U.S. NUCLEAR REGULATORY COMMISSION
REGION I

Report No. 50-029/90-18

Docket No. 50-029

License No. DPR-3

Licensee: Yankee Atomic Electric Company

Facility Name: Yankee Rowe Nuclear Power Station

Inspection At: Bolton, MA and Rowe, MA

Inspection Conducted: September 24-28, 1990

Inspectors: Roy K Mathew — 10-24-90
R. Mathew, Reactor Engineer, Plant Systems Section, EB, DRS — date

J. F. Lara — 10-24-90
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for Roy K Mathew — 10-24-90
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Approved by: C J Anderson — 10/24/90
C. J. Anderson, Chief, Plant Systems Section, Engineering Branch, DRS — date

Inspection Summary: Inspection Report No. 50-029/90-18

Areas Inspected: A special announced team inspection to review the emergency diesel generator replacement modification and testing program.

Results: 1) One violation regarding inadequate testing was identified during the review of the licensee's test program and test results. This violation is discussed in Section 4.2. 2) The licensee's qualification tests demonstrated the EDGs' capability to carry the design bases loads. The EDG test program did not demonstrate the performance of the EDG units at U.8 rated power factor. This issue is also discussed in Section 4.2.

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DETAILS

1.0 Persons Contacted

1.1 Yankee Atomic Electric Company

* R. Mitchell, Maintenance Manager
* R. Mellor, Technical Director
* N. St. Laurent, Acting Manager, Operations
* T. Henderson, Acting Plant Superintendent
* J. Kay, Technical Services Manager
* S. Rosenberg, Lead Electrical Engineer, Yankee Project
* M. V. Prabhakar, Sr. Electrical Engineer, Yankee Project
  B. Jones, Engineering Manager, YNSD
* P. Sheldon, Systems Engine[illegible] YNSD
  J. Parker, Senior Mechanica[illegible]ngineer, YNSD
  R. Rusin, Plant Mechanical Engineer
  J. Lynch, Systems Engineer
  K. E. Jurentkuff, Plant Operations Manager
  D. King, Maintenance Support Supervisor
* R. P. Dobosz, Stores Supervisor
* D. Calsyn, QA Engineer
* L. K. Bozek, QA Supervisor
* G. Maret, Reactor Engineering Manager
* A. J. Falconieri, Electrical Engineer, Maintenance Division

1.2 U.S. Nuclear Regulatory Commission (NRC)

* Koshy, T., Sr. Resident Inspector
* Markley, M., Resident Inspector
* Dudley, N. F., Sr. Resident Inspector, Seabrook

* denotes personnel present at the exit meeting held on September 28, 1990

2.0 Introduction and Background

The Emergency Diesel Generators (EDGs) serve as the standby source of onsite electric power in the event that offsite power is lost. The YNPS original standby units consisted of three 400 kW, 480 V, 3-phase, 60 hz, 1800 rpm, 0.8 pf, diesel engine-driven generators. During the Core XXI refueling outage, the licensee performed a major overhaul of each of the three EDGs. EDGs 1 and 2 were returned to service following satisfactory completion of the monthly Technical Specification (TS) operability test. Upon completion of the EDG 3 overhaul, subsequent 18 month surveillance tests conducted in August 1990 revealed that EDG No. 3 could not meet the TS required capacity of 400 kW. The NRC questioned the adequacy of the post-maintenance testing performed on EDGs 1 and 2. The licensee's evaluations concluded that the existing EDGs were incapable of supporting their respective design bases loading of 400 kW. Therefore, all three EDGs were declared inoperable.

Subsequent load capability tests on EDG-1 were successful. However, EDG-2 was incapable of demonstrating the required rated capacity of 400 kW. Although the EDGs were declared inoperable, YNPS aligned them to accept the load requirements (367kW) while in the refueling mode (Mode 5). A special NRC inspection (50-29/90-14) was conducted to review EDG reduced capacity and other deficiencies in the testing of the EDGs. Potential violations of NRC requirements were identified and a subsequent enforcement conference was held on September 21, 1990.

