

U.S. NUCLEAR REGULATORY COMMISSION

REGION I

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Report No. 99-12

Licensee: Vermont Yankee Nuclear Power Corporation

Facility: Vermont Yankee Nuclear Power Station

Location: Vernon, Vermont

Dates: June 28 to August 11, 1999

Inspector: Julian H. Williams, Senior Operations Engineer

Approved by: Richard J. Conte, Chief  
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## EXECUTIVE SUMMARY

Vermont Yankee Nuclear Power Station  
NRC Inspection Report No. 50-271/99-12

This inspection reviewed the maintenance rule periodic evaluation required by 10 CFR 50.65(a)(3). The report covered a one week on-site period and subsequent document review in the King of Prussia office by a regional inspector.

### Maintenance

- The evaluation of risk significant (a)(1) and (a)(2) structures, systems and components (SSCs) that were reviewed by the inspector were done in a satisfactory manner.
- The evaluation of several SSCs including some risk significant SSCs were not documented in the periodic assessment and this indicated a lack of attention to maintenance rule activities.
- Monitoring of equipment performance during the refueling outage from March 21, 1998 to May 31, 1998 was not adequate to assess maintenance effectiveness or to balance reliability and unavailability for a number of risk significant SSCs. This was a violation of NRC requirements. The violation was cited because it was identified by the NRC and could have reasonably been provided by correction actions for a previous violation. Also, the violation was not placed into the corrective action program.

## Report Details

### II. MAINTENANCE

#### **M1 Conduct of Maintenance**

##### **M1.1 Maintenance Rule Periodic Assessment**

###### **a. Inspection Scope (62707)**

The inspector reviewed the periodic evaluation required by paragraph (a)(3) of the maintenance rule. This review included the verification that performance and condition monitoring activities and goals and preventive maintenance activities were evaluated and industry-wide operating experience was used where practical. It also included verification that adjustments were made where necessary to ensure that the objective of preventing failures of structures, systems, and components (SSCs) through maintenance was appropriately balanced against the objective of minimizing unavailability of SSCs due to monitoring or preventive maintenance activities. The inspector verified that the periodic assessment for the period November 1996 through May 1998 (Cycle 19) was completed in a timely manner.

###### **b. Observations and Findings**

The inspector reviewed activities (such as goals setting, performance criteria evaluations, monitoring performance, use of industry operating experience, and corrective actions) associated with selected risk significant (a)(1) and (a)(2) SSCs. For those SSCs reviewed, the activities were satisfactory.

During the review of the periodic assessment the inspector noted that not all in-scope SSCs were included in the assessment. In discussions with the maintenance rule coordinator (MRC), it was determined that some system engineers did not provide inputs to the periodic assessment that were included in Tab 2 (Individual System Assessments). Upon further review by the MRC, he indicated that all SSCs were included in the periodic assessment but the documentation was weak or missing. In several places in the assessment, reference is made to the SSC evaluations in Tab 2 for the (a)(3) required assessments. However, the following systems were not included in Tab 2:

- Building and Structures
- Circulating Water
- Hoists
- RHR Service Water
- Stator Cooling
- Seal Oil
- Service Water
- Main Turbine Generator
- Turbine Lube Oil

After additional information was supplied, the inspector determined that the required periodic assessment could have been completed for the SSCs missing from Tab 2. The inspector determined that the periodic assessment indicated a lack of attention to detail in maintenance rule activities.

10 CFR 50.65 (a)(3) states that adjustments shall be made where necessary to ensure that the objective of preventative failures of SSCs through maintenance is appropriately balanced against the objective of minimizing unavailability of SSCs due to monitoring or preventative maintenance. The inspector reviewed the balancing of reliability and unavailability of risk significant SSCs. Balancing for "at power conditions" was completed for those SSCs reviewed. Balancing of reliability and unavailability during the refuel outage was not done and is discussed below.

The Outage Performance Review dated 11/19/98 was part of the periodic assessment and addressed SSC performance during the outage. Unavailability was defined in the Vermont Yankee Maintenance Rule program as "the period of time, during the monitoring period, that a SSC is not capable of performing its intended function when the intended function is required or may be demanded as a fraction of the total time (hours) during the monitoring period". Unavailability monitoring for risk significant SSCs was accomplished through a review of outage performance. Monitoring was against the following key plant safety functions;

- decay heat removal
- reactivity control
- coolant inventory control
- containment availability
- AC and DC electrical power

Monitoring these key safety functions is important for managing plant risk during the outage but this practice does not monitor the effectiveness of maintenance on specific SSCs nor does it allow a meaningful balancing of reliability and unavailability. The inspector noted that the maintenance rule baseline inspection (MRBI) found that risk significant SSCs were not monitored for unavailability during a previous refuel outage and the MRBI cited this practice as a violation of 10 CFR 50.65(a)(2). Vermont Yankee's response to the violation was to revise Guideline No. 9, "SSC Performance Monitoring," to assess the ability to meet minimum daily planning states for key plant safety functions. This was considered by VY a measure of unavailability of key plant systems against the detailed outage plan and was sufficient to meet the requirements of 10 CFR 50.65 (a)(2). However, the NRC cautioned VY that failure to monitor unavailability during a refuel outage could result in ineffective periodic balancing of unavailability and reliability as required by 10 CFR 50.65(a)(3).

The inspector reviewed the "Outage Performance Review" (Tab 8), which was part of the periodic assessment covering the refueling outage. There were many maintenance activities during this period that were not effectively integrated in the individual system assessments performed by the responsible system engineers. Performance measures for risk significant systems worked on during the outage appeared to be estimates for the time to complete the work and had little, if any, safety or PRA basis. In many cases, the Outage Performance Review did not appear to capture all of the SSC outage time. VY did appear to schedule equipment outages using plant risk as a consideration.

