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REQUEST FOR ADDITIONAL INFORMATION

FOR

Virginia Electric and Power Company
Early Site Permit Application
Environmental Report
For North Anna Site

PNNL Project 44427
NRC Project JCN J-3012

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Prepared by Pacific Northwest National Laboratory
Operated for the U.S. Department of Energy
by Battelle Memorial Institute
Richland, Washington

Request for Additional Information for Virginia Electric and Power Company Early Site Permit Application Environmental Report North Anna Site

Socioeconomics

E4.4.2-1 **Section 4.4 of ER (Social and Economic Impacts)** - During the December 8 site visit, a Dominion contractor mentioned that a study had been undertaken (source unknown) on the availability of construction workers for the proposed Units 3 and 4 at North Anna. PNNL would like a copy of the study.

Radiation Protection/Transportation/Fuel Cycle

E3.5-1 **Section 3.5 of ER (Radioactive Waste Management)** - The Applicant made the statement that LWR gaseous and liquid effluents bounded effluent releases from gas-cooled reactor designs. Provide references to support this statement. Has the impact of the multiple modules (reactors) for the gas-cooled reactor designs been considered in this determination?

E3.6.1-1 **Section 3.6.1 of ER (Effluents Containing Chemicals or Biocides)** - Provide projected average and maximum chemical concentrations in the plant effluents and the average and maximum levels of these substances in the receiving waters.

Section 3.8 of ER (Transportation of Radioactive Materials) - The following information is requested to support development of RADTRAN 5 computer code input files to model shipments of advanced reactor irradiated fuels to calculate incident-free exposures and accident risks. To assist in modeling the advanced reactor irradiated fuel and packaging systems, please provide:

E3.8-1 **Radionuclide content of advanced design irradiated fuel.** To help quantify the consequences of accidental releases of radioactive material in transit, provide each irradiated fuel type with a detailed listing of all radionuclides and their inventories (e.g., Ci per MTU or other suitable unit that can be used to calculate the inventories of each radionuclide in advanced reactor irradiated fuel shipments). Explain the technical basis for the data (how the information was obtained) and the accuracy of the data.

E3.8-2 **Detailed information about the advanced fuel designs.** Sufficient information is needed to support a preliminary comparative evaluation of the abilities of the advanced fuel designs to withstand structural and thermal accident conditions relative to current design fuel assemblies.

E3.8-3 **Information about the designs of shipping casks for advanced reactor irradiated fuels.** Provide capacities and dimensions of the shipping casks being modeled. It is assumed that the advanced LWR irradiated fuels would be shipped in casks similar to the current generation. For advanced non-LWR irradiated fuels, information about irradiated fuel handling, fuel behavior regarding failure and release fractions, and shipping cask concepts are needed. Include all references and provide the basis for all assumptions made.

Section 3.8 of ER (Transportation of Radioactive Materials) - The following are some specific questions related to Section 3.8 of the ER:

E3.8-4 Table 3.8-2 (p. 3-3-87) - This table provides data on fission product inventory, actinide inventory, and ^{85}Kr inventory for gas-cooled reactors. What was the source for this information?

E3.8-5 p.3-3-78 (Section 3.8.2.3, second paragraph) - What are the initial core loadings and annual fuel reloadings for the gas-cooled reactor designs (PBMR and GT-MHR)?

E3.8-6 p.3-3-78 (Section 3.8.2.3, 7th paragraph) - The ER specifies that low-level radioactive waste shipments would be less for gas-cooled reactor technologies (i.e., 6-9 shipments annually compared to 46 shipments for the reference LWR). What is the basis (reference) for the smaller waste volumes for gas-cooled reactors? Provide the radionuclide inventory estimates and the basis for the low-level radioactive waste shipments.

E3.8-7 p.3-3-79 (Section 3.8.2.3, first paragraph) - The ER provides an annual value of truck shipments for the reference LWR (110 shipments), the PBMR (18 shipments), and GT-MHR (41 shipments). When adding up unirrradiated fuel shipments, spent fuel shipments, and LLW shipments, we obtained different totals – reference LWR (112 shipments); PBMR (24 shipments); and GT-MHR (58 shipments). Explain the discrepancies and provide the correct information.

E3.8-8 p.3-3-80 (2nd paragraph) - What is the reference for the decay heat estimates for gas-cooled reactor technologies (i.e., 6.36 kW/MTU for GT-MHR and 3.91 kW/MTU for PBMR)?

E3.8-9 p.3-3-81 (first paragraph) - Have any calculations been performed to try to quantify the increase in neutron dose based on the increased actinide activity in the fuel for the gas-cooled reactor technologies?

E3.8-10 p.3-3-81 (last paragraph) - The ER contains a statement that the accident rate for large trucks has steadily declined for more than the past 25 years and is less than half the rate in 1975. What is the basis (reference) for this statement?

