 & 4?	
71	3/2/05 ACRS Transcript 154-160	3/2/05 ACRS Transcript	The SSE for the proposed units is much higher than the SSE for the existing 2 units (0.15 g versus possibly 0.5g). Is this an issue for the existing plants or is it simply a different way of looking at seismic information?	
			Radiological Effluent Release Dose Consequences From Normal Operations	
72	SER 11-2	SER Section 11.1.3.1	In this section and throughout the report, it is presumed that fission product inventories scale directly with reactor thermal power. See, for example, SER Section 15.3.4, p 15-6, "Source Terms." For some isotopes, this is not strictly true. As one example, Cs-134, a critical radionuclide, is produced by neutron capture in nonradioactive Cs-133 which is a fission product. Cs-134 thus scales with the square of reactor fluence not with reactor power. Is this effect of sufficient consequence to require modification of any of the radioisotope concentration tables?	
73	SER 11-2, SSER viii	SER Section 11.1.3.1, SSER Exec. Sum.	The thermal power limit was increased to 9000 MW (SSER viii) with an appropriate scaling of isotope concentrations. However, the original plant designs were based upon particular temperature and flow conditions and a power increase would appear to produce a shift in one or the other of these numbers. Wouldn't this factor contribute to increased fission product release that is greater than a linear extrapolation?	

#	Document Page	Document Section	Inquiry	Answer (Including Author, sme, and key documents)
74	SER 11-3	SER Section 11.1.3.2	Identical values are quoted for maximum annual dose equivalents during normal operation for both thyroid and total body doses. This would appear to imply that air or water exposure to radioactive iodine is inconsequential. Is this not an unexpected result?	
75	SSER 11-1	SSER Section 11.1	Is there a regulation or other authoritative definition of "source term?" If so, please provide it.	
76	SSER 11-1	SSER Section 11.1.1	Based on the PPE for Units 3 and 4, what radiation dose is received (a) immediately outside the reactor containment and (b) at the EAB boundary, from direct transmission of radiation through the reactor shield?	
77	SSER 11-2	SSER Table 11.1-1	Legal Question: Table 11.1-1 refers to the Part 50 Appendix I doses as "objectives." Please explain how these objectives are included in the proposed ESP and whether they are legally enforceable. Please explain whether it would be a violation to exceed these objectives.	
78	SSER 11-2	SSER Table 11.1-1	Legal Question: Table 11.1-1 refers to the Part 50 Appendix I doses on a per unit basis. Please explain whether it is your position that, since the Dominion group of companies would have four reactors on the site, it would be allowed to quadruple the amount of radiation it can release under Appendix I?	
79	SSER 11-2	SSER Table 11.1-1	Legal Question: Table 11.1-1 refers to the 40 CFR Part 190 environmental dose standards. Would it be a violation to exceed these standards? How will they be incorporated into the proposed ESP?	
80	SSER 11-2	SSER Table 11.1-1	Legal Question: Table 11.1-1 specifies that the 40 CFR Part 190 dose limits are for the entire site and apply to all operating units. How will the Part 190 25 mrem/yr total body dose limit be allocated between the two existing reactors (Units 1 and 2) and proposed Units 3 and 4? How will compliance be monitored and measured?	

#	Document Page	Document Section	Inquiry	Answer (Including Author, sme, and key documents)
81	SSER 11-3	SSER Section 11.1.1	The SER states that the Applicant calculated a collective whole body dose for the population within 50 miles of the ESP site. Please provide this collective whole body dose amount and the calculations supporting it. Please confirm whether this dose is based on the PPE maximums and that it segregates the existing units from the proposed units.	
82	SSER 11-3	SSER Section 11.1	NRC Reg. Guide 8.29 uses a coefficient of 4×10^{-4} fatal cancers per rem for purposes of occupational radiation risk estimates and states that "the scientific community generally assumes that any exposure to ionizing radiation can cause biological effects." Assuming (a) a linear no threshold application of the Reg Guide coefficient, (b) that proposed Units 3 and 4 operate for 40 years, and (c) using the population estimate provided by the Applicant in response to RAI 2.1.3-1 (SER page 2-8), please calculate and provide the estimated number of additional fatal cancers resulting from routine operation of Units 3 and 4 for the 50 mile radius area assuming the two units operate for 40 years.	
83		SSER Section 11.1.1	Have you calculated or estimated the collective whole body dose for the population within 50 miles of the ESP site in the event of a fuel melt DBA? If so, please provide these data and the basis for your estimate or calculation.	
84	SSER 11-4	SSER Section 11.1.3.1	Legal Question: 10 CFR § 20.1301(a) specifies that "each licensee" shall conduct operations so that the TEDE to individual members of the of the public from the "licensed operation" does not exceed 100 mrem per year, exclusive of background. In the case of multiple reactors at a site, would it ever be possible to multiply the maximum dose allowed by the number of units so that a four unit site could provide an exposure up to 400 mrem per year to an exposed individual? If this is ever possible, under what conditions would it be allowed?	