The licensee concluded that the EDGs were operating above the range of design operating temperature and therefore the testing did not demonstrate the capacity of the EDGs over the full range of design conditions. The licensee subsequently conducted an in-depth review of the EDG capacity and its supporting systems. The licensee decided to replace the existing EDGs and correct any hardware problems. Modification Engineering Design Change Request (EDCR) No. 90-305 was initiated to replace the existing three EDGs with those of higher capacity (450 kW continuous and 600 kW 2 hour short term rating). During this inspection, the team noted that YNPS completed the EDG replacement modification as well as testing of all 3 EDGs.

3.0 Purpose and Scope

The purpose of this inspection was to review the adequacy of the Emergency Diesel Generator (EDG) modification and testing program to verify that associated activities conformed with regulatory requirements, commitments, and industry guides and standards. This effort was accomplished through the review of the: modification package, safety evaluation, system calculations, operating and surveillance procedures, commercial grade dedication and quality assurance program. The inspection effort also included a plant walkdown to verify the EDG installation.

4.0 Modification EDCR 90-305 - YNPS EDG Replacement

The purpose of this modification was to replace the existing 400 kW EDGs with new units rated at 450 kW continuous and 600 kW short term and to modify the support systems to accommodate the new EDG capacity. This modification enhances the existing generating capability and capacity of the on-site Emergency AC Power System. The units were procured as commercial grade and dedicated for safety-related service through the licensee's commercial-grade dedication program. The new units are Detroit Diesel Allison, 12V92TA, 12 cylinder, 600 kW, twin turbo diesel generator units. Ventilation system changes were made to accommodate the increased cooling and air flow requirements. The instrumentation and controls used in this design change are the same as for the old EDG units which meets the manufacturer's design specifications for the 600 kW diesel units. The EDG power feeder cables were replaced with four 250 MCM cables per phase to meet the additional loading on the cables. EDG fuel oil consumption and minimum fuel requirements were reevaluated. Engine fuel oil supply and return piping and exhaust systems were modified to accommodate the new EDG. Surveillance tests and qualification tests were conducted to verify the capacity and capability of the EDGs.

The EDG loading calculation, short circuit study and cable ampacity calculations were also updated to reflect the additional capacity of the units. The kW loadings based on the continuous rating for EDGs Nos. 1, 2 and 3 are 87.6%, 84.76% and 86.58%, respectively. The maximum loading on any one EDG is approximately 394.2 kW. The auto starting and control system for the new EDGs is identical to the old units. The EDG breaker control and auto load sequencing of ECCS pumps also remain the same.

4.1 Safety Evaluation

The team reviewed the licensee's safety evaluation for the EDG replacement modification to determine whether the changes as a result of the modification satisfied the requirements delineated in 10CFR 50.59.

The licensee's safety evaluation concluded that the changes involved did not involve a change in the technical specification (TS) in that the new EDG units meet or exceed the requirements of the TS and provide greater capacity than the replaced units. The licensee will propose changes to the TS to acknowledge the increased EDG capacity and to meet the 1981 Westinghouse Standard Technical Specification test requirements. The safety evaluation further concluded that the subject modification changes and tests do not involve an unreviewed safety question.

No unacceptable conditions were identified during the review.

4.2 EDG Qualification and Operational Testing

4.2.1 EDG Test Program

The new EDG units were procured by Yankee Nuclear Power Station (YNPS) as commercial grade and dedicated for safety-related service through the commercial grade dedication program. The dedication process included extensive testing as described in YNPS' August 28, 1990 letter to the NRC. The EDG test program consisted of the following:

A. Factory Production Tests performed on all 3 units

B. Qualification Testing of EDG 1 performed at Power Products Inc.

1. Initial Production Test
2. Initial Type Tests
    a. Load Capability Test
       (1 hr @ 450 kW, 2 hrs @ 600 kW, 22 hrs @ 450 kW)
    b. Load Rejection Test
    c. No-Load Test
3. Start and Load Acceptance Test

C. EDG Pre-Operational and Reliability Test for all 3 EDGs

1. Pre-Operational Test
2. Starting Reliability Test (30 consecutive starts)

The team reviewed the licensee's test procedures and results to determine whether the results of the above test program adequately demonstrated acceptability of the units for safety-related use. The team also reviewed the licensee's modification package EDCR-90-305, "YNPS Emergency Diesel Generator Replacement" and supporting documents during this inspection.

