SUGGESTED DISCUSSION ITEMS [AS MODIFIED DURING THE MEETING]

LARGE BREAK LOSS-OF-COOLANT-ACCIDENT SUBMITTAL

SHEARON HARRIS NUCLEAR POWER PLANT, UNIT NO. 1

PROGRESS ENERGY

DOCKET NO. 50-400

1. The submitted ECCS evaluation is not clear as it does not appear to consider the droplet shattering model separate from the fuel relocation study. See, for instance, Figure 6-17.

   a. Please characterize the impact of enabling the droplet shattering model without modeling the fuel relocation.

   b. Similarly, please show the sensitivity of the fuel relocation model study to fuel relocation packing factor. Consideration should be made to include a range of packing factors that is more inclusive of the available data, i.e., 30-80 percent. It would be beneficial if this sensitivity is shown using the Shearon Harris Nuclear Plant (SHP) limiting-peak clad temperature (PCT) case, and using an evaluation model variant that does not include the droplet shattering enhancement.

2. Address whether droplet shattering is calculated on all flow blockage (non-vertical) surfaces in the S-RELAP5 calculation. If not, provide the flow blockage surfaces which are assumed to cause droplet shattering.

3. Page 122 of ANP-3011(P), “Harris Nuclear Plant Unit 1Realistic Large Break LOCA Analysis” states,

   > In the present model, the rupture blockage ratio [which is correlated to the number of droplets to yield a maximum atomization factor], Є, is taken from the swelling and rupture correlation.

   a. Address whether droplet shattering is calculated only against the hot pin rupture, or the additional flow blockage areas (i.e., balloon/burst regions, spacer grids, etc.) assumed to be present upstream of the hot pin rupture location, and address implementation of these models in S-RELPA5.

   b. If the additional flow blockage areas are not based on pre-transient core geometry, discuss how the locations and sizes of flow blockages are distributed.

4. On page 123 of ANP-3011(P), it is stated,

   > It can be seen that the code predicted the peak cladding temperature variation well.

   The data is so tightly clustered that the degree of agreement is difficult to ascertain. Please tabulate the data to provide a more quantitative indication. Address how well the S-RELAP5 modification predicted the data.

5. Comparative data demonstrate the global effects of the droplet shattering phenomena; however, the correlation as implemented discriminates between large and small droplets and the behavioral differences between the two. Validate droplet size distribution as implemented in model. Explain how the Sugimoto/Murao correlation applies to the scenario in which it is applied.

6. Explain how droplet shattering model incorporates the following droplet-dependent heat transfer effects:
   a. Inter-phase heat transfer;
   b. Fluid-structural interactions including cladding, balloon, and spacer heat transfer to coolant; and
   c. Validate heat transfer modeling for these separate effects.