#	Document Page	Document Section	Inquiry	Answer (Including Author, sme, and key documents)
85	SSER 11-4	SSER Section 11.1.3.1	The SSER refers to Table 5.4-11, which specifies that the total radioactive effluents from the plants will produce a dose of 6.4 mrem/yr and that the total from the "existing units" is 0.32 mrem/yr. Is this correct? Why does the PPE for the two new reactors show them emitting twenty times the amount of radiation as the two existing reactors?	
86	SSER 11-4, 11-5	SSER Section 11.1.3.2	The SER states that it performed independent evaluations or calculations and obtained "similar" results for the following tables of data provided by the Applicant. Please provide the Staff's independent calculations, evaluations, and similar results for Tables 5.4-6, 5.4-7, 5.4-8, 5.4-9 and 5.4-10 of the ER.	
87	SSER 11-4, 11-6	SSER Section 11.1.3.1, 11.1.3.2	The SER states that the Applicant's results of 6.4 mrem/yr for the whole body, 27 mrem/yr for the thyroid, and 11 mrem/yr to bone are smaller than the maximum doses specified in 40 CFR § 190.10(a). Did the Staff calculate the results? What were the Staff's results for whole body, thyroid, and bone?	
			Emergency Planning	
89	SER 13-1	SER Section 13.3	In the event of an emergency, what are the respective responsibilities of Dominion Resources, Virginia Electric Power Co., Dominion Nuclear North Anna, North Anna Power Station (the Applicant) and Old Dominion Electric Corporation? Would personnel from these respective organizations have to work in close cooperation on emergency issues?	
90	SER 13-3	SER Section 13.3.1.1	The SER uses the term ETE (evacuation time estimate) and also refers to "the ETE" as if it is a specific document. Are all SER references to "the ETE" a reference to the "EM/TEC01-220, "Evacuation Time Estimates for the North Anna Power Station and Surrounding Jurisdictions," dated November 2, 2001? Please provide "the ETE."	

#	Document Page	Document Section	Inquiry	Answer (Including Author, sme, and key documents)
91	SER 13-13	SER Section 13.3.1.1	Section 13.3.3.3 covers "Onsite Emergency Organizations." For purposes of the ESP application, is the NAPS site (beyond the ESP boundary) considered not "onsite?" If not, please explain how the term onsite and offsite are used with regard to emergency planning. Are NAPS and ESP treated as one site?	
92	SER 13-37	SER Section 13.3.3.10.3	The SER states that "Dominion would use both fixed and portable radiation monitoring equipment to perform dose assessment..." Does the use of the word "Dominion" here also include Virginia Power and Dominion Nuclear North Anna?	
93	SER 13-39	SER Section 13.3.3.11.1	The SER states that "evacuation decisions would be based on dose projections or offsite monitoring results." Section 5.9.6 "Radiological Monitoring" in the North Anna EIS provides a general description of the offsite monitoring to be carried out at Units 3 and 4. Please explain why this information is not included as a part of the SER.	
94	SER 13-44	SER Section 13.3.3.11.3	The SER states that the Staff "applied current requirements" on Federal guidance relating to protective action recommendations (in the event of an accidental release of radioactivity). The Staff acknowledged that the Federal guidance may change and that "[a] COL or OL applicant should address any such changes, and the staff will determine compliance with the requirements, in this area during a COL or OL review." The Board has the following questions related to this statement in the SER:	

#	Document Page	Document Section	Inquiry	Answer (Including Author, sme, and key documents)
95			A. Legal Question: Please explain how this statement in the SER comports with 10 CFR § 52.39(a)(1) which states that the “Commission may not impose new requirements, including new emergency planning requirements, on the early site permit or the site for which it was issued, unless the Commission determines that a modification is necessary either to bring the permit or site into compliance with the Commission’s regulations and orders in effect at the time the permit was issued, or to assure adequate protection of the public health and safety or the common defense and security.”	
96			B. Legal Question: Contrary to the statement in the SER, does 10 CFR § 50.39(a)(1) mean that the Applicant is immunized (grandfathered) against any more stringent regulatory requirements or guidance for up to 80 years (the term of the ESP (20 years) plus extensions (20 years) plus the term of any COL (40 years)) unless a change can be shown to be “necessary . . . to assure adequate protection of the public health and safety or the common defense and security?”	
97			C. Legal Question: The SER states, at page 13-49, that “the staff did not consider the extent to which future radiological protection procedures would address radiological protection and onsite contamination control functions.” Would the Applicant be exempt from these future procedures (unless they are shown to be necessary to assure adequate protection of public health and safety)? Please explain.	
			Accident Analysis	
99	SER 15-4	SER Section 15.3.1	What is the basis for the statement that the proposed Design Based Accidents for the ABWR and AP-1000 reactor designs would bound the DNBs for CANDU and gas-cooled reactors?	

