



UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
ADVISORY COMMITTEE ON REACTOR SAFEGUARDS  
WASHINGTON, D.C. 20555-0001

ACRSR-1877

PDR

March 13, 2000

The Honorable Richard A. Meserve  
Chairman  
U.S. Nuclear Regulatory Commission  
Washington, D.C. 20555-0001

Dear Chairman Meserve:

**SUBJECT: SECY-00-0007, "PROPOSED STAFF PLAN FOR LOW POWER AND SHUTDOWN RISK ANALYSIS RESEARCH TO SUPPORT RISK-INFORMED REGULATORY DECISION MAKING"**

During the 468<sup>th</sup> and 470<sup>th</sup> meetings of the Advisory Committee on Reactor Safeguards, December 2-4, 1999, and March 1-4, 2000, we discussed the NRC staff's Low-Power and Shutdown Risk Perspectives Report. Our Subcommittee on Reliability and Probabilistic Risk Assessment met on November 18, 1999, to discuss this matter. We had the benefit of the documents referenced.

**Conclusions and Recommendations**

1. The staff should evaluate the adequacy of its analytical tools for independently assessing the risk significance of plant configurations during low-power and shutdown (LPSD) operations, especially during plant transitions. If the staff's analytical tools are found to be inadequate or lacking in certain areas, the staff should develop a course of action to address these inadequacies.
2. We agree with the staff's proposed continued support to the American Nuclear Society for developing an industrial standard in the area of LPSD risk assessment.
3. Assessment of human performance during LPSD operations and transition periods should be included in the ATHEANA (A Technique for Human Event Analysis) project. Human actions that initiate abnormal events should be given special attention.

**Discussion**

In reports dated April 18, 1997 and June 11, 1999, we commented on the importance of evaluating the significance of LPSD risks to the development of risk-informed regulations and on the need for the NRC to develop robust methods to assess these risks. In our report dated June 11, 1999, we noted that the analytical tools developed and used by licensees for

RSO1

configuration risk management during outages are valuable. The tools used by licensees include the Outage Risk Assessment Management (ORAM™) software, the Equipment Out Of Service (EOOS™) methodology, Safety Monitor™, and risk monitors. These tools are based on combinations of defense-in-depth strategies and PRA insights. The extent to which PRA is used varies.

Although we are encouraged by the increased use of such methodologies by the licensees, we believe that the staff should have the capability to independently evaluate licensee analyses and activities. It is not apparent that the senior reactor analysts and inspection staff have adequate analytical tools to independently evaluate management of LPSD risk. The staff should evaluate the adequacy of its tools in comparison with those used by the industry. If the staff's analytical tools are found to be inadequate or lacking in certain areas, the staff should develop a course of action to address these inadequacies.

The first phase of the staff's program to evaluate LPSD risk resulted in a report entitled "Low Power and Shutdown Risk: A Perspectives Report." The staff's conclusions in that report substantiated our concern that the risks from LPSD operations can be comparable to those from power operations. The report also confirmed that human errors are a significant contributor to risk during LPSD operations. The report further noted that the LPSD risks were high even after configuration risk management strategies were implemented. In addition, it is not apparent to what extent the risks during plant transition periods were assessed. The NRC-sponsored LPSD risk studies did not investigate risk during plant transitions in detail.

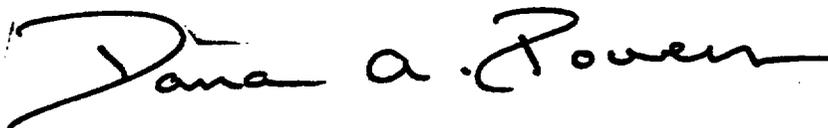
A major conclusion in the report is that human performance issues are especially important during LPSD operations and related transition periods. The operational experience and the expert judgments cited in the report indicate that the error-forcing contexts during LPSD operations may be quite different from those anticipated during power operations. In less familiar situations, operators may have to function in a "knowledge-based" mode. This is contrary to the thinking that evolved after the 1979 accident at Three Mile Island. It is now believed that operator performance should be "rule-based," using procedures, rather than "knowledge-based." Some of the reasons for the differences in error-forcing contexts are unfamiliar plant configurations, unfamiliar indications, and limited procedural guidance.

When human performance during LPSD operations is discussed, the emphasis is usually on recovery actions. As noted in our report on ATHEANA dated December 15, 1999, there is a need to investigate human performance during normal activities that may cause a plant event. This is particularly important for LPSD operations because of the multiplicity of tasks that operators perform, the increased volume of concurrent and competing work activities, and the large number of different plant configurations with equipment out of service. Emphasis should be given to investigating human performance during transitions between plant operational states. We believe that progress in addressing these human performance issues is achievable within the context of the ATHEANA project.

We agree with the staff's proposed continued support for the development of an industrial standard by the American Nuclear Society in the area of LPSD risk assessment.

We look forward to working with the staff as it proceeds with resolving these important issues.

Sincerely,



Dana A. Powers  
Chairman

References:

1. Memorandum dated January 12, 2000, from William D. Travers, Executive Director for Operations, NRC, to the Commissioners, Subject: SECY-00-0007, Proposed Staff Plan for Low Power and Shutdown Risk Analysis Research to Support Risk-Informed Regulatory Decision Making.
2. ACRS report dated June 11, 1999, from Dana A. Powers, Chairman, ACRS, to Shirley Ann Jackson, Chairman, NRC, Subject: Development of a Low-Power and Shutdown Risk Assessment Program.
3. ACRS 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.
4. ACRS letter dated December 15, 1999, from Dana A. Powers, Chairman, ACRS, to William D. Travers, Executive Director for Operations, NRC, Subject: NUREG-1624, Revision 1, "Technical Basis and Implementation Guidelines for a Technique for Human Event Analysis (ATHEANA)."
5. SAND99-1815, Sandia Report, "Summary of Information Presented at an NRC-Sponsored Low-Power Shutdown Public Workshop, April 27, 1999, Rockville, Maryland," July 1999.
6. U. S. Nuclear Regulatory Commission, NUREG/CR-6143, "Evaluation of Potential Severe Accidents During Low Power and Shutdown Operations at Grand Gulf, Unit 1," July 1995.
7. U. S. Nuclear Regulatory Commission, NUREG/CR-6144, "Evaluation of Potential Severe Accidents During Low Power and Shutdown Operations at Surry, Unit 1," October 1995.