U.S. NUCLEAR REGULATORY COMMISSION

REGION I

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LICENSEE:	Vermont Yankee Nuclear Power Corporation
FACILITY NAME:	Vermont Yankee Nuclear Power Station
INSPECTION AT:	Vernon, Vermont
INSPECTION DATES:	March 7-11, 1994

INSPECTOR: Richard A Skokowski 6 Apr. 94

Richard A. Skokowski, Reactor Engineer Date
Electrical Section, Engineering Branch
Division of Reactor Safety

APPROVED BY: J M Trapp April 7, 1994

James M. Trapp, Acting Chief Date
Electrical Section, Engineering Branch
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Area Inspected: This was an announced inspection of the Vermont Yankee diesel generators by regional personnel to review the status of several previously-identified issues and to determine the adequacy of the licensee's actions to resolve these issues.

Results: Four unresolved items identified in NRC Inspection Report 50-271/93-10 associated with the emergency diesel generators (EDG) were reviewed and closed. Additionally, the status of two unresolved items were updated.

The inspector concluded that Vermont Yankee continued to make progress in improving the EDG maintenance program as evidenced by:

1) the identification of discrepancies during periodic inspections of the EDGs;

2) the development of the EDG Performance Review Group, whose activities include the review of maintenance practices, equipment conditions, and identifying improvement initiatives; and

3) increased ability and activity in areas of trending and tracking.

Even though progress had been made in the areas of trending and tracking, continued licensee attention is required in these areas to ensure a complete and effective program.

DETAILS

1.0 PURPOSE

The purpose of this inspection was to review the status of several previously-identified issues related to the emergency diesel generators (EDGs) and to determine the adequacy of the actions taken to resolve these issues. As part of this inspection, the EDG maintenance and surveillance programs were reviewed, including the status of the items identified in Vermont Yankee's, "Emergency Diesel Generator Reliability Improvement Team Summary Report."

2.0 FOLLOWUP OF PREVIOUSLY IDENTIFIED EDG ISSUES (40500)

2.1 (Update) Unresolved Item (50-271/93-10-01) Jacket-Water Coolant Chemistry

This item pertained to the EDG jacket-water coolant chemistry, specifically about four inches of black material, later identified as magnetite, was removed from the "A" EDG expansion tank. The inspector reviewed Vermont Yankee's commitment tracking item responses associated with this issue and found the evaluation and actions to control jacket cooling water system chemistry were adequate. Included in Vermont Yankee's actions to control jacket water chemistry were the following:

- Initiating monthly monitoring of jacket water chemistry, which began in November 1990;
- Revising Procedure OP5223 to include a cleaning and inspection of the expansion tanks;
- Replacing cylinder liners for both EDGs with new liners having improved design;
- Revising Procedure OP4613 to include an acceptance criterion of 5 parts per million (ppm) for iron concentration in the EDG jacket cooling water system, and providing guidance to perform feed and bleeds of the expansion tanks if the concentration exceeds the acceptable value;
- Changing the source of makeup water for the EDG jacket cooling water system from the turbine building closed cooling water system to the demineralized water storage system; and
- Changing the corrosion inhibitor used in all closed cycle cooling systems to molybdate nitrate, which began in 1988.

However, the inspector noted that the source of the corrosion products was not identified in Vermont Yankee's evaluation. Since the cylinder liners and other parts of the engine coolant surfaces could have been the source for these corrosion products, there may be a resultant decrease in component strength. Vermont Yankee had contacted the diesel generator vendor to determine if they had experienced magnetite in jacket coolant expansion tanks in other

diesel generators. There was no documented response to this inquiry; however, Vermont Yankee personnel stated that the diesel generator vendor stated they had not experienced corrosion products in the jacket water and did not believe this would adversely effect EDG performance.

This item will remain unresolved pending the licensee's upcoming inspection of the "A" EDG expansion tank to verify that chemistry controls are effective. This is not considered an immediate concern with engine integrity since the cylinder liners for the EDGs were recently replaced and that hydrostatic testing of the EDG jacket cooling system was successfully performed during the 18-month maintenance.

2.2 (Update) Unresolved Item (50-271/93-10-02) Adequacy of Technical Reviews

The following two issues are associated with this unresolved item: 1) the adequacy of Vermont Yankee's review of the October 1992 EDG electrical oscillations; and 2) the adequacy of Vermont Yankee's review of NRC Information Notice (IN) 87-42, "Diesel Generator Fuse Contacts."