As specified in the EDCR, the acceptance-type and pre-operational tests were to be conducted using the guidance presented in IEEE 387 which is endorsed by NRC Regulatory Guide (RG) 1.9. During the review of the licensee's pre-operational and reliability tests, the team noted that the testing methodology differed from the guidance presented in IEEE 387 in that the tests were not performed at the rated power factor. A resistive load bank was used to vary the test load. This corresponds to a unity power factor. The effect of testing the EDGs at unity power factor is that the EDG unit is not being required to demonstrate the capability to carry the continuous rating kW load at the rated output current. The differences in current output for each test load at different power factors are tabulated below.

Load (kW)	pf	Current (A)
450	1.0	541
	0.8 lag	677
600	1.0	722
	0.8 lag	902

The licensee stated that the testing of the EDG units was conducted with a resistive load bank due to the current carrying limitations on the tie cables between the 1E and non-1E 480 Vac buses. (See Section 4.4.2 for further discussion on cable ampacity limits). The licensee stated that although the testing had not been conducted as specified in IEEE 387, the units were tested extensively and sufficiently to support 600 kW short term and 450 kW continuous ratings at 0.8 rated power factor.

Conclusions

The inspection team concluded that the tests conducted by the licensee demonstrated that the EDG units can carry a continuous load of 450 kW and a short term load of 600 kW at unity power factor. The licensee has calculated the worst case EDG loading (kW) under a LOCA scenario and the expected power factor. The results of the EDG load study were calculated on the licensee's computer program (DAPPER). The most heavily loaded EDG was determined to be EDG 1 with a load of 394 kW at a 0.887 lagging power factor. This load demand on the EDG is within the demonstrated EDG load capability ratings. Therefore, the EDG's ability to carry the worst case design loads has been demonstrated.

Although the qualification tests performed demonstrated the capability of the EDG units to carry the design loads, they did not demonstrate the units' capability to carry the same kW load at rated power factor. The licensee intends to submit to the NRC a TS change request to incorporate revised EDG surveillance test requirements. The new surveillance tests will include provisions for testing the EDGs at the higher ratings. This request will be reviewed by the NRC upon submittal.

4.2.2 Review of EDG Test Results

The team reviewed pre-operational and reliability test results for all three EDGs during this inspection. Documents reviewed included test procedures, test data sheet results, and associated EDG strip charts.

The licensee presently adjusts the EDG no-load frequency at 63 Hz during pre-operational testing. The setting is chosen such that when the EDG is loaded, a frequency decrease due to loading will result in a running frequency of 60 Hz. This ensures that during a design bases accident, all ECCS loads will be powered from the EDGs at the rated motor frequency. Operation Procedure No. OP-5000.312, "Pre-Operational and Reliability Test" consisted of pre-operational test and reliability test requirements. Attachment A of the procedure specifies the pre-operational tests and Attachment B of the procedure specifies the reliability test requirements. During the review of test results, the team identified two discrepancies pertaining to the EDG 1 no-load frequency setting. One of the discrepancies pertains to appropriate acceptance criteria for EDG frequency for pre-operational test in accordance with Attachment A of Procedure No. OP-5000.312. The other discrepancy dealt with inadequate review of acceptance criteria specified in Attachment B of Procedure No. OP-5000.312 for reliability test. The identified test discrepancies are described below.

Pre-operational Test

Results indicated that during the 24 hour pre-operational load test for EDG 1, the frequency was approximately 63 Hz. Further review by the licensee indicated that the no-load frequency was 66 Hz prior to loading the EDG with the test load. This setting differs from the no-load frequency of 63 Hz established in earlier procedural steps.

Discussions with the licensee indicated that the high no-load frequency, and subsequent high running frequency, was not identified during the actual testing. Further review of operation procedure No. OP-5000.312, "Pre-Operational and Reliability Test", Issue Date 9/90, indicated that there was no specified acceptance criteria pertaining to an acceptable EDG frequency. Attachment A of the procedure, "EDG Pre-Operational Test," specifies the acceptance criteria for the diesel generator pre-operational test but does not include any reference to an acceptable frequency operating range.

