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Your ref:
Our ref: LTR-RAC-11-27
April 8, 2011

SUBJECT: REPLY TO REQUEST FOR ADDITIONAL INFORMATION
REFERENCE: TAC L33069

Mr. Ryder:

Westinghouse Electric Company LLC (Westinghouse) herein provides a response to your letter of March 10, 2011. The request for additional information pertains to a Westinghouse amendment request for the Columbia Plant License Application. Enclosed please find the detailed responses to the information requested.

Should you have any further questions or require additional information, please contact me at (803) 647-2045, or the Nuclear Criticality Safety Engineering Manager, Carl Snyder at (803) 647-3550.

Sincerely,

Gerard F. Couture Manager
Licensing & Regulatory Programs
Columbia Fuel Fabrication Facility
(License SNM-1107, Docket 70-1151)

NM5501

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Enclosure A

1. In interpreting the commitment in Section 1.1.6.22 of the License Amendment, are the sentences in parenthesis to be interpreted the same as the sentences parenthesis.

   Yes, the parentheses were only included as that was the format and context provided when this wording was previously approved by NRC [August 20, 2007]. If necessary for clarity, Westinghouse does not object to resubmitting with the () removed.

2. Provide an example of how "an external event for which the frequency of occurrence can conservatively be estimated as less than once in a million years," will be used to demonstrate incredibility in a Criticality Safety Evaluation (CSE).

   The Lake Murray Dam, confining the 50,000-acre Lake Murray, is on the Saluda River feeding the Congaree River, upstream of the CFFF. Based on an evaluation by SCE&G, total failure of the Lake Murray Dam could result in a peak flood level of about 154 feet (above MSL) at the CFFF site; overtopping failure of the dam could result in a peak flood level of 169 feet (above MSL). Failure of the Lake Murray Dam would result in substantial flooding of the Columbia area and of the CFFF site. Because of the vulnerability of the original Lake Murray Dam (which is an earthen dam) to earthquake-induced failure, SCE&G has completed a secondary containment dam. The secondary containment dam is designed to withstand an earthquake the size of the 1886 Charleston earthquake which measured a maximum Moment Magnitude (M_w) 7.56. Based on information obtained from the US Geological Survey, an earthquake with a moment magnitude greater than 7.5 in the Lake Murray Dam area has a probability of occurrence less than 10^{-6}. It can be stated confidently, therefore, that a criticality accident from a seismic event large enough to catastrophically fail the Lake Murray Dam system is not a credible event.

3. Provide an example of how "a process deviation that consists of a sequence of many unlikely upsets, including human actions or errors for which there is no reason or motive (In determining that there is no reason for such actions, a wide range of possible motives, short of intent to cause harm, must be considered. Necessarily, no such sequence of events can have ever actually happened in any fuel cycle facility)," will be used to demonstrate incredibility in a CSE.

   An example is the stacking of pellet trays at the fuel rod loading station. The transfer of pellets from a pellet tray to the fuel tube takes place one tray at a time. The width of the rod loading table allows the placement of a single tray on the alignment poly blocks. There is no production incentive to stack trays as this would prevent the pellets from being raked onto the heater section or vibratory feed section of the loading station. Stacking of the pellet trays is also a product quality issue in regard to potential pellet damage. Calculations demonstrate that a minimum of ten stacked pellet trays (two stacks of five each) with full reflection on five sides of the array, and accumulation of moderator to the top of the pellets is needed for the upper subcritical limit to be exceeded. In order to allow loading and unloading, the pellet trays are completely open on one end of the rows and partially enclosed on the other, therefore, accumulation of moderator in the trays is not possible for any credible water source in the area. Full density 12" water reflection of the stacked trays on five sides (flooding) is not possible at the rod loading station as it is >30" above floor level, completely open for draining where the tray is positioned for loading, and close proximity of the operators on more than three sides of the tray stack is not possible due to the size of the table. Therefore, criticality from stacking of trays at the loading station in a non-favorable configuration with sufficient moderation for the system reactivity to exceed the acceptance criteria requires multiple unlikely upsets and is considered incredible.

4. Provide an example of how "process deviations for which there is a convincing argument, given physical laws, that they are not possible or are unquestionably extremely unlikely (The validity of the argument must not depend on any feature of the design or materials controlled by the facility's system of SSCs [safety significant controls] or management measures)," will be used to demonstrate incredibility in a CSE.

An example of an incredible scenario based on this argument is a large scale fire in fuel rod transfer caskets. Two potential configuration scenarios for the caskets could result from a large scale fire. Either the casket retains its shape and the interior contents are rearranged due to melting of the spacers, or the casket melts, and the contents are no longer constrained. Calculations demonstrate that the system reactivity for an infinite array of loaded caskets does not exceed any license limit. The models investigate optimal spacing for the rods. Melting of the spacers and subsequent rearrangement of the rods within the caskets cannot produce a more reactive system. For the case where the casket melts, the spacers would also melt, and there are no credible means available to configure a system more reactive than the infinite planar array of optimally pitched, concrete and water reflected system modeled. Therefore, this is not a credible criticality scenario because a large scale fire cannot cause a criticality. The argument does not depend on the design or materials of the transfer caskets.

