Docket

Mr. Tom Green
General Electric Nuclear Energy
175 Curtner Avenue (MC 182)
San Jose, CA 95125

October 26, 1999

SUBJECT: REQUEST FOR ADDITIONAL INFORMATION

Dear Mr. Green:

On June 15, 1999, the NRC staff met with General Electric Company to discuss its review of the GE Licensing Topical Report NEDC-32721P, "Application Methodology for GE Stacked Disk ECCS Suction Strainer," dated November 1997. Following the meeting, GE submitted supplemental information by letter dated August 3, 1999. The staff has reviewed the supplemental information and has determined that the enclosed questions must be addressed for the staff to complete its review. These questions were discussed with your staff in a phone call on October 20, 1999, and it was agreed that responses would be provided within 30 days from the receipt of this letter.

Should you have any questions, please contact me at (301) 415-3016.

Sincerely,
ORIGNAL SIGNED BY:
Robert M. Pulsifer, Project Manager, Section 2
Project Directorate III
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Project No. 691

Enclosure: Request for Additional Information

cc w/encl: See next page

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GE Nuclear Energy

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REQUEST FOR ADDITIONAL INFORMATION

GE LICENSING TOPICAL REPORT NEDC-32721P

"APPLICATION METHODOLOGY FOR GE STACKED DISK ECCS SUCTION STRAINER"

The following questions refer to GE's August 3, 1999, letter to the NRC.

1. In Attachment 2, figure 5 shows the first bending moment frequencies for various values of θ (theta) versus η (eta). In accounting for the effect of rotary inertia on the added (hydrodynamic) mass in the GE hammer or pluck tests, what were the values of the quantities η (eta), θ (theta), and the fourth power correction term (1 - 1.04*eta - 1.4*theta)**4 in equation 12?

   Also provide a value for the correction parameter ε (epsilon), explain how it was obtained, and provide an error bar for its value.

2. In the model of Attachment 4 for the Keulegan-Carpenter number (K) effect, the force acting on the solid parts of the porous shell is computed by integrating the pressure difference across the shell. The pressure difference is obtained by applying the integral form of the momentum theorem in the direction normal to the surface, that is, the calculation neglects forces acting tangentially to the (nominal) strainer boundary.

   An effective shear force is exerted on a strainer due to the fact that when fluid is sucked in or out through the holes, it carries a tangential as well as a normal component of momentum, and the tangential momentum flux differs from one side of the hole to the other because of flow separation (jetting) on the downstream side. An effective tangential stress results on the body surface, and can be computed by applying the tangential component of the integral momentum theorem. This shear stress is much higher on a GE strainer (relative to the normal stress) than on the porous sphere, since most of a strainer's perforated surface is parallel to the bulk flow when the bulk flow vector is transverse to the strainer's axis. An order-of-magnitude estimate appears to suggest that the shear force may be of the same order as the pressure force.

   Please explain why GE did not include the shear force.

3. Attachment 4 presents computations for strainers of the ratio $c_m(K)/c_m(0)$, where $c_m(K)$ is the added mass computed at Keulegan-Carpenter number K and $c_m(0)$ is the value computed at K=0.

   Provide the value(s) of $c_m(0)$ for the strainer computations at K=0.

4. Is c_m in Attachment 4 (e.g. in Figs 4-6 and 9-10) the same quantity as c_m in Attachment 2?

5. In applying the theory of Attachment 4 to the experimental data for the porous sphere, what was assumed about the sphere's solid-structure displacement volume V_s (the quantity that appears in Equation (2) of Attachment 2)?

6. In Attachment 2, page 1, you describe Equation 2 as "reasonably well known". Is there an uncertainty associated with this expression? If yes, does it affect the acceleration drag volume (ADV) margin as defined by Equation 18?

7. Please provide derivation of Equations 13 and 16 in Attachment 2.

8. The following questions refer to Attachment 2. Following the logic of Equation17, Equation 18 may be written as:

   Margin ADV = (ADVdesign - ADVmin)/ADVmin

   a. Is this correct?

      If yes, then if ADV design is calculated from Equation 2, and ADVmin=Vs/Vcir, the margin ADV is given by Mh/(rho water)/Vs.

   b. Is this correct? If yes, is this equivalent to Equation 18.?

9. Starting with the test data, can you provide some numerical examples leading to Keulegan-Carpenter numbers given in Attachment 3, Tables 1 and 2?

10. Dividing a Keulegan-Carpenter number based on a hole size (Att. 3, Table 2) by equivalent Keulegan-Carpenter number based on outside diameter (Att. 3 Table 1) should give a constant ratio of D_{out}/D_{hole}. Yet, this ratio varies from 300 (Cooper, CO frequency 10 Hz) to 500 (Arnold, CH frequency 20 Hz). Please explain this discrepancy. What is the actual value of this ratio?

11. Page 7 of Attachment 2 states that 10 percent has been added to the best estimate hydrodynamic mass to account for the uncertainty. What is the basis for this value?

12. What is the reference for the range of accident frequencies quoted on page 1, Attachment 3?