Reliability Test

At the start of the EDG 1 Starting Reliability Test which consists of 30 consecutive starts, the no-load frequency was at 64 Hz. At the completion of the first test, the no-load frequency was 66 Hz. Since the desired no-load frequency is 63 Hz, the governor was adjusted to decrease the frequency to 63 Hz prior to initiating the second EDG start. However, by the start of the ninth (9) test, the frequency was at 66 Hz. The higher than desired frequency was noted throughout the remaining consecutive starts. Discussions with the licensee indicated that these discrepancies were not identified during the performance of the tests.

Review of operation procedure No. OP-5000.312, "Pre-Operational and Reliability Test," Issue Date 9/90, indicated that there was an inadequate evaluation of the test results to verify that the specified acceptance criteria was met. Attachment B of the procedure, "Starting/Load Capability Reliability Test," specifies the acceptance criteria for the diesel generator reliability test and it states in part the following:

> "...demonstrate diesel generator reliability by performing 30 consecutive valid tests with no failures. Successful starts to 480 V +/- 48 (432-528) and a frequency based on the final no-load governor setting established within Attachment (A) +/-2% in less than 14 seconds, followed by successful loading to 450 kW - 472.5 kW...should be considered valid successful tests."

The no-load governor setting established in Attachment A of the procedure was 63 Hz. Upon completion of the reliability tests, the licensee evaluated the results and determined the acceptance criteria had been satisfied even though the no-load frequency was 66 Hz or +4.76 % above the no-load governor setting established in Attachment A. Operation of induction motors at 63 Hz results in a 5% and 10% decrease in starting current and starting torque, respectively.

Results

As a result of the team's concerns, the licensee proceeded to perform a series of tests to verify the stability of the no-load frequency. The tests consisted of: 1) Four 5-minute runs at no-load and 2) One hour run at no-load followed by a 1 hour run at a load greater than 450 kW for at least one hour. Results of these tests indicated that the no-load frequency response operated satisfactorily. However, these test results did not provide an explanation for the observed frequency discrepancies during the pre-operational and reliability tests. At the conclusion of this inspection, the licensee could not provide an explanation for the observed frequency drift.

Failure to incorporate EDG frequency acceptance criteria for the preoperational test to verify proper operation and failure to adequately review the reliability test results to verify conformance to the specified acceptance criteria is a violation (50-029/90-18-01).

4.3 Surveillances, Testing, and Calibration

The objective of this inspection element was to evaluate the licensee's surveillance procedures and instrument calibration data to assure that changes resulting from the modification have been incorporated into appropriate operating procedures.

As a result of the emergency diesel generator (EDG) modification, administrative limits were developed to preclude overloading of the tie cables between the 480 Vac safety-related and non-safety related buses. This possibility could exist during a LOCA event and when the EDGs are back-feeding the non-Class 1E buses during monthly surveillance testing. These administrative limits require that control room operators ensure that the load current through the tie cables does not exceed 510 A when back-feeding to the normal station and emergency 480 volt buses and that the load current through the tie cables does not exceed 600 A when a Low Pressure Safety Injection (LPSI) pump is operating. Control room operators were made cognizant of these restrictions through Special Orders issued by the control room shift supervision.

Operation procedures for the pre-operation, starting, synchronization and loading of the EDGs were reviewed and verified to contain appropriate cautions and instructions to reflect the changes resulting from the installation of the new EDGs. Additionally, instrument calibration data for associated instruments pertinent to EDG testing were reviewed. These instruments included current, voltage, and kW meters.

The team concluded that procedures incorporated the appropriate administrative controls resulting from the EDG modification.

4.4 Review of System Calculations

4.4.1 Short Circuit Study

The licensee performed short circuit study No. YRC-857, "Electrical System Fault Study", Rev. 0 to support the replacement of the existing 400 kW EDGs with new 450 kW units. The purpose of this study was to review and analyze the acceptability of the short circuit ratings of various components of the electrical auxiliary distribution system considering the increase in the EDGs' potential fault current contribution.

