LeeRAIsPEm Resource

From: Hughes, Brian
Sent: Thursday, July 16, 2009 2:41 PM
To: LeeRAIsPEm Resource
Subject: LEE-RAI-LTR-073.doc
Attachments: LEE-RAI-LTR-073.doc

Hearing Identifier: Lee_COL_RAI
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Sent Date: 7/16/2009 2:40:58 PM
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From: Hughes, Brian

Created By: Brian.Hughes@nrc.gov

Recipients:
"LeeRAIsPEm Resource" <LeeRAIsPEm.Resource@nrc.gov>
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July 17, 2009

Mr. Peter S. Hastings, P.E.
Licensing Manager, Nuclear Plant Development
Duke Energy
526 South Church Street
Charlotte, NC 28201-1006

SUBJECT: REQUEST FOR ADDITIONAL INFORMATION LETTER NO. 073 RELATED TO SRP SECTION: 02.04.12 - GROUNDWATER FOR THE WILLIAM STATES LEE III UNITS AND 2 COMBINED LICENSE APPLICATION

Dear Mr. Hastings:

By letter dated December 12, 2007, as supplemented by letters dated January 28, 2008, February 6, 2008 and February 8, 2008, Duke Energy submitted its application to the U. S. Nuclear Regulatory Commission (NRC) for a combined license (COL) for two AP1000 advance passive pressurized water reactors pursuant to 10 CFR Part 52. The NRC staff is performing a detailed review of this application to enable the staff to reach a conclusion on the safety of the proposed application.

The NRC staff has identified that additional information is needed to continue portions of the review. The staff's request for additional information (RAI) is contained in the enclosure to this letter.

To support the review schedule, you are requested to respond within 30 days of the date of this letter. If changes are needed to the final safety analysis report, the staff requests that the RAI response include the proposed wording changes.

If you have any questions or comments concerning this matter, you may contact me at 301-415-6582.

Sincerely,

/**RA**/

Brian Hughes, Senior Project Manager
AP1000 Projects Branch 1
Division of New Reactor Licensing
Office of New Reactors

Docket Nos. 52-018
52-019

Enclosure:
Request for Additional Information

CC: see next page

P.Hastings

If you have any questions or comments concerning this matter, you may contact me at 301-415-6582.

Sincerely,

/**RA**/

Brian Hughes, Senior Project Manager
AP1000 Projects Branch 1
Division of New Reactor Licensing
Office of New Reactors

Docket Nos. 52-018
52-019

eRAI Tracking No. 2686

Enclosure:
Request for Additional Information

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DATE	06/23/09	06/24/09	06/01/09	07/16/09

*Approval captured electronically in the electronic RAI system.

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Request for Additional Information No. 2686

7/16//2009

William States Lee III, Units 1 and 2
Duke Energy Carolinas, LLC
Docket No. 52-018 and 52-019
SRP Section: 02.04.13 - Accidental Releases of Radioactive Liquid Effluents in Ground and Surface Waters
Application Section: FSAR Section 2.4.13

QUESTIONS for Hydrologic Engineering Branch (RHEB)

02.04.13-19

In its independent review of alternative pathways, the staff determined that several alternative pathways were not evaluated. The applicant did not evaluate the impact of a failure of the dams associated with make-up ponds A and B (such an event could increase the hydraulic gradient substantially and therefore decrease travel times). The applicant did not evaluate alternative geohydrologic features such as continuous partially weathered rock along all pathways (which would decrease travel times). The applicant did not evaluate the potential for preferential flow paths (e.g., buried pipes, or coarse bedding material beneath them) created by Cherokee construction activities (which would decrease travel times). Because the pathways described above are plausible, the applicant should evaluate each pathway, or justify why each is not plausible and therefore should not be evaluated further.

02.04.13-20

In its review of FSAR Section 2.4.13, the staff noted that the plume dimension did not account for porosity. Using a PWR porosity value of 0.44 (FSAR Revision 0) and assuming the same vertical dimension of 2 m, the plume length and width would have to be 9.81 m to accommodate the leak volume of 22,400 gallons. Because the plume dimension is important to the RESRAD analysis, the applicant should correct the plume dimension for porosity, or justify why such a correction is inappropriate.

02.04.13-21

In its review of FSAR Section 2.4.13, the staff noted that total porosity was lowered and set equal to the effective porosity value of 0.08. Rather than lead to a conservative result, the lowered total porosity value increases the travel time of retarded contaminants in the RESRAD analysis. Because setting the total porosity value lower than it really is results in a less conservative estimate of contaminant travel time, the applicant should repeat the RESRAD analysis using a more appropriately conservative value of total porosity, or justify why the value of 0.08 is conservative for contaminants that sorb to the sediments.

02.04.13-22

In its review of the applicant response to RAI 2.4.13-03, the staff noted the use of the phrase “maximum conservative” value of 1.4E-03 cm/s. This value is the same as the “conservative estimate” described in Section 2.4.12. The staff considers the use of the term “maximum” in this context to potentially be misleading. The applicant should modify the text in the FSAR, or justify why using the term “maximum” is justified.

