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POLICY ISSUE
(Information)

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For: The Commissioners

From: Victor Stello, Jr.
Executive Director for Operations

Subject: STAFF ACTIONS TO REDUCE TESTING AT POWER

Purpose: To inform the Commissioners of staff actions to reduce testing during power operation.

Background: By a staff requirements memorandum dated February 25, 1988, the Commission requested that the staff investigate the pros and cons of continuing to require surveillance and testing of equipment while the plant is at power and inform the Commission of any proposed modifications of the present requirements. In a subsequent June 20, 1988 Commission briefing on the status of the Technical Specifications Improvement Program the staff described some of its ongoing work in this area. Following that briefing the staff received another staff requirements memorandum dated July 6, 1988 requesting that a Commission paper on the results of continuing staff actions to reduce testing during power operation be provided by October 17, 1988.

Discussion: Identifying and eliminating unnecessary testing in general, and at power in particular, has long been an important objective of the staff. Beginning in 1983 with the publishing of NUREG-1024, "Technical Specifications -- Enhancing the Safety Impact," the staff initiated a program to develop analytical methods to support the implementation of changes in required surveillance intervals for testing safety-related equipment. This program was conducted by the Office of Nuclear Regulatory Research and was titled Procedures for Evaluating Technical Specifications (PETS). The effort to actually implement changes to surveillance requirements has been integrated into the current

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Technical Specifications Improvement Program associated with the Interim Commission Policy Statement on Technical Specifications Improvement issued in February 1987.

The early focus of this work has been on extending surveillance intervals for safety-related instrumentation. So far the staff has approved three topical reports which propose reduced surveillance testing of reactor protection system instrumentation, one for Westinghouse-designed pressurized water reactors and two for General Electric-designed boiling water reactors. The staff reviews of six more reports from all four reactor vendors proposing to reduce surveillance testing on reactor protection systems (RPS), engineered safety feature actuation systems (ESFAS), Emergency Core Cooling Systems (ECCS) and BWR isolation instrumentation common to RPS and ECCS are scheduled for completion this fall.

This will complete staff review of all industry proposals currently submitted to the staff for review which cover virtually all on-line testing of safety-related actuation instrumentation for major systems. Overall, when fully implemented, these changes will result in a factor of three reduction in the number of tests of these systems. The work of the PETS program was an important factor in enabling the staff to approve these changes at this time.

Other More Recent Staff Initiatives

In addition to the instrumentation work discussed above, the staff has recently broadened its efforts in this area to include major mechanical equipment and systems and to explore methods to give greater consideration to the effectiveness of maintenance programs in establishing test frequency requirements. This work was started in June of this year when NRR initiated a short-term study (approximately 120 days) of Technical Specifications testing requirements. The focus is on changes that can be implemented in a relatively short period of time and justified primarily on the basis of engineering judgment and existing or new short-term studies of actual failure rate data, as opposed to the more rigorous and time consuming PRA based analysis used to evaluate the changes in testing requirements approved for safety-related instrumentation.

The study began with a comprehensive line-by-line review of all of the testing requirements in the Technical Specifications to

identify potential candidates for change. Specifications which met one or more of the following four criteria were selected for further study:

(1) The surveillance is a burden on plant personnel because the time required is not justified by the safety significance of the requirement.

(2) The surveillance could lead to a plant transient.

(3) The surveillance results in unnecessary wear to equipment.

(4) The surveillance results in exposing plant personnel to radiation levels that are not justified by the safety significance of the requirement.

An important part of the study was staff visits to five nuclear power plants to obtain information from reactor operations, maintenance, engineering, chemistry, planning, and testing personnel on which Technical Specifications surveillance requirements meet one or more of the four criteria used for the study. The sites visited were Crystal River Nuclear Plant, Unit 3; San Onofre Nuclear Generating Station, Units 1, 2, and 3; Catawba Nuclear Station, Units 1 and 2; North Anna Power Station, Units 1 and 2; and La Salle County Station, Units 1 and 2.

The study also made use of the work done as part of the NRC Nuclear Plant Aging Research (NPAR) program (NUREG-1144, Revision 1). The reports on various systems and components prepared under this program gave insight into the rate of failure of specific systems and components and also into the causes of the failures. This information was used to assess whether more testing is being done than could be justified based on the failure rates of equipment.

Findings

The technical work of the study is essentially complete and the results are being documented in a comprehensive report to be issued this month for peer review. Some of the more important general findings are summarized below. Examples of the specific recommendations that are under peer review are listed in the enclosed table. This list is not complete and it is likely that the peer review process will result in refinement to the specific recommendations.