The station service system is comprised of three 2400 V station service buses each normally supplied from a different power source. Two of three auxiliary buses are supplied by each of the 115 kV (offsite source) transmission lines via respective station service transformers (115 kV/2400 V). These transformers are equipped with voltage regulators to maintain 2400 V on the secondary side if the primary voltage varies by +/- 15 %. The third auxiliary bus is supplied from the station main generator. The most limiting system transient due to an electrical

fault considered by the licensee's calculation consists of all normal plant loads in operation. In addition, all three EDGs were assumed to be synchronized to the station auxiliary system. This assumption is conservative since only one EDG is synchronized to offsite power at any one time.

The team review of the short circuit fault analysis study noted that all plant circuit breakers, with the exception of one non-safety related, have sufficient capacity to meet the short circuit withstand demand. The study documents one exception of a 2400 Vac non-Class 1E circuit breaker whose withstand rated capacity is exceeded by approximately 4 %. The licensee concluded that due to the conservatism built into the calculated system configuration, and the assumptions stated above, it was unlikely that this circuit breaker would ever be required to actually withstand the postulated fault current magnitude. Considering the conservative assumptions in the study, the team had no further questions with regard to this item.

The team raised a concern to the licensee as to the assumed maximum pre-fault system voltage of 115 kV. Though this is the nominal system voltage, five years of historical data of system voltages at the Yankee Rowe plant indicate that the system voltage has on occasions reached 118 kV. In addition, documents reviewed indicated that the system grid voltage may be allowed to increase to 121 kV. In response to the team's concern of higher possible system grid voltages, the licensee stated that a study would be initiated to consider higher system voltages as well as verify calculation assumptions.

Based upon the team's review of the presented study, the team concluded that there is no immediate safety concern with respect to the increased EDG capacity resulting in electrical equipment ratings being exceeded. However, the licensee stated that the short circuit calculation would be updated to reflect the maximum system grid voltage and verify other calculation assumptions. The team had no further questions on this issue.

4.4.2 Cable Ampacity

Replacement of EDG Power Cables

In this modification the licensee replaced the existing EDG power cables (2-350 MCM/phase) feeding the associated Class 1E 480 V switchgear with new (4-250 MCM/phase) cables to support the higher EDG capabilities.

Calculation YRC-859 demonstrated that these new power cables can withstand the continuous current rating of the new EDGs. However, during the EDG short time capabilities (500 kW for 2 hrs), the cables will be overloaded by 8.4 %. Based upon the guidance provided in IEEE 242-1975, "Recommended Practice For Protection and Coordination of Industrial and Commercial Power Systems", the licensee concluded that this short time overloading condition was acceptable since the cable temperature will reach approximately 102° C which is below the 130° C temperature allowed by IEEE-242 during emergency overloading.

Presently there are no surveillance requirements to test the EDGs at 600 kW other than the original qualification tests. The current TS requires the licensee to test the EDGs at 200 kW for 2 hours on a monthly interval and 400 kW every 18 months for one hour. IEEE 242 allows emergency loading of the EDG for 100 hours per year. The team concluded that the EDG cables are adequate to support the units' performance.

480 V Tie Cables

The non-Class 1E 480 V station service buses provide power to the Class 1E 480 V buses through associated tie cables. These cables are classified as non-nuclear safety-related. The rated ampacities of these cables is adequate to support normal plant operation with expected cable temperatures of 60° C. However, these cables are expected to carry approximately 135.6 % of the rated current capacity during design bases events (LOCA). This condition is expected to be present for 180 days to support ECCS equipment operation following a LOCA. Calculation YRC-836 demonstrated that under this overload condition, the tie cables' temperature rise could reach approximately 115° C. The licensee has concluded that these cables can operate at this higher temperature for approximately 1.7 years without degradation. The licensee has committed to upgrade the tie cables during the next refueling outage.

During this inspection the team also selected safety-related motor operated valves to verify proper cable sizing to support equipment operability.

No deficiencies were identified.

4.4.3 EDG Fuel Oil Consumption

The team reviewed the fuel oil consumption calculation YRC-858 and associated operating procedures to determine the volume of fuel required to support operation of the EDG at rated capacity and at design basis loading condition.