#	Document Page	Document Section	Inquiry	Answer (Including Author, sme, and key documents)
100	SSER 15-3, 15-9	SSER Section 15.1	The SSER states that the Applicant's response to Supplemental RAI 1 revealed that the highest 2-hour dose at the EAB for certain of the ESBWR DBAs does not occur in the first two hours. How did the Staff handle this fact in developing its proposed site specific X/Q values in Table 15.3-1?	
101	SSER 15-6	SSER Section 15.3.2	Given that the Applicant and Staff have each calculated the site specific X/Q values for this ESP site, why should the "postulated X/Q values in the certified ABWR DCD" or the proposed X/Q values for the AP1000 DCD be used?	
102	SSER 15-6	SSER Section 15.3.3	The SSER states that "Smaller X/Q values are associated with greater dilution capability, resulting in lower radiological doses. The radiological consequences are thus inversely proportional to the X/Q values." Don't you mean that they are directly proportional? Please explain.	
103	SSER 15-7	SSER Section 15.3.3	The SSER states that "the applicant provided a set of bounding reactor accident source terms as a set of PPE values." Please explain how the the Staff knows that, in fact, the Applicant's source terms are bounding. In this context, does "bounding" simply mean that, by definition, the ultimate reactor accident source terms in the COL must be within the PPE in order to comply with the ESP?	
104	SSER 15-8	SSER Section 15.3.5	The SSER states that the Staff "has verified the design specific source terms the applicant has provided." Please describe what the Staff did to verify these source terms.	
105	SSER 15-9	SSER Table 15.3-1	The SSER states that the Staff intends to include the site-specific X/Q values listed as site characteristics in Appendix A in any ES Table 15.3-1 includes a value for "4 to 30 day LPZ." Why is this value not included in Appendix A.3?	

#	Document Page	Document Section	Inquiry	Answer (Including Author, sme, and key documents)															
106	SSER 15-9	SSER Section 15.3.5	The SSER states that the Applicant calculated the radiological consequences at the EAB and LBZ boundary based on the ESBWR source term and X/Qs and that the results obtained by the Applicant are below the TEDE doses specified in 10 CFR § 50.34(a)(1). Please describe what the Staff did to verify the Applicant's calculations.																
107	SSER 15-9	SSER Table 15.3.-1	<p>Why are the dispersion factors in Table 5-14 in the Draft EIS different from the dispersion factors in Table 15.3-1 in the SSER?</p> <p>Example:</p> <table border="1"> <thead> <tr> <th></th> <th>EIS Table 5-14</th> <th>SSER Table 15.3-1</th> </tr> </thead> <tbody> <tr> <td>0-2 hr. EAB</td> <td>3.3×10^{-5}</td> <td>2.26×10^{-4}</td> </tr> <tr> <td>0-8 hr. EAB</td> <td>2.17×10^{-6}</td> <td>2.05×10^{-5}</td> </tr> <tr> <td>8-24 hr LPZ</td> <td>1.5×10^{-6}</td> <td>1.3×10^{-5}</td> </tr> <tr> <td>1-4 D LPZ</td> <td>1.2×10^{-6}</td> <td>5.58×10^{-6}</td> </tr> </tbody> </table>		EIS Table 5-14	SSER Table 15.3-1	0-2 hr. EAB	3.3×10^{-5}	2.26×10^{-4}	0-8 hr. EAB	2.17×10^{-6}	2.05×10^{-5}	8-24 hr LPZ	1.5×10^{-6}	1.3×10^{-5}	1-4 D LPZ	1.2×10^{-6}	5.58×10^{-6}	
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General Questions																			
108	Responses to RAIs (one of nine).		Some RAIs posed complex questions that did not always appear to be completely addressed in the response. Two examples are RAI 3.8-9, which addresses the increase in neutron dose from the Gas Cooled Pebble Bed reactor, and E 3.8-16, which requests in-core differences in LWRs and Advanced Reactors with respect to seven cited features. What actions would NRC typically take to obtain the information requested?																
109	General	General	If a plant is built that derives from the current ESP, are there any regulatory repercussions if actual release rates and doses exceed the values approved in the ESP?																
110	General	General	Does NRC regularly check actual routine releases from nuclear plants against the claimed releases in applications or licenses?																