- A large number of surveillance tests are required by the Technical Specifications. For example, the licensee for Limerick provided the following information on the total number of surveillances done on an annual basis. For 1986, with no refueling outage, 14,888 surveillances were performed. For 1987, with a refueling outage, 17,540 surveillances were performed. Approximately 98% of these were required by the Technical Specifications, the other 2% were required by other agreements between the licensee and the NRC.

  A simple [illegible] over 40 tests per day for the year with no [illegible] outage.

- The surv[illegible] required by Technical Specifications which are [illegible] ent causes of reactor trips are:

  RPS Testing [illegible]WR, B[illegible]
  Turbine Valve [illegible]ting (PWR, BWR)
  Control Rod Movement Testing (PWR)
  Main Steam Isolation Valve Surveillance Testing (PWR, BWR)
  Reactor Trip Breaker Testing (PWR)
  Nuclear Excore Instrumentation Testing (PWR)

- The surveillance tests required by Technical Specifications which cause the most significant equipment wear are:

  Auxiliary Feedwater Pump Testing and other safety-related pump testing in which a recirculation line is inadequately sized (PWR)
  Emergency Diesel Generator Testing

- Two programs directed by the Office of Nuclear Regulatory Research (RES) are studying ways to improve the testing of emergency diesel generators. These programs are Generic Issue B-56, "Diesel Reliability" and the Nuclear Plant Aging Research (NPAR) program. Generic Issue B-56 is scheduled for completion in June 1989. It will provide the staff with the capability to review licensee reliability programs to assure that diesel generator reliability meets the goals of the Station Blackout rule, 10 CFR 50.63, with the least adverse effect on the diesel generators.

- The surveillance tests which result in the most significant radiation dose to plant personnel are:

  Containment Purge and Exhaust Isolation Valve Leak Testing (PWRs)
  Waste Gas Storage Tank Surveillance
  Walkdowns to Verify Valve Position
  Snubber Inspections

- Surveillance and inservice testing account for approximately 20% of the annual cumulative radiation dose at a reactor. Maintenance is the largest contributor to cumulative dose.

- Improving preventive maintenance programs is an important element in reducing testing at power. A review of licensee event reports and other data shows that many of the failures found from testing are due to dirt or impurities in fluid systems, bent or broken parts, loose parts, etc., which should have been corrected before they resulted in failure. Surveillance testing can only identify that a piece of equipment is in an inoperable condition so that the time it is inoperable can be limited; preventive maintenance, however, can limit the number of failures that occur. In this way, improved preventive maintenance can make a greater contribution to reactor safety than is being made by surveillance testing.

Implementation Schedule

As noted above, some of the proposed reductions in surveillance testing for RPS and ESFAS instrumentation have already been approved with the remainder scheduled for approval before the end of the year. Individual licensees are expected to begin to submit the license amendment applications necessary to implement these changes early next year. It is possible that they could be fully implemented by the end of 1989. The implementation of these changes will result in a reduction in the frequency of tests which have been identified as being major causes of testing-induced reactor trips and thereby improve safety.

With respect to changes in testing requirements for major mechanical equipment and systems, the staff expects to complete its peer review of specific recommendations by the end of 1988. The actual implementation of the approved changes will be integrated with the implementation of the overall Technical Specifications Improvement Program through individual plant conversions to the new Standard Technical Specifications or individual license amendments. The implementation process and schedule for these types of changes at any specific plant will be based on the most cost effective use of available staff resources recognizing that, while important, they do not have the same safety significance as the changes proposed for RPS and ESFAS instrumentation.

Longer Term Activities

Based on the work that has been done to date the staff is studying the feasibility of a longer term effort with the objective of developing an entirely new approach to establishing test frequencies based on actual failure rate experience and preventive maintenance activities. Conceptually the approach would be to set minimum test intervals and reliability goals for systems and equipment and allow licensees the flexibility to increase these intervals as part of an integrated maintenance and testing program using actual failure rate history to verify that the reliability goals are being met. We understand that a similar concept is being used in Canada today. The ultimate objective would be to eliminate all testing at power for any equipment where acceptable reliability can be achieved without such testing.

A detailed schedule and milestones for this effort have not been worked out. The staff has, however, met with various industry groups and individual utilities that are pursuing programs in this area. In July of this year the staff visited the San Onofre site and met with corporate engineers and site operation and maintenance staff who are developing a program which shares many of the objectives we have established for a reliability-based integrated maintenance and surveillance program. One option for continuing this work, which is under active consideration, would be for the staff to work with an individual licensee or group of licensees to develop a pilot program to serve as a model for all plants.

The staff believes that additional work in this area could be an important first step in developing a fully integrated risk and reliability based approach to Technical Specifications.

