Mitman, Jeffrey

From: Khanna, Meena INRR
Sent: Thursday, December 16, 2010 6:31 PM
To: Mitman, Jeffrey INRR
Subject: RE: OFI Concerns - ~~OUO - Sensitive Information - Do Not Disclose~~

thanks Jeff

From: Mitman, Jeffrey
Sent: Thursday, December 16, 2010 6:19 PM
To: Khanna, Meena
Cc: Rodriguez, Veronica
Subject: FW: OFI Concerns - ~~OUO - Sensitive Information - Do Not Disclose~~

Meena, here is my email to Veronica which is the basis for my talk with her and Mark last week. I've also talked with Veronica and she is ok with sending it on to you.

Jeff

From: Mitman, Jeffrey INRR
Sent: Thursday, December 09, 2010 4:08 PM
To: Rodriguez, Veronica
Subject: OFI Concerns - ~~OUO - Sensitive Information - Do Not Dislose~~
Importance: High

My concerns with the draft memo titled "Supplement to Technical basis for Allowing Oconee Nuclear Station to Remain in Operation through November 2011, Associated with the External Flooding Issue" are described below.

- Based on the limited description of the interim compensatory measures (ICM) documented in the NRC CAL dated 06-22-2010 coupled with the fact that the final changes to the site have not yet been identified, if Jocassee fails, Oconee currently has no defense in depth against a Jocassee Dam failure.

  A failure of the Jocassee dam will cause a failure of all onsite and offsite power sources, all ECCS and all balance of plant equipment that is capable of cooling the cores. The ICMs will not prevent these failures. The only system with the possibility of flood survival is the SSF. The Duke inundation analysis indicates that the 7.5 wall protecting the SSF will be overtopped. If the SSF is not inundated, Duke calculates that it has a failure probability of 27%. The ICMs do not protect the SSF. Duke has indicated that under this scenario the SSF will fail and all three units will simultaneously progress to core damage five hours after loss of core cooling. However, Duke also indicates that the flood waters will take approximately five hours to recede. Duke also indicates that 59 to 68 hours after dam failure all three containments will fail. Among other functions, the ICMs do attempt to prevent containment failure.

  Oconee lacks defense in depth because: 1) No balance between prevention of core damage, containment failure and consequence mitigation is maintained. 2) Prevention of consequences hinges on an over-reliance on programmatic activities (i.e., ICMs) to compensate for weaknesses in plant design. 3) There is little system redundancy (Duke has supplied two "B.5.b type" pumps as part of the ICM strategy), no independence, or diversity of the systems to deal with the inundation. The limited

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capability is not commensurate with the expected frequency of 1E-4 per year (the only CDF calculation of record), the consequences of the challenge (loss of all mitigation capability) and the high uncertainty on the event frequency and the site damage caused by the flood. 4) The flood leads to a common cause failure of all permanently installed mitigation equipment and the ICMs introduce a new common cause failure mode via its complete reliance on plant personnel. 5) Independence of barriers does not exist as core damage will occur, the RCS is anticipated to fail and the containment is potentially saved only by the ICMs. 6) Defenses against human errors are not preserved as the only line of defense completely rests on operator actions.

- The inundation studies performed to date are not bounding as they have not looked at Jocassee or Keowee Reservoir levels above full pond (i.e., 1110 and 800 feet MSL respectively).

In a letter (ML0905707790 dated 04/30/2009) NRC instructed Duke during its inundation sensitivity analysis to vary reservoir levels as reservoir level is recognized as a key flooding variable input. Sensitivity analysis has not been performed on this parameter as all analysis was performed with a Jocassee Reservoir level of 1110 ft. and a Keowee level of 800 ft.

Duke analysis of the probable maximum precipitation (PMP) event at the Jocassee Reservoir indicates that water level will reach approximately 1122 ft MSL. Analysis conducted by APOB indicates that a storm of 40% of PMP with successful operation of the Jocassee Dam spillways and turbines will result in a level of 1111 ft. MSL. If the spillways or turbines fail, likely consequences of large storms, reservoir levels will be higher. It can be argued that the simultaneous independent random failure of the Jocassee Dam under the unlikely scenario of a very large storm is not credible. However, as the reservoir has never been above 1110 ft. the dam has never experienced loading at these reservoir levels. Thus, the dam's performance under these conditions is unknown and the independence argument is questionable.

If a substantial combination of spillways and turbines fail during a storm of a large fraction of the PMP, Jocassee Dam could be overtopped.

All of these scenarios will put more stored volume behind the Jocassee Dam and if it fails under these circumstances the flood height can be assumed higher at ONS then currently analyzed.

- The consequences analysis performed to date is incomplete. The inundation analysis performed determined water depths and velocities across the Oconee site. However, only water depth at the SSF has been addressed.

The March 2009 HDR one-dimensional analysis indicates that the maximum flow across the Keowee dam is approximately 3.2 million cubic feet per second (cfs) while the maximum flow across the intake canal dike is approximately 0.5 million cfs. As a point of reference the average flow in the Mississippi River at New Orleans is 0.6 million cfs. The subsequent two-dimensional analysis gives similar results. The velocity and the subsequent effects of this water to the structures, systems and components have not been addressed.

For example, ONS UFSAR Revision 18 in the section on internal flooding (Section 3.4.1.1.1) states that the wall separating the Turbine and Auxiliary Buildings (the "N" line) "is capable of withstanding a flood to a depth of 20 ft. above elevation 775 + 0." Under a failure of the Jocassee Dam, water is currently analyzed to be at approximately a maximum level of 814 ft MSL at the SSF. Will this wall fail? If it does what are the consequences?

I reviewed the February 2009 draft "E.M. 5.3 – Evaluations by Station Management in the TSC – Beyond Design Basis Mitigation Strategies for Jocassee Dam Failure." This strategy relies on a "B.5.b pump' to supply water into fire hydrants to supply water to the auxiliary feedwater system for core cooling. The consequences of the flood volumes and velocities on the functionality of this strategy have not been addressed.

Finally, a flood of this magnitude will move significant amounts of earth and debris onto and away from the ONS. The consequences of this movement have not been addressed.

It should be remembered that there are three access roads to the site. All three roads cross bridges near the site. None of the bridges can be expected to survive a Jocassee Dam failure. All recovery actions will have to be performed without land access to the site.

- In the NRC CAL dated 06/22/2010, Duke was required to "submit to by November 30, 2010 a list of all modifications necessary to adequately mitigate the inundation, and shall make all necessary modifications by November 30, 2011." To my knowledge, the list of modifications has not yet been submitted. I doubt that the modifications will be completed by November 2011.

Jeff Mitman

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