#	Document Page	Document Section	Inquiry	Answer (Including Author, sme, and key documents)
111	SER xiii	SER Exec. Sum.	The Part 52 ESP process is intended to address and resolve site-related issues. The SER serves to identify matters resolved in the Staff's safety review and to identify remaining items to be addressed in a later proceeding (CP, COL, or a design certification proceeding). Many site issues are not resolved because they are related to final design or are simply put off to later licensing actions. Might it be assumed that only those issues resolved in the SER, FEIS, and Commission rulings and decisions will be considered resolved for purposes of future hearings? If this is not the case, how are carryover site-related issues flagged for handling if they are not listed in an action file such as the COL Action Item list?	
112	SER 2-88	SER Section 2.4.4.3	COL Action Item 2.4-6 requires that an Applicant should demonstrate that the UHS reservoirs are designed to satisfy the NRC's regulations. The NRC Staff says that the detailed design of underground UHS reservoirs is not within the scope of ESP review. Is it true that an ESP permits some site work including the possible construction of cooling towers? If so, could this issue and COL Action Item 2-4-7 fall between the cracks?	
113	SER 2-89	SER Section 2.4.4.3	COL Action Item 2.4-7 concerns the adequacy of the remaining liquid volume stored in the UHS. How do you determine what is adequate or are you saying that that determination be made and incorporated into a plan of action?	
114	SSER A-7 to A-9	SSER Section A-2	Why aren't the following Action Items identified for a COL application?	
115			A. Radiation exposures to construction personnel should be reevaluated in light of the specific steam supply system chosen. A projected person-rem exposure of 120 person-rem/yr. gives some likelihood of adverse health effects when projected over the entire construction cycle. <u>See</u> Section 4.9.4 of NUREG 1811.	

#	Document Page	Document Section	Inquiry	Answer (Including Author, sme, and key documents)
			B. The impact of localized fogging on transportation accidents should be evaluated.	
			C. The potential release paths of radioactivity into the environment during normal operation should be established and evaluated.	
			D. The procedures and equipment to be used to maintain tritium releases and concentrations below EPA limits should be defined.	
			E. Specified allowed soil settling rates should be readdressed in light in of subsoil compositions identified for the COL.	
116	SSER viii	SER Exec. Sum.	Appendix A is described as “certain site-related items that an applicant will need to address at the combined license or construction stage” and that “these items . . . are more appropriately addressed at later stages.”	
			A. Legal Question: Does Appendix A run afoul of 10 CFR § 52.39(a)(1), which states that an ESP is final and that thereafter “the Commission may not impose new requirements . . . on the site?” Please provide legal support and analysis.	
			B. Legal Question: How does the quoted provision comport with the Commission’s refusal, when it promulgated the ESP regulations, to condone the issuance of “partial” ESP permits. <u>See</u> 54 Fed Reg. 15372, 15378 n.3 (April 18, 1989) (“the Commission declines to follow the suggestion . . . that partial early site permits be issued.”). By incorporating so many items to be determined later, isn’t the Staff proposing a “partial ESP?”	
			C. Legal Question: How does this provision comport with the Commission’s statement that “[w]here adequate information is not available, early site permits will not be issued?” 54 Fed Reg. at 15378 n.3.	
			D. Legal Question: Are all of these matters unresolved within the meaning of 10 CFR § 52.39(a)(2). If not, why not?	

#	Document Page	Document Section	Inquiry	Answer (Including Author, sme, and key documents)
			E. Legal Question: Will a petition alleging that the site or Applicant is not in compliance with a permit conditions, COL action item, site characteristic, or bounding parameter specified in Appendix A be within the scope and litigable (provided it meets the other criteria of 10 CFR § 2.309(f)(2)) at the COL stage?	

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

In the Matter of)
)
DOMINION NUCLEAR) Docket No. 52-008-ESP
NORTH ANNA, LLC)
)
(Early Site Permit for North Anna ESP Site))

CERTIFICATE OF SERVICE

I hereby certify that copies of the foregoing LB ORDER (ISSUING SAFETY-RELATED QUESTIONS) have been served upon the following persons by U.S. mail, first class, or through NRC internal distribution.

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Dated at Rockville, Maryland,
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