During a routine surveillance test in October 1992, the EDG "A" was secured by control room operators due to electrical oscillations after approximately one hour. Subsequent trouble-shooting by Vermont Yankee identified a bent contact to a potential transformer (PT) in the voltage regulator sensing circuitry, which caused the electrical oscillations. During Inspection 93-10, the inspectors determined that the evaluation associated with the EDG oscillations was based on the EDG in parallel operation with offsite power. Since the EDG is designed to operate independent of offsite during accident conditions, there was a concern that the evaluation did not adequately address this issue. The inspector reviewed the evaluation of the EDG oscillations and noted that the evaluation describing the EDG response in parallel operation enveloped the EDG response in isochronous operation and considered the evaluation adequate.

During Inspection 93-10, the inspectors determined that the contact arrangement for the EDG voltage regulator sensing circuitry PT was similar to the arrangement described in IN 87-42. Vermont Yankee's review of this IN, dated September 14, 1987, classified the issue as "no impact on plant operation or safety" since "Vermont Yankee does not have the type of arrangement described." Discussions with the licensee indicated that the IN was not properly evaluated. As a result, a new commitment tracking item was initiated to review the IN. Therefore, this item remains unresolved pending the licensee's evaluation of IN 87-42 and subsequent NRC review.

2.3 (Closed) Unresolved Item (50-271/93-10-03) EDG "A" Speed Switch Replacement

This item pertained to the lack of an engineering evaluation associated with determining the setpoints for the "A" EDG speed switch. In April 1993, the licensee tried to replace the speed switch on the "A" EDG with a "spare" obtained from the vendor. The part numbers were identical and the switch was calibrated. During installation of the switch, the licensee identified that the wiring in the switch connector was different from the engine wiring harness. The licensee identified that the new switch was not the same as the originally installed switch. The old speed switch was recalibrated and reinstalled, but the licensee did not appropriately establish the switch setpoint tolerance used to recalibrate the speed switch. The licensee chose a value without providing any engineering evaluation to demonstrate that the machine speed and voltage would not cause an overvoltage transient or an underfrequency transient when the machine loads.

The inspector reviewed Vermont Yankee's responses to several associated commitment tracking items. Vermont Yankee performed evaluations to justify both the low speed and engine running setpoints associated with the speed switch. The inspector found these evaluations were thorough and the setting tolerances were acceptable. Additionally, the inspector noted that Vermont Yankee had incorporated the testing of the engine running setpoint into Procedure OP4126, and intend to incorporate a procedure change to require the removal and calibration of the speed switch into the upcoming revision to Procedure OP5225, due June 1994.

The inspector identified a concern regarding a mismatch between the newly determined low speed setpoint of 200 rpm, and a setting of 250 rpm as indicated on Plant Drawing 5920-3992. Discussions with Vermont Yankee staff indicated that the low speed setpoint has not changed since original construction. As a result, Vermont Yankee created Commitment Tracking to correct the drawing. The inspector determined that the licensee's actions were appropriate, and considered this item closed.

2.4 (Closed) Unresolved Items (50-271/93-10-04 & 05) Maintenance Program Weaknesses

These issues pertained to weaknesses identified in the Vermont Yankee maintenance program, and included several discrepancies identified while performing a walkdown of the EDGs during NRC Inspection 93-10. Additionally, during NRC Inspection 93-10, Vermont Yankee was requested to provide corrective actions to address shortcomings identified in their EDG maintenance program. Vermont Yankee provided these corrective actions in their letter to the NRC dated June 11, 1993. The inspector reviewed these actions and determined that they were adequately completed.

Unresolved Item 93-10-04 pertained to an inconsistency between several fuel injector pumps having safety (lock) wire holding the fuel plug in place, and a larger number not having the safety wire. The EDG vendor stated in a letter to Vermont Yankee that the design of the set

screw on the injection pump changed in the early 1970s, and this new design included a self-locking feature, which eliminated the need for safety wiring. Newly purchased fuel injector pumps should not contain safety wiring, and older injector pumps rebuilt by Colt Industries were modified to use the self-locking feature and do not require safety wire. The EDG vendor also stated that using both self-locking and lock-wired injector pumps on the same machine was acceptable. The inspector considered this item closed.