E3.8-11 General question - For the light water reactor designs, what is the bounding value for 1) the number of truck shipments of irradiated fuel annually per unit, and 2) MTU of spent fuel per truck cask?

E4.5-1 **General** - To adequately evaluate health impacts (i.e., estimated injuries and deaths) from construction, we will need a bounding estimate of the number of construction hours per year and the number of years it will take to complete construction for each unit.

E5.4.2-1 **Section 5.4.2 of ER (Radiation Doses to Member of the Public)** - Provide any occupational dose estimates for the advanced reactor designs and information on which design would have the bounding occupational dose impacts.

E5.4.2-2 **Section 5.4.2 of ER (Radiation Doses to Member of the Public)** - The Applicant used the LAPTAP II computer code to calculate dose estimates to the maximally exposed individual and the population from the liquid effluent pathway. Section 5.4.2 and associated tables provides many of the parameters that were likely used as inputs into the code; however, several parameters were undefined. To complete our evaluation, we need information on the following inputs:

- Shore-width factor
- Population supplied by drinking water
- Dilution factor for water intake locations
- Transit time from discharge location to water supply intake (h)
- Supply rate of drinking water for current water plant (gal/d)
- Average rate of water usage by individuals (gal/d)
- Total shoreline usage time (person-h/y)
- Dilution factor for current shoreline exposure location
- Transit time from release point to current shoreline location
- Total exposure time for swimming for the current usage location (person-h/y)
- Dilution factor for the current swimming usage location
- Transit time from release point to current swimming location
- Total exposure time for boating activities (person-h/y)
- Dilution factor for current boating usage location
- Transit time from release point to current boating location (h)

E5.4.2-3 **Section 5.4.2 of ER (Radiation Doses to Member of the Public)** - The Applicant used the GASPAR II computer code to calculate dose estimates to the maximally exposed individual and the population from the gaseous effluent pathway. Section 5.4.2 and associated tables provide many of the parameters that were likely used as inputs into the code; however, several parameters were undefined. To complete our evaluation, we need information on the following inputs:

- Distance (mi) from site to northeast corner of US

- Fraction of year leafy vegetables are grown
- Fraction of year that milk cows are on pasture
- Fraction of the maximum individual's vegetable intake that is from his own garden
- Fraction of milk-cow feed intake that is from pasture while on pasture
- Average absolute humidity over the growing season
- Average temperature over the growing season
- Fraction of year that goats are on pasture
- Fraction of year that beef cattle are on pasture
- Fraction of beef-cattle intake that is from pasture while on pasture
- Milk production (L/y) by distance and sector
- Meat production (kg/y) by distance and sector

E5.4.3-1 **Section 5.4.3 of ER (Impacts to Man)** - Table 5.4-12 of the ER provides collective dose data within 50 miles of the proposed units. The ER does not provide any discussion on how the collective doses were calculated. Were the LADTAP II and GASPAR II codes used to calculate collective dose?

E5.4.3-2 **Section 5.4.3 of ER (Impacts to Man)** - Provide information on health impacts from the estimated doses to the public.

E5.4.4-1 **Section 5.4.4 of ER (Impacts to Biota Other Than Members of the Public)** - Section 5.4.4.2 of the ER indicated that external ground deposition doses calculated by GASPAR II were increased to account for closer proximity of terrestrial organisms to the ground but the ER did not identify the factor or the basis for it. Provide the factor used and the technical basis for its use.

E5.7-1 **Section 5.7.2.3.1 of ER (Uranium Fuel Cycle Impacts)** - Provide a reference for the discussion on the environmental impacts of the operation of the fuel fabrication facility for a modular high temperature gas reactor.

E5.7-2 **Section 5.7.2.3.2 of ER (Uranium Fuel Cycle Impacts)** - Provide a reference for the statement that centrifuge technology requires less than 10% of the energy needed for the gaseous diffusion process and as such, the environmental impacts associated with the electrical generation would be correspondingly less.

Hydrology

E4.2.2-1 **Section 4.2 of ER (Water Related Impacts)** - Provide the stage-storage relationship for Lake Anna. This is a table of lake storages over the range of feasible lake elevations. Provide a description of the method and data used to construct the stage-storage table. Storages for lake elevations down to at least 219 ft should be included.

E4.2.2-2 **Section 4.2 of ER (Water Related Impacts)** - Based on available county and/or State growth management plans, provide a description of likely upstream land-

use changes and changes in downstream water demand, both in terms of intensity and frequency of low water conditions.

E4.2.2-3 **Section 4.2 of ER (Water Related Impacts)** - Provide topographic maps of land surface elevation below the lake surface.

E4.2.2-4 **Section 4.2 of ER (Water Related Impacts)** - Provide in electronic format all lake physical monitoring data (including velocity) in both the lake and WHTF.

E4.2.2-5 **Section 4.2 of ER (Water Related Impacts)** - Provide a description of the quality assurance protocol followed in the lake modeling analyses.