By the VY program, risk is managed by properly planning and conducting activities during the outage. "Minimum" safety function status was defined as meeting minimum technical specifications requirements.

The outage assessment states that the decay heat removal safety function ( defined as 1 functional residual heat removal (RHR) loop, 1 residual heat removal service water (RHRSW) heat exchanger and 1 RHRSW pump) was below minimum on three separate occasions (totaling about 10 days of the planned 20 day outage). This outage time amounted to about 240 hours of unavailability for the shutdown heat removal function of RHR during the outage which was not accounted for in balancing reliability and unavailability. Unavailability performance criteria for each of two trains was 0.84% (203 hrs) per 3 years of "at power conditions". The actual "at power " unavailability as reported by the licensee of train A was 0.74% and train B was 0.82%. Both trains were in "(a)(2) with review" which provided an increased level of monitoring. If the unavailability during the refuel outage had been adequately considered, the RHR Shutdown Cooling function would have been considered for placement into (a)(1) with goals established, and a corrective action program developed.

Other risk significant systems required to be functional during shutdown where unavailability was not properly measured and balancing could not be done include:

AC electrical (115 KV and 345 KV)- These systems had times of unavailability loosely defined for the outage but the time was not considered in balancing. Both systems had "at power" unavailability performance criteria of 0.84% per three years. The actual "at power" unavailability as reported by the licensee was 0.18% for the 115 KV system and 0.09% for the 345 KV system. Both systems were in (a)(2).

Control Rod Drive (CRD)- This system had 82 hours of "planned" unavailability which was actually 153 hours of unavailability not included in balancing. The B train of CRD has unavailability performance criteria of 1.79% for 3 years (432 hrs) for "at power conditions". Actual "at power" unavailability as reported by the licensee was 2.48% and the B train was in (a)(1).

Emergency Diesel Generator (EDG) Train B- A planned five day outage turned out to be a 12 day (288 hrs) outage which was not considered in balancing. Unavailability performance criteria for "at power conditions" for each train is 1.93% (466 hrs) per 3 years. The actual "at power" unavailability as reported by the licensee was 0.91% for the B train and it was an (a)(2) system.

125 VDC/Main Station Battery- A 3 day planned outage took 10 days (240 hrs) and the unavailability was not considered in balancing. Unavailability criteria was revised during the periodic assessment from 0.36% to 0.61% (162 hrs) per 3 years for "at power conditions". Actual "at power" unavailability was 0.48% and the system was "(a)(2) with review" which provided an increased level of monitoring.

Core Spray Train A- A planned 3 day outage took 13 days (312 hrs) and the unavailability was not considered in balancing. Unavailability performance criteria for each train is 0.84% (203 hrs) per 3 years for "at power conditions". The actual "at power" unavailability as reported by the licensee was 0.03% and the system was (a)(2).

The inspector discussed with facility representatives the need to measure unavailability or some similar performance parameter when a risk significant system was required to be functional. The inspector also discussed the difference between managing plant risks and monitoring maintenance effectiveness. The licensee representatives did not appear to agree with this need when the plant was shutdown even when the function was required to be available. The licensee's position was that as long as the critical plant safety function was monitored, the system function does not have to be monitored against established performance criteria. The maintenance rule applies to all operational states of the plant and unavailability is required to be monitored when a risk significant SSC is required to be functional. Failure to do so does not allow balancing reliability and unavailability of risk significant SSCs, and is a violation of 10 CFR 50.65 (a)(3). **(VIO 50-271/99-12-01)**. The violation is being cited because it was NRC identified and was repetitive as a result of inadequate corrective action for a previous violation. This violation could reasonably have been prevented by the corrective actions for the previously cited violation of 10 CFR 50.65. Also, the violation was not placed into the corrective action program.

c. Conclusions

The evaluation of risk significant (a)(1) and (a)(2) SSCs that were reviewed were done in a satisfactory manner.

The periodic evaluation of several SSCs including some risk significant SSCs were not documented in the assessment and this indicated a lack of attention to maintenance rule activities.

Monitoring of equipment performance during the refuel outage was not adequate to assess maintenance effectiveness or balance reliability and unavailability for risk significant SSCs. This was a violation of NRC requirements. The violation was cited because it was identified by the NRC and could have been reasonably been prevented by corrective action for a previous violation.

### **X1 Exit Meeting Summary**

The inspector met with licensee representatives periodically throughout the inspection. A telephone exit was conducted on July 30, 1999. Additional telephone conversations to discuss the findings were conducted from July 30, 1999 to August 11, 1999. During the exit, the scope and findings of the inspection were reviewed and discussed, including the violation.

#### ITEMS OPENED, CLOSED, OR DISCUSSED

##### Opened

VIO 99-12-01 Failure to balance reliability and unavailability in the periodic evaluation required 10 CFR50.65(a)(3).

#### LIST OF ACRONYMS USED

AC	Alternating current
CFR	Code of Federal Regulations
CRD	Control Rod Drive
EA	Enforcement Action
EDG	Emergency Diesel Generator
KV	Kilovolts
MRC	Maintenance Rule Coordinator
MRBI	Maintenance Rule Baseline Inspection
NRC	Nuclear Regulatory Commission
PDR	Public Document Room
PRA	Probabilistic Risk Assessment
RHR	Residual Heat Removal
RHRSW	Residual Heat Removal Service Water
SSC	Structures, Systems, and Components
VDC	Volts Direct Current
VY	Vermont Yankee