UNITED STATES
NUCLEAR REGULATORY COMMISSION
ADVISORY COMMITTEE ON REACTOR SAFEGUARDS
WASHINGTON, DC 20555 - 0001

ACRSR-2072

April 22, 2004

The Honorable Nils J. Diaz
Chairman
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

SUBJECT: OPTIONS AND RECOMMENDATIONS FOR POLICY ISSUES RELATED TO LICENSING NON-LIGHT WATER REACTOR DESIGNS

Dear Chairman Diaz:

During the 511th meeting of the Advisory Committee on Reactor Safeguards, April 15-17, 2004, we met with representatives of the NRC staff to discuss proposed options and recommendations for policy issues related to licensing non-light water reactor (LWR) designs. We also had the benefit of the documents referenced.

OBSERVATIONS AND RECOMMENDATIONS

1. The Quantitative Health Objectives (QHOs) apply to the site as a whole. The sum of the contributions from each reactor on the site to acute and latent fatalities should be bounded by the QHOs.

2. The Committee has not reached consensus on the approach that should be taken to determine the core damage frequency (CDF) goal. Two views are presented in the discussion below.

DISCUSSION

In a June 26, 2003 Staff Requirements Memorandum (SRM), the Commission provided direction to the staff on two policy issues related to licensing non-LWR designs:

- "The staff should provide further details on the options for, and associated impacts of, requiring that modular reactor designs account for the integrated risk posed by multiple reactors."

- "...The staff should pursue the development of functional performance standards [for non-LWR containment functional performance] and then submit options and recommendations to the Commission."

In our meeting with the staff, we discussed the staff's response to this SRM. The development of functional performance standards is part of the development of a technology-neutral regulatory system. Therefore, in this report, we comment only on the issue of integrated risk. The staff has indicated that it plans to recommend to the Commission an option to treat integrated risk in assessing modular reactor designs as follows:

- "Taking into consideration the integrated effect of risk when assessing accident prevention for modular reactor designs, independent of reactor power level, and

- Taking into consideration the integrated effect of risk when assessing accident mitigation for modular reactor designs in a fashion that allows for consideration of reactor power level."

We agree with the staff that the QHOs are intended to protect the population around a site from the risk due to all reactors and spent fuel storage facilities on that site. Meeting the site QHOs will depend on the site's total number of plants and their design and power levels and the resulting risk will be the sum of risks from all contributors.

The issue of integrated risk has ramifications for the technology-neutral regulatory framework that is being developed by the staff. We understand that the preliminary proposal for this framework is to develop frequency-consequence (F-C) risk goals as a surrogate for the QHOs and to also deal with higher frequency incidents. Once again, an "achieved" F-C value would be a site characteristic and would depend not only on meteorology and population but on the design, number of units, and power levels at the site. For comparison with any goal, the composite F-C risk goals for the site will be required. The staff should keep this in mind in developing the technology-neutral framework.

With respect to the accident prevention (CDF) goal, we understand the staff's option to mean that, for any new modular plant, the CDF goal (e.g., 10^{-4} per reactor year) will be divided by the number of modules to arrive at a goal for each module.

The Committee has two differing views on the approach to determining a CDF goal for modular plants.

One view supports the staff's recommendation. A core damage accident is a very undesirable event even if it involves no adverse health consequences. Consequently, it is unacceptable that one site has a CDF of 10^{-5} per reactor year while another site with 20 modular reactors has a CDF of 20×10^{-5} per reactor year. The risk from and the likelihood of a core damage accident at all sites cannot be precisely equal. However, there is the expectation that they be comparable. The staff's recommendation addresses this expectation.

The alternative view is that CDF is an accident prevention goal and its value should be the same for each reactor at every site. A CDF goal should depend on the total number of reactors nationwide (not the number on a site). Requiring each module to have a CDF value given by the overall CDF goal divided by the number of modules introduces a new Safety Goal concept, a site CDF. Such a concept was never intended to be part of the Safety Goals.

The intent of a CDF goal has always been twofold: (1) to limit the chances of having an accident anywhere in the country over the projected lifetime of the plants, and (2) to serve as a defense-in-depth measure that balances accident prevention and mitigation for any given design. The extension of this concept to a site CDF goal is going far beyond the original intent.

Although the concept of a site CDF goal has some merit, it is fraught with so many troublesome issues that some ACRS members believe it is untenable. Some of these issues are:

- It introduces a new safety goal that likely will supercede the latent fatality Safety Goal.
- It tends to undermine the early site permit concept in that it could severely limit the number of acceptable sites.
- It will redefine the intended appropriate balance between prevention and mitigation for a given design.
- It is at cross purposes with the certification process which certifies a reactor design independent of a site.
- This concept, if adopted, would tend to lead to a lack of regulatory coherence and stability.
- Licensees desiring to use a specific site must choose a reactor design to accommodate the eventual projected maximum number of modules irrespective of the fact that these modules will be added much later in time and actually may never get to the maximum. A licensee would select a large (non-modular) plant that has a relatively high CDF to ensure meeting the site CDF goal rather than having a modular design that has to render each module to such a low CDF that the determination via PRA is suspect and difficult to achieve.
- With a universal CDF limit that is site independent, the population around any site would already have an acceptably low chance of seeing an accident at that site. There is no compelling reason to further limit the CDF value for the site.

Sincerely,

/RA/

Mario V. Bonaca
Chairman

References:

1. Draft SECY Paper (PREDECISIONAL) from William D. Travers, EDO, to the Commissioners, Subject: Response to the June 26, 2003, Staff Requirements Memorandum on Policy Issues Related to Licensing Non-Light Water Reactor Designs, April 2004.
2. Staff Requirements Memorandum (SRM) from Annette L. Vietti-Cook, Secretary, to William D. Travers, EDO, SECY-03-0047, Subject: Policy Issues Related to Licensing Non-Light-Water Reactor Designs, dated June 26, 2004.
3. Report dated December 13, 2002, from George E. Apostolakis, Chairman, ACRS, to Richard A. Meserve, Chairman, NRC, Subject: Draft Commission Paper on Policy Issues Related to Non-Light-Water Reactor Designs.