



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

June 11, 1999

The Honorable Shirley Ann Jackson
Chairman
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555-0001

Dear Chairman Jackson:

SUBJECT: DEVELOPMENT OF A LOW-POWER AND SHUTDOWN RISK ASSESSMENT PROGRAM

During the 463rd meeting of the Advisory Committee on Reactor Safeguards, June 2-4, 1999, we met with the staff to discuss its plans for developing a low-power and shutdown (LPSD) risk assessment program.

In a report dated April 18, 1997, we stated that it was essential to establish a more complete understanding of the full spectrum of risk if the Commission's efforts to adopt risk-informed, performance-based regulation were to be successful. This more complete understanding is now becoming urgent as pivotal decisions are being made on the implementation of risk-informed, performance-based regulation. LPSD operations are not included in most current probabilistic risk assessments (PRAs). Even when they are, the PRA methods are less mature than those for full power operations. We note that risk during LPSD operations has been estimated to be comparable to that of full power operations.

There are two distinct types of applications for LPSD risk assessments:

- (1) risk management of outages, and
- (2) risk-informing regulations and decisionmaking.

The risk management of outages focuses on specific outage configurations and the related current risk status. We believe that the LPSD risk assessment methodologies developed and used by the licensees are valuable tools for risk management during outages, and we are encouraged to see the increased use of such methodologies.

The needs for PRA development for supporting risk informing regulations are different and more difficult to satisfy than those for outage management. The LPSD risk assessment must determine the contribution to a plant's risk that results from all of its future shutdowns. Over a plant's lifetime of shutdowns, there may be hundreds of different plant configurations existing for short times during different modes of operation. Each of these configurations is sufficiently different to require

a separate analysis, including configuration-specific initiating events and operator actions. The configurations in such future shutdowns cannot be known *a priori*, yet, their simulations in the PRA will be necessary. In essence, it appears that shutdown risk assessments will have to rely on representations of likely future shutdown configurations. It will be necessary to adapt PRA methodology to address the unique character of LPSD operations.

To simulate likely future shutdown configurations, we believe that LPSD PRAs will have to be internally capable of selecting the system/component/feature configuration on an industry-wide average time-out-of-service weighted basis. Thus, a substantial new industry-wide database will be needed on unavailability (or altered configuration) frequencies, durations, and correlations.

The development of the capability to make comprehensive, defensible, and quantitative shutdown risk assessments will require significant effort. To improve the PRA methodology, a better understanding of the unique phenomena that can occur during LPSD operations may be required. We recommend that the staff develop a research program along these lines and complete it on an expedited basis.

Sincerely,



Dana A. Powers
Chairman

Reference:

Report dated April 18, 1997, from R. L. Seale, Chairman, ACRS, to Shirley Ann Jackson, Chairman, NRC, Subject: Establishing a Benchmark on Risk During Low-Power and Shutdown Operations.