The discrepancies associated with Unresolved Item 93-10-05 included:

- conduit that contains the field cable from the exciter to the generator field was broken and had a sharp edge rubbing the field cable;
- a broken weld on the drip pan under the "Rootes" blower casing;
- several copper fuel and air lines were crimped; and
- electrical tape had been used as a cushion material between an instrument line and a clamp. In several cases, the electrical tape had fallen away exposing the instrument line to the chaffing action of the clamp.

The inspector performed a walkdown of the EDGs and verified that these discrepancies were corrected. The inspector also reviewed the open work orders associated with EDGs, found the backlog to be acceptable. In addition, the Vermont Yankee staff stated that a Maintenance Department initiative to perform monthly inspections of the EDGs had been implemented. These walkdowns are performed by experienced mechanical maintenance technicians, as well as by the mechanical maintenance engineer. The inspector reviewed the results of the most recent EDG inspection for each EDG and found them extensive. The inspector concluded Vermont Yankee's actions were appropriate to address this issue, and considered it closed.

2.5 (Closed) Unresolved Item (50-271/93-10-06) Trending

This item pertained to observations made during EDG run on March 31, 1993. The following two issues are associated with this unresolved item: 1) the "B" EDG individual cylinder exhaust temperatures and the average cylinder exhaust temperatures trended upward, while the "A" EDG run, earlier the same day, indicated cylinder exhaust temperatures were stable under the same operating conditions; and 2) Technical Specification (TS), requirement 4.10 A.1.a, requires that "each diesel generator shall be started and loaded once a month for sufficient time for the diesel engine and generator to reach equilibrium temperatures at expected maximum emergency loading not to exceed the continuous rating to demonstrate

operational readiness," while Vermont Yankee considers the machine to be in equilibrium at the end of one hour and does not review temperature trends to establish equilibrium conditions.

In response to the concern regarding cylinder exhaust temperatures demonstrating an upward trend, Vermont Yankee contacted the vendor and together they performed a review of the data for both EDGs and could not find any adverse trends in the data. They determined that the reason the "B" EDG cylinder exhaust temperatures continued to raise while the temperatures for the "A" EDG stabilized was due to changes in ambient conditions. The "A" EDG was run at night when the ambient temperature was relatively constant and the "B" EDG was run the following morning, when there was a significant increase in ambient temperature. The licensee's evaluation included a review of the average cylinder exhaust temperatures for diesel runs during the time frame between July 1992 and March 1993. The results of this review demonstrated that there were no adverse trends in exhaust temperatures for the "B" EDG as compared to the "A" EDG.

In response to the concern regarding the lack of reviewing temperature trends to establish equilibrium conditions to ensure adequate completion of the TS requirement, the licensee performed a review for both EDGs, and determined that both machines reached thermal equilibrium after approximately one hour, as determined by stable oil and water temperatures. The inspector verified that Vermont Yankee's definition of equilibrium was consistent with the definition of equilibrium as stated in IEEE Standard 387-1977, "Standard Criteria for Diesel Generator Units Applied as Standby Power Supplies for Nuclear Power Generating Station."

The inspector found the evaluation associated with this issue acceptable, and considered this item closed.

2.6 Control of Procedure Improvement Changes (93-20)

During NRC Inspection 93-20, a weakness was identified pertaining to the lack of administrative control of the maintenance department procedure change suggestion process. At the conclusion of Inspection 93-20, Vermont Yankee committed to developing and incorporating a mechanism for the controlling the procedure change improvement process into the maintenance department administrative procedures, or into a site wide procedure. Procedure AP0037, "Plant Procedure," was revised to incorporate controls for the procedure change suggestion process. The inspector concluded that these changes were appropriate.

2.7 Part 21 Associated with the Air Start Cam

Fairbanks Morse issued a 10 CFR Part 21 notification pertaining to the identification of a cracked air start distributor cam. Vermont Yankee determined that this Part 21 was applicable to their EDGs and initiated the following actions to address this issue:

1) two cams were ordered;

2) an inspection of the "A" EDG was scheduled for March 1994, at which time a dye penetration examination of the cam will be performed. Replacement of the cam will be based on the results of the inspection; and

3) an inspection of the "B" EDG was scheduled for September 1994, at which time a dye penetration examination of the cam will be performed. Replacement of the cam will be based on the results of the inspection.