02.04.13-23

In its review of FSAR Section 2.4.13, the staff noted applicant’s use of the phrase “lowest uncertainty corrected Kd values.” Given that only three samples (one from fill material, two from soil/saprolite) were analyzed, it is highly unlikely that the uncertainty in Kd values can be quantified with confidence. The applicant should explicitly describe the Kd values as mean values minus one standard deviation, or else justify the terminology “lowest uncertainty corrected values.”

02.04.13-24

In its review of FSAR Section 2.4.13, the staff noted that parameters used in RESRAD-OFFSITE effectively yielded a recharge rate of 7.68 in/yr, which is lower than estimates of 10-15 in/yr in FSAR Section 2.4.1.2.4 and 10.7 to 16.0 in/yr in ER Section 2.3.1.1.5. Recharge is used in RESRAD to leach contaminants from the contaminated zone into the groundwater. Because recharge affects the leach rate in the RESRAD analysis, the applicant should choose runoff and evaporation factors for RESRAD that yield conservative estimates of recharge, or justify why the recharge rate used (7.68 in/yr) is conservative.

02.04.13-25

In its review of FSAR Section 2.4.13, the staff noted that there were no measurements of Kd for the PWR material, which is the material considered in the most conservative pathway. Because Kd values are important to the transport of retarded contaminants, the applicant should use Kd values for the PWR material that are measured on site samples or justify why the existing values are conservative.

02.04.13-26

In its review of FSAR Section 2.4.13 and the response to RAI 2.4.13-11, the staff noted that the applicant discussed correcting the DCD concentrations by the factor 0.12/0.25. This correction is recommended by the NRC in BTP 11-6. However, the uncorrected DCD values were used in the RESRAD analysis. The staff noted that the applicant also adjusted concentrations by a factor of 1.01, but no reason was given and a basis for such an adjustment was not found in BTP 11-6. The staff also noted that the Xe-133 concentration in the RAI response was 1.2E-2 uCi/g, whereas the DCD value is 1.2E2 uCi/g. Because it is important to be clear about methodology, the applicant should a) use the 0.12/0.25 corrected concentrations, or justify why not, b) not use the 1.01

correction, or justify why it is needed, and c) confirm the Xe-133 concentration used in the analysis and update the analysis if appropriate.

02.04.13-27

In its review of FSAR Section 2.4.13, the staff noted DCD Table 11.1-2 does not list tritium explicitly but says that the concentration will not exceed 3.5 uCi/g in the design basis coolant. For their RESRAD analysis, the applicant used a tritium concentration of 1.0 uCi/g, which is the activity listed under Realistic Reactor Coolant (DCD Table 11.1-8). Because the RESRAD analysis should be initialized to be consistent with the DCD, the applicant should conduct the RESRAD analysis using only “design basis” concentrations or “realistic” concentrations, or justify why a mix of the two is conservative.

02.04.13-28

In its review of FSAR Section 2.4.13, the staff examined the rationale for using the default reservoir mixing volume in RESRAD-Offsite and determined that it is insufficient. Default values are placeholders only, to be replaced by values representative of the situation being modeled. The choice of a mixing volume should be independently determined using site-specific characteristics. The concentrations of radionuclides in the groundwater just prior to entry into the Broad River may provide the basis for a conservative estimate of exposure without the need to define a mixing volume. An alternative approach would be to define a mixing volume based on site-specific river flow conditions. The applicant should identify and use parameters that can be related to site-specific characteristics, or justify the use of default values.

02.04.13-29

In its review of FSAR Section 2.4.13, the staff examined the method used to initialize the contaminant concentrations in RESRAD. The staff determined that this method was incorrect for two reasons.

First, RESRAD assumes that the initial concentrations are in terms of activity per unit dry weight of soil (pCi/g) rather than per unit volume of water (pCi/cm3). However, the applicant entered values based on the initial source-term concentrations, which are for water, not soil. RESRAD automatically multiplies the quantity entered by the bulk soil density, in this case 1.59g/cm3, to give the total activity per unit volume of soil (pCi/cm3). The total activity is therefore 1.59 times too large.

Second, the applicant defined the dimensions of the contaminated volume in RESRAD so that its volume is the same as that of the fluid released, 22,400 gallons. RESRAD assumes, however, that the contaminated volume contains both soil particles and water, and that the portion occupied by water is defined by the porosity, in this case 0.08. RESRAD thus calculated the concentration in the contaminated zone by placing the total

inventory of radionuclides in the 22,400 gallons of leaked fluid into a water volume that is smaller by a factor of (1/0.08), or 12.5 times.

The result is that the concentration in water in the contaminated volume is too large by a factor of (1.59/0.08), or 19.9 times. The applicant's method of initializing the radionuclide concentrations in RESRAD is very conservative, but it is based on erroneous input values rather than reasoned conservative assumptions. Because conservatism must be based on a reasonable rationale that accounts for system characteristics of the subsurface at the site, the applicant should repeat the RESRAD analysis using a well-defined method for initiating reasonable and appropriate contaminant concentrations, or provide a more defensible justification for the approach used in the FSAR.