5. Provide an example of how the definition in the License Application Section 1.1.6.38, "unlikely event" will be used at the working level and why the definition is different from the definition on Page 7-15 of your ISA Handbook.

An unlikely event is an event that is not anticipated to occur during normal operations. It is considered a credible abnormal event and therefore requires double contingency. An example is the double contingency argument for improper mop bucket design. The first contingency credits the design of the mop buckets as a passive engineered control. Given the conservative approximation of this design in the analyses, this control is judged to be unlikely to fail sufficiently to support a criticality. The second contingency credits two explicit, administrative verifications of the mop bucket design before it is placed into service, as well as two post-installation inspection requirements. Because of the robustness of the configuration control and procurement programs, it is judged that failure of these controls sufficient to accept a less conservative mop bucket design is unlikely.

The currently approved license application definition is a plain language definition that is synonymous, consistent and equivalent to the definition provided in terms of Overall Likelihood Index (OLI) on page 7-15 of the ISA handbook and the approved license application page 74 Table 4.4. Non analytical personnel tend to comprehend the concepts outlined for compliance with Part 70 better from the plain language description. Technical staff who develop, review and approve safety basis documents used to demonstrate compliance will tend to utilize the OLI basis. They are functionally equivalent. NRC has previously approved the definition of Unlikely which is contained in and was approved by the NRC in the SNM-1107 license application [ML072180276] and also in the ISA Summary approval [August 20, 2007] with the accompanying Technical Evaluation Report concluding on page 39 that the Westinghouse definition is in compliance with 70.61.

6. Provide an example of "human actions or errors for which there is no motive", and how this would be used at the working level.

As stated in the response to Item 3, an example is the stacking of pellet trays at the fuel rod loading station. There is no production incentive or other motive to stack trays at the loading station. This would prevent the pellets from being raked onto the heater section or vibratory feed section of the loading station. Stacking of the pellet trays is also a product quality issue in regard to potential pellet damage. Additionally, there is no decrease in workload or any other benefit to the operator. The response to Item 3 describes how this is considered in an incredible scenario.

7. Provide a definition of "unquestionably extremely unlikely." and an example of how this would be used at the working level.

   The use of "unquestionably extremely unlikely" is the same as the source document, NUREG-1520 March 2002. The implication in 10 CFR 70.61 is that events that are not credible may be neglected. For this to be acceptable on a risk basis, unless the event is impossible, it must be of negligible likelihood. Negligible likelihood means sufficiently low that, considering the consequences, the addition to total risk is small. Note that consideration must thus be given to how many such events have, in fact, been neglected. An applicant may demonstrate, by quantitative reasoning that a particular event is of negligible frequency. Such a demonstration must be convincing despite the absence of designated IROFS. No specific example that best exhibits the use of this "or" statement for the revised NCSIP-II program has been approved to date.

8. Clarify if these three "sets of qualities" are the only sets that will be used to define an event as incredible.

   One or a combination of these sets of criteria is clearly defined in the License Application as the only definition. The proposed wording for credible in the license application states that an event is credible if it "does not satisfy the definition of incredible".

9. Will controls, either Items Relied on for Safety (IROFS) or safety significant controls (SSCs), be placed on incredible events, as mentioned in NCS-017?

   Incredible scenarios may contain administrative safety significant controls. The ISA will classify these controls as SSCs unless the controls are also designated as IROFS in credible scenarios.

10. Provide a definition of "design features" as used in NCS-017.

    The design features of a system are the specific attributes that are credited with a passive design feature. For example, for a polypak cart, the cart might be listed as a passive IROFS with only the spacer hoop credited as a design feature. Therefore, changing other attributes of the cart that do not affect that design feature would be acceptable.

11. Provide an example of "some design features of the system [that] may be implicitly credited in incredibility determinations," as mentioned in NCS-017.

    Specifically, if a CSE adequately demonstrates double contingency for the design of a system, subsequent incredible scenarios based on administrative controls are acceptable. For example, consider the revised polypak rack CSE which includes a credible scenario with the rack design as the primary contingency and several administrative verifications of the design as the secondary contingency. Subsequently, there is an incredible scenario for inadvertent loading of larger sized polypaks in the rack. The incredibility argument states that larger polypaks are prohibited by an administrative SSC, and the supporting calculations demonstrate that up to sixteen such polypaks in the rack remain sufficiently subcritical. Therefore, criticality is judged to be incredible based on the multiple, unlikely failures of that administrative control that would be required (i.e., "many unlikely human actions or errors for which there is no reason or motive"). The design of the rack (an engineered IROFS) is only implicitly credited in the incredible scenario, but this is acceptable because the rack design is itself doubly contingent.