Vermont Yankee performed an inspection of the "B" EDG air start distributor in October 1993. The inspection indicated that the air start distributor appeared in "good shape." The licensee decided that no immediate dye penetration examination of the "B" EDG was required and that it could be performed during the next scheduled maintenance, in September 1994. However, should evidence of cracking be detected during the dye penetration examination of the "A" EDG, an examination of the "B" EDG distributor cam will be scheduled as soon as practical. The inspector reviewed Vermont Yankee's response to this item and determines that it was appropriate.

2.8 EDG Room Fire Detector Activation

On February 22, 1994, while the "B" EDG was being operated, a small amount of oil that leaked onto the exhaust manifold and was observed smoking. The smoking oil caused a fire detector to activate. Discussions with the Vermont Yankee staff stated that they were aware of the problem with the excess oil and were addressing it by a modification being developed by the EDG Performance Review Group. This modification will allow air baring of the EDG, which will minimize the oil on the exhaust manifold during EDG starts. The inspector concluded that Vermont Yankee's actions were appropriate to address this issue.

2.9 Vermont Yankee's EDG Task Team Recommendations

Vermont Yankee Nuclear Power Station completed a review of their maintenance and surveillance programs for the EDGs in September 1992. They produced a document titled, "Emergency Diesel Generator Reliability Improvement Team Summary Report." Vermont Yankee's team was to review the current maintenance and surveillance programs for the EDGs and to identify potential areas for improvement and recommend changes that could improve EDG reliability.

The inspector reviewed a sample of Vermont Yankee's commitment tracking issues related to the recommendations made by their EDG Task Team. The development of the EDG Performance Review Group was determined to be a strong initiative in that it provides the knowledge of several engineering disciplines to resolve EDG problems.

The Vermont Yankee Emergency Diesel Generator Reliability Improvement Team identified several issues related to engine parameters trending. As a result, these issues were evaluated by the recently-established EDG Performance Review Group, and changes were made to the EDG monitoring program. These changes included new parameters to be trended, and the development of plant modifications to allow for additional parameters to be monitored.

The inspector reviewed the Vermont Yankee Emergency Diesel Generator Monitoring Program, which includes methods used to monitor and record EDG reliability in accordance with the station blackout rule. The data analysis portion of the monitor program provided guidance regarding maximum and minimum available values; however, little guidance was provided regarding acceptable deviations from normal for various monitored parameters. Discussions with Vermont Yankee staff indicated that they had established normal baseline values for various parameters and they do review the deviations from normal for these parameters.

The inspector determined that the Vermont Yankee's effort to improve EDG parameter trending was noteworthy. However, effort should be continued by the licensee in this area, including completing the modifications and ensuring that the program adequately reflects the evaluations performed by their staff.

3.0 UNRESOLVED ITEMS

Unresolved items are matters about which additional information is necessary to determine whether they are acceptable, a deviation or a violation.

4.0 EXIT MEETING

At the conclusion of the inspection on March 11, 1994, the inspector met with Vermont Yankee representatives denoted in Attachment 1. At that time, the inspector summarized the scope and findings of the inspection. Vermont Yankee representatives did not dispute the inspection findings. Also at this exit meeting, it was established that Mr. T. Watson would be the Vermont Yankee technical contact for future NRC discussions regarding the issues covered by this report.

Attachment: Persons Contacted

ATTACHMENT 1

Persons Contacted

Vermont Yankee Nuclear Power Corporation

*	D. Amidon	Electrical Engineer
*	M. Ball	Mechanical Engineer
*	D. Caslyn	Quality Assurance Supervisor
*	P. Corbett	Electrical Engineering & Construction Manager
*	R. Gerdus	Chemistry Engineer
*	F. Helin	Senior Reactor Engineer
*	S. Jefferson	Assist to Unit Manager
	W. Limberger	Materials Manager
*	M. McKenney	Operation Shift Engineer
*	S. Naeck	Mechanical Maintenance Engineer
	C. Nichols	Production Supervisor
	R. Wanczyk	Plant Manager
*	T. Watson	Maintenance Manager

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*	H. Eichenholz	Senior Resident Inspector, Vermont Yankee
	P. Harris	Resident Inspector, Vermont Yankee
	G. Lazarowitz	Reactor Engineer, Electrical Section, Region I
	J. Shedlosky	Project Engineer, Section 3A, Region I
	J. Trapp	Acting Chief, Electrical Section, Region I

* Denotes those present at the exit meeting held at Vermont Yankee, March 11, 1994.