NUCLEAR ENERGY INSTITUTE

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Mr. Stuart Rubin
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Division of Systems Analysis and Regulatory Effectiveness
Office of Nuclear Regulatory Research
Mail Stop: T-10E32
U.S. Nuclear Regulatory Commission
Washington DC 20555-0001

Dear Mr. Rubin:

We appreciated the opportunity to participate in the January 14, 2004, public workshop and discussions with the NRC staff on functional performance requirements for non-LWR reactor containment buildings. These discussions clearly showed the need for a different approach in the design and licensing of advanced reactor designs, in particular, gas cooled reactors, from the approach used for LWR designs in the past.

Perhaps the most fundamental principle that came up again and again in the workshop is that "containment" in gas cooled reactor designs is an integrated plant-wide function and not a building. The reactor building is one of several fission product barriers providing defense in depth. It is illogical to develop performance requirements for the building without considering the role that it plays in conjunction with the other barriers. We recommend consistent use of terminology, like that used by the staff in the November 19, 2003, advanced reactor regulatory framework workshop, which maintains this distinction between physical structures and the "mechanistic containment concept."

We strongly endorse the concept of functional performance requirements for advanced reactor structures, systems and components (SSC) that implement the "mechanistic containment concept." Applying this concept to gas cooled design reactor buildings leads us to two functional performance requirements specific to the reactor building, namely:

- Provide structural support for certain safety significant SSC and maintenance of core geometry
- Provide structural protection for certain safety significant SSC from internal loads and external hazards

The enclosure to this letter summarizes the industry perspective on these and other potential containment performance requirements discussed in the workshop.

We look forward to further constructive discussions with the staff in the next public meeting on this topic in mid-2004.

Sincerely,

Ronald Simard

## Summary of industry participant comments on potential functional performance requirements and criteria discussed in the workshop

*Containing fission products* and *preventing/mitigating severe core damage accidents.*

These may be appropriate functions for LWR "containment" buildings, but not for gas cooled reactor structures. "Containment" in gas cooled reactor designs is an integrated plant-wide function and not a building. The reactor building is one of several fission product barriers providing defense in depth. It would be illogical to develop performance requirements for the building without considering the role that it plays in conjunction with the other barriers.

In the second area, the term "severe core damage" should not be used, as its meaning for non-LWR designs has not been adequately defined.

These two potential areas should be eliminated. But in the event that a performance requirement is retained specific to the reactor building, it should reflect the mechanistic containment concept. One possibility might be to *maintain defined, monitored pathways for potentially significant fission product releases.*

Further, gas cooled reactor designers should have the option to use a vented structure rather than the type of pressure retaining buildings appropriate to LWR designs. For some designs, early venting of the reactor building under some potential accident scenarios enhances safety by releasing non-condensable gases and depressurizing the building. If small quantities of fission products are released later in the scenario, there is no elevated pressure within the building to force their release to the environment. In some designs, this may also allow for timely operator access to key areas to take additional remedial actions to further reduce the potential for fission product releases from the fuel. These actions may be needed to restore failed barriers, reactivate non-safety cooling or ventilation systems, or take other steps to minimize the potential for elevated temperatures and elevated fuel fission product releases.

*Remove heat during accidents*

The need for a separate performance requirement in this area should be reconsidered. Heat removal is a necessary function, but one provided by a number of systems, structures, and components. In the event that a performance requirement is retained specific to the reactor building, it should specify that the reactor building support, or not interfere with, heat removal rather than perform a heat removal function.

We noted that the staff's workshop slides for this area and the first area listed potential performance requirements where the first item on each slide was, in fact, a measure of performance. But subsequent items on the slides were more like measures of performance capability. It would be more appropriate to keep the performance requirements at a relatively high level, and not prescriptive, consistent with the intent of the advanced reactor regulatory framework. Measures of ability to meet those performance levels would then be addressed at the next level down, for example, in technology-specific regulatory guides.

*Protect safety equipment from natural phenomena, dynamic effects*

This is an appropriate function for the reactor building. But the supporting criteria should be specific to the structural protection offered by the building rather than meeting onsite and offsite dose consequences, a responsibility shared among several systems, structures and components.

*Protect on-site workers from radiation*

This is another area where the need for a performance requirement specific to the reactor building is questionable. The reactor building is one of several design features that help to limit worker exposure. In the event a requirement is proposed in this area, it should focus on normal operating conditions. The potential to expand this to accident conditions seems to be tied to a proposal, under the draft advanced reactor regulatory framework, to set some new dose criteria or risk criteria for workers under severe accident conditions. This raises a fundamental policy question that will have to be brought to the Commission.

*Containment SSC functionality*

The need for singling out the reactor building SSC in a separate performance requirement should be reconsidered. If a requirement is to exist in this area, it simply note that, under the risk informed advanced reactor regulatory framework, all SSC (including those associated with the reactor building) are subject to special treatment requirements commensurate with their safety significance.

*Conclusion*

Applying the mechanistic containment concept, and the reasoning above, leads us to conclude that there are two areas where functional performance requirements are appropriate for non LWR (gas cooled) reactor buildings. They are the functions of providing structural support and structural protection. This is consistent with the design philosophies of the reactor designers. For example, the following points are excerpted from the Framatome ANP workshop presentation.

Required safety functions:

- Provide structural support for reactor vessel, reactor cavity cooling system and major reactor components, for maintenance of core geometry and passive heat removal
- Provide structural protection of reactor vessel, HPB, and safety-related SSCs (to the extent needed to support required safety functions) from loads of internal and external hazards during design basis events

Supportive safety functions which provide margin for offsite requirements and an element of defense-in-depth:

- Limit air ingress to control chemical attack
- Provide protection of all SSCs from loads for internal and external hazards
- Provide additional retention through deposition and other natural phenomena for any fission products released from the HPB
- Provide shielding for workers and prevent excessive direct shine doses offsite