UNITED STATES
NUCLEAR REGULATORY COMMISSION
ADVISORY COMMITTEE ON REACTOR SAFEGUARDS
WASHINGTON, D. C. 20555

May 19, 1999

Dr. William D. Travers
Executive Director for Operations
U. S. Nuclear Regulatory Commission
Washington, D.C. 20555-0001

Dear Dr. Travers:

SUBJECT: MODIFICATIONS PROPOSED BY THE WESTINGHOUSE OWNERS GROUP TO THE CORE DAMAGE ASSESSMENT GUIDELINES AND POST ACCIDENT SAMPLING SYSTEM REQUIREMENTS

During the 462nd meeting of the Advisory Committee on Reactor Safeguards, May 5-8, 1999, we reviewed the modifications proposed by the Westinghouse Owners Group (WOG) to the Core Damage Assessment Guidelines (CDAG) and the Post Accident Sampling System (PASS) requirements. Our Subcommittee on Severe Accident Management also reviewed this matter on April 30, 1999. During our review, we had the benefit of discussions with representatives of the NRC staff and WOG, and of the documents referenced.

Background

With the promulgation of the "Three Mile Island-2 Requirements," licensees developed the CDAG for assessing the extent of core damage to help guide offsite radiological protective action decisions. The specifications for the PASS are included in NUREG-0737, "Clarification of TMI Action Plan Requirements," and Regulatory Guide 1.97, Revision 3, "Instrumentation for Light-Water-Cooled Nuclear Power Plants to Assess Plant and Environs Conditions During and Following an Accident."

The specifications for the PASS are based substantially on guidelines developed around 1984 by the WOG for its member licensees. These guidelines relied primarily on sampling for radionuclide analysis and on confirming the results using indirect indicators including containment hydrogen concentration, core exit temperatures, reactor vessel level indication, and containment radiation monitoring. The regulatory requirements of the PASS for Westinghouse pressurized water reactors are to determine:

- from the reactor coolant system (RCS): dissolved gases, hydrogen, oxygen, pH, conductivity, chlorides, boron, and specific radionuclides,

- from the containment atmosphere: hydrogen, oxygen, and specific radionuclides, and
- from the containment sumps: pH, chlorides, boron, and specific radionuclides.

The licensees' experience with the PASS, derived from tests and emergency drills, has been that because of delays in acquiring and analyzing radionuclide samples the relevant information is not provided in a timely manner to guide short-term emergency response decisions. In practice, primary reliance is placed on the use of the indirect indicators to infer particular phases of core damage such as cladding damage, onset of significant hydrogen production, fuel overtemperature, and substantial core damage.

Based on this experience, the WOG has made a proposal outlined in its topical report (WCAP-14986-P) that broadly consists of:

1. Eliminating the PASS sampling requirements except for:
   - RCS boron concentration within 8 hours of obtaining a safe, stable state.
   - Containment hydrogen concentration within 30 minutes of core damage.
   - Containment sump pH only if all three of the following exist:
     - brackish water at the plant for cooling,
     - no passive pH control,
     - a single barrier only between the containment and the heat sink.
2. Retaining the capability to obtain PASS samples for long-term cleanup and recovery planning.
3. Relying primarily on core exit temperatures and containment high-range radiation monitoring as the primary indicators to be applied to the CDAG and using containment hydrogen concentration, reactor vessel level, source monitoring, and hot-leg temperature as secondary, confirmatory information.

Discussion

The WOG proposes to assess core damage based on information obtained from indirect measurements. This information and knowledge derived from calculations of accident progression, hydrogen generation, and fission product release and transport through the RCS and the containment will be used to make the core damage assessment.

We agree with the staff's preliminary review finding that the proposed modifications to the CDAG will provide information on a timely basis to support decisions regarding short-term emergency response.

With regard to the proposed modifications to the PASS requirements, it is our view that the intent of the regulations was to have direct information regarding the disposition of fission products and that this intent could have been easily met by a change to the sample measurements such as the addition of specific gamma monitors at the sampling station. Gamma monitors tuned to krypton and cesium, along with total gamma measurements, are all

that is necessary to infer the full source term on a timely, accurate basis. There would be no need for removing the sample and subjecting it to chemical analysis.

In addition, without pH control, materials generated during a severe accident can lower containment sump water pH. Consequently, to assess the potential for fission-product iodine revolatilization from such sumps, we believe that the sump pH should continue to be measured at all plants.

Recommendations

We recommend that the Commission approve the WOG proposals to modify the CDAG and the PASS requirements, but with the qualification that pH measurements in the sump continue to be required.

The staff should revise the regulatory requirements to make clear that the PASS samples are to be used to assist long-term post-accident decisions and recovery actions.

Sincerely,

Dana A. Powers
Chairman

References:

1. Westinghouse Electric Corporation Topical Report, WCAP-14696, "Westinghouse Owners Group Core Damage Assessment Guidance," July 1996.
2. Westinghouse Electric Corporation Topical Report: WCAP-14986-P, Revision 1, "Westinghouse Owners Group Post Accident Sampling System Requirements: A Technical Basis," August 1998 (Proprietary).
3. U. S. Nuclear Regulatory Commission, Office of Nuclear Reactor Regulation slides provided for ACRS Subcommittee meeting on April 30, 1999, "Background and NRR Staff Preliminary Evaluation of WCAP-14696, Westinghouse Owners Group Core Damage Assessment Guidance," April 19, 1999 (Predecisional).
4. U. S. Nuclear Regulatory Commission, Office of Nuclear Reactor Regulation slides provided for ACRS Subcommittee meeting on April 30, 1999, "Background and NRR Staff Preliminary Evaluation of WCAP-14986-P, Westinghouse Owners Group Post Accident Sampling System Requirements, A Technical Basis," April 21, 1999 (Predecisional).