The performance curves provided by the diesel manufacturer and fuel consumption test data were reviewed to determine the volume of fuel required to support operation of the new EDGs. The new EDG requires a fuel oil volume of 7938 gallons to support operation of two EDGs for a period of seven days under design basis loading conditions. YNPS' Technical Specification requires that a minimum volume of 8000 gallons be maintained in the fuel storage tank (4'6.5") in Modes 1 through 4 and 4000 gallons (2'4.5") while in Modes 5 or 6. The team noted that the fuel oil consumption rate of the new EDG is less than the old units. However, a volume of 13,000 gallons (approximately 7') of fuel in the tank is required for 2 EDGs to operate for seven days at the continuous rating of 450 kW. The licensee is planning to submit changes to the current Technical Specification to reflect a requirement that the fuel oil storage tank level not to drop below 13,000 gallons or approximately 7' for Modes 1-4 and 6500 gallons or approximately 4' for Modes 5 or 6.

The team noted that the existing fuel oil storage tank has a capacity of approximately 30,000 gallons (15') in the tank. Existing operations procedure OPF-4207.1 requires that operations personnel notify the plant Stores Department to arrange for fuel oil delivery when the level drops to 10' or approximately 19,000 gallons as monitored on indicator FO-LIA-1 in the Waste Disposal building. Presently the fuel oil storage tank level is recorded three times a day. A high level alarm is provided in the control room and local panel at a level of 15'. The low level alarm is normally adjusted to just below the current reading to alert the operator of a leak or actual consumption. Specific operator actions are provided in procedure OP-3894 to identify and take appropriate actions for a particular alarm condition.

During this inspection, the team noted that the administrative procedures OP-4254, OPF-4207:1, OP-4207, AP2007, and OP-3894 had not been revised to reflect the above requirement. However, a memo dated September 17, 1990 was sent from the engineering group to the plant recommending revisions of administrative procedures. The team raised the concern regarding the licensee's practice of using this memo as the operating guidance instead of approved administrative procedures. The licensee stated that these procedures are in the review and approval process.

Following the inspection, the licensee informed the NRC that the appropriate procedures had been revised. Review of these procedures did not reveal any deficiencies.

Based on the review of fuel consumption calculation, the team concluded that the existing EDG fuel oil storage tank level requirements assure adequate fuel oil for two new EDGs to operate at rated capacity for seven days. No unacceptable conditions were noted.

4.4.4 EDG Cooling Evaluation (Calculation YRC-854)

The team reviewed the cooling capacity of the ventilation system of the new EDGs to determine if sufficient air flow is available to cool the diesel engine at rated load.

The EDG ventilation system consists of two air intake dampers and one exhaust and bypass damper. This modification requires the air intake to be increased to provide adequate engine cooling to maintain the room temperature below 104° F. The two intake hoods combined air flow design capacity is approximately 41,600 CFM. The calculated pressure drop was less than the EDG fan capacity and hence the flow provided by the fan will exceed the design requirement of 37,572 CFM. The internal room temperature with all the heat loads and with an average room temperature of 88° F corresponds to a maximum room temperature of 99.6° F. This is well below the maximum design temperature of 104° F. The temperature noted during post installation testing was found to be approximately 70° F.

The team concluded that the EDG ventilation system is capable of developing sufficient air flow to allow the radiator to cool the engine and keep the room temperature below the design temperature limit of 104 degrees F.

4.5 Commercial Grade Dedication Program

The commercial grade dedication program was reviewed to evaluate the implementation of the licensee's commercial dedication program with respect to the EDG modification.

The team noted that the licensee's commercial grade dedication program specification requires compliance with the requirements specified in 10 CFR 50 Appendix B criteria. The new EDGs purchased from Detroit Allison were evaluated for safety class applications. The dedication method selected by the licensee for achieving qualification was through special tests and inspections. The testing program is discussed in detail in Section 4.1. Both electrical and mechanical components were reviewed by the licensee to assure that they are qualified to operate in the mild environment for a total integrated radiation dose equivalent to 8.3 x E4 Rads. The only component which is vulnerable to the radiation environment in the EDG rooms is the MOSFET (transistor) used in the voltage regulator. The licensee has protected this component by installing a lead shielded box.

Based on the review of the information provided by the licensee, the EDGs are qualified for the mild environment and is in accordance with the licensee's existing commercial dedication program.

4.6 Quality Assurance (QA)

The objective of this inspection element was to evaluate the implementation of YNPS' quality assurance program throughout the emergency diesel generator modification process.

YNPS' corporate quality assurance group was involved throughout the preliminary and final review stages. The initial review consisted of two elements. The first element was an independent examination by Power Products, Incorporated of the diesel manufacturer, Detroit Diesel Corporation, and the generator manufacturer, Marathon Electric, for controls of manufacturing, testing, and materials of three new emergency diesel generators. The second element was an independent review of Power Products, Incorporated by the QA organization.

Throughout the procurement, installation, testing, and qualification of the new EDGs, QA personnel audited engineering activities to evaluate adherence to procedures and technical specifications. The team reviewed various surveillance reports (Attachment I) as well as YNPS Deficiency/Observation Reports to determine the depth and scope of the combined QA programs for the EDG replacement modification.

The team concluded that the licensee's QA program provided an acceptable level of independent reviews to ensure that applicable requirements were implemented and satisfied throughout the EDG qualification process.

4.7 Equipment Walkdown

The team conducted a plant walkdown to verify the installation of the new EDGs and the associated instrumentation to assure that the as-built conditions agree with the design requirements.

The team verified the installation of EDGs, power cables and control circuits, fuel oil level instruments, cooling and ventilation systems and also the instrumentations available at the control room. During the walkdown, the team noted that there is a potential for inadvertent operation of the EDG voltage regulator potentiometer in the present installation. This was identified to the licensee and they committed to install a guard around the potentiometer to prevent any possible inadvertent operation. No other deficiencies were identified during this walkdown.

5.0 Conclusions

The team's evaluation of design documents revealed that the EDG replacement modification was thorough in addressing the essential attributes to qualify the units for safety-related applications. Independent reviews and audits by the licensee's QA organization were also evident. The qualification test program results demonstrated the capability of the EDG units to carry the required design bases loads. Therefore, the licensee has conducted sufficient analyses and tests to qualify the units for safety-related use.

The team concluded that the qualification tests performed did not demonstrate the EDGs' capability at rated power factor. The licensee plans to submit TS change request to the NRC to incorporate new EDG surveillance tests and to take credit for the additional EDG rated capacity. The licensee's intent to take credit for the higher EDG capacity ratings will be reviewed by the NRC upon the TS submittal in the light of the tests performed at other than the units' rated power factor.

The team identified weaknesses in the testing of EDGs. One violation was identified with respect to inadequate review of test results and lack of appropriate acceptance criteria to verify EDG performance.

6.0 Exit Meeting

At the conclusion of the inspection on September 28, 1990, the team met with the licensee representatives denoted in Section 1.0. The team summarized the scope and findings of the inspection at that time.

ATTACHMENT I

Documents Reviewed

OP-4207, "Surveillance Of The Station Power DC And AC Distribution Systems And The Emergency Diesel Generators"

OP-2504, "Operation Of The Station Power System OP-5000.311 Replacement of EDG No. 1 Power Cables"

OP-2000.273, "New EDG Test During EDG Outage - EDG No.2"

OP-6000.253, "Installation And Testing of EDG No.1 Instrumentation"

OP-3251, "Loss Of AC Supply"

OP-3254, "Total Loss Of AC With Shutdown Cooling In Service"

OP-2501, "Restoration Of Normal AC Power After Total Loss Of AC"

YR-EDG-1, "Yankee Atomic Emergency Diesel Qualification Test Procedure"

QA Surveillance Reports: Vendor Surveillance Report No. 90-093
Vendor Surveillance Report No. 90-097
Vendor Surveillance Report No. 90-098
Vendor Surveillance Report No. 90-099

5000.312, "Pre-operational and Reliability Test"
- EDG Nos. 1, 2, and 3 Test Results

OP-2000.275, "No. 1 EDG No-Load Frequency Response Test."

Calculation No. YRC-857, "Electrical System Fault Study", Rev. 0

Calculation No. YRC-836, " 480V Cable Ties Long-Term Aging and Post-Accident Operability Analysis"

Calculation No. YRC-859, "Emergency Diesel Generators 1, 2, and 3 Power Cable Selection"

EDCR 90-305, "YNPