

July 3, 2000

Denwood F. Ross, Jr.
7441 Bee Bee Drive
Rockville, MD 20855

Dear Dr. Ross:

I am replying to your letter to Chairman Meserve dated April 7, 2000, and the subject discussions we had on May 22, 2000, concerning NRC-sponsored thermal-hydraulic research. We recognize your extensive experience in nuclear safety and reviewed your paper with interest. You highlighted several topics, namely:

1. Thermal fatigue,
2. Loss of coolant during transition to shutdown
3. BWR stability,
4. Water hammer,
5. Overcooling transients, and
6. Vortex formation.

In general, we agree that RES should not lose interest in these important areas and intend to consider your suggested topics further. These are important issues from the standpoint of plant design and operation, and while they have been addressed through past research, we will continue to consider them in the context of current programs and new research initiatives, in collaboration with EPRI, international partners and the CSNI.

The topics that you list are reinforced by operating experience and are significant from the standpoint of design and operation. While we have conducted thermal hydraulic work in most of the areas, as discussed below, we also see the need to maintain expertise and to focus new work on resolving these and other evolving issues.

The topics of fatigue, water hammer, and vortices are common to many industrial applications, and have been studied in many forums. With the exception of thermal fatigue, we conducted research and developed guidance for the review of designs for the other areas, e.g., design and operations to prevent water hammer, NUREG/CR-6519, Screening Reactor Steam/Water Piping Systems for Water Hammer. Similarly, vortex formation was the subject of a research program in the 1980's, and insights are considered during the design and review process. The industry, though EPRI, has an initiative on thermal-fatigue effects in metal components, which is responsive to an NRC request for industry leadership and action in this area. The NRC is following this program.

In the early 1990's, the NRC revisited BWR stability issues and developed criteria for the detection and prevention of BWR instability. Nevertheless, the issues continue to be of interest and a research program that is being carried out by JAERI will improve our knowledge of this complex issue. We are attempting to obtain the data to assess a coupled thermal-hydraulic and neutronic code.

We are currently revisiting overcooling transients from the overall perspective of risk, thermal hydraulics, and fracture mechanics to revise the PTS rule to take advantage of improved data on flaw distribution. This work is to update the studies performed in the early 1980s on three plants, one for each PWR vendor. The thermal-hydraulic results are integrated with probabilistic risk assessment and fracture mechanics to provide an overall assessment of the risk of pressurized thermal-hydraulic shock from over-cooling transients. This work is due to be completed in 2002.

Finally, with regard to loss of coolant during transition to shutdown, we continue to make improvements to the TRAC-M and RELAP5 codes, to improve the calculational stability at low pressures with the presence of significant noncondensables, to better predict the outcome of such events. Furthermore, the Commission's March 31, 2000 SRM on SECY-00-007 approved a limited amount of work, principally to support the development by American Nuclear Society of a PRA Standard.

We appreciate your interest in and insights with respect to these important areas.

Sincerely,

/RA/ T. L. King for

Ashok C. Thadani, Director
Office of Nuclear Regulatory Research