Summary Of Conclusions:

In summary, a review of operating events caused by surveillance testing shows that the large majority are caused by problems arising from surveillance on RPS and ESFAS instrumentation. However, the actual number of reactor trips related to such testing is not high. It is currently less than one per plant per year. The staff approval of the industry's proposals to increase the surveillance testing intervals for this instrumentation should, by reducing the test frequency, reduce these types of reactor trips, engineered safety features actuations, and other transients. The staff is prepared to begin to receive license amendment requests to implement these changes immediately with a goal of full implementation by the end of 1989. However, the actual rate at which changes are implemented will depend upon the extent to which individual licensees elect to participate in this voluntary program.

The implementation of the work on Technical Specifications surveillance testing of major mechanical equipment and systems will not have a large effect on reducing transients since trips due to surveillance testing make up only a small fraction of the total number of trips. Implementation of the recommendations of this work, along with the implementation of the reduction in RPS and ESFAS testing proposed in the owners groups topical reports is, however, expected to substantially reduce the number of transients caused by testing. This will result in an increase in reactor safety. The reduction in testing will also increase the performance and availability of safety-related equipment, resulting in greater reactor safety. A reduction in the Technical Specifications-related workload will result in utility technicians and engineers having more time available for other work more important to safety such as preventive maintenance.

And finally, the staff intends to continue to pursue work in developing a fully integrated risk and reliability based approach to technical specifications with the ultimate objective of eliminating all testing at power for any equipment where acceptable reliability can be achieved without such testing.

The staff plans to place a copy of this Information Paper in the Public Document Room. We will continue to keep the Commission informed of the results of this effort as they develop.

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Enclosure:
As stated

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Table
Examples of recommended changes to surveillance requirements undergoing peer review

TS surveillance requirement	Recommended change
REACTIVITY CONTROL SYSTEMS	
Control rod movement testing (PWR)	Change to quarterly from every 31 days
Standby liquid control system pump test monthly (BWR)	Change surveillance test interval (STI) to quarterly
Reactor trip test to verify operability of scram discharge volume vent and drain valves. Required once every 18 months. (BWR)	Delete requirement
INSTRUMENTATION	
In core detector surveillance done weekly on CE plants and 7 days prior to use for B&W plants (PWR)	Change CE surveillance requirement to B&W surveillance requirement.
Turbine overspeed protection: Turbine valves cycled once per 7 days. Direct observation of turbine valve cycling required every 31 days (PWR, BWR)	Change all turbine valve testing to quarterly if turbine vendor agrees.
REACTOR COOLANT SYSTEM	
Leak test RCS isolation valves if in cold shutdown for more than 72 hours if not leak tested in last 9 months (PWR)	Change 72 hours to 7 days.
Check capacity of pressurizer heaters (PWR)	Change frequency to refueling intervals from every 92 days.
Demonstrate emergency power supply to pressurizer heaters is operable (done every 18 months) (PWR)	Retain for those plants where power is not from vital bus. Otherwise delete.

Table (Continued)

TS surveillance requirement	Recommended change
EMERGENCY CORE COOLING SYSTEM	
Verify boron concentration in accumulator after makeup and every 31 days (PWR)	Change to delete boron concentration check if makeup from normal source (RWST).
At least every 31 days, check for air in ECCS (PWR)	Change to after integrated leak rate test (ILRT) or maintenance on system after initial check each cycle.
Do analog channel operational test on accumulator level and pressure instrumentation (PWR)	Change to quarterly from 31 days.
CONTAINMENT	
Check areas entered in containment for loose debris after each entry (PWR)	Change to only once on last entry when successive entries are made.
Hydrogen recombiner (PWR, BWR)	Change surveillance test to refueling intervals. Presently every 6 months.
Test containment spray nozzles for obstructions every 5 years (PWR)	Extend to 10 years but require test at first refueling.
Verify operability of ice condenser doors (PWR)	Change to 18-month refueling outage for all doors rather than 25% each quarter (approved for McGuire, Catawba).
Chemical analysis of concentration of sodium tetraborate and pH of ice (PWR)	Change analysis to refueling outage (presently every 9 months)

Table (Continued)

TS surveillance requirement	Recommended change
PLANT SYSTEMS	
AFW pump surveillance test (PWR)	Change from monthly to quarterly.
Verify that control room temperature is less than specified value (typically greater than 100°F) (PWR, BWR)	Delete or revise requirement.
ELECTRICAL SYSTEMS	
Diesel generator testing (PWR, BWR)	The testing for the diesel generators should be based on reliability concepts. A reliability goal should be selected, and a program established (such as that in NUREG/CR-5078 developed for Generic Issue B-56) which will establish a testing plan to assure that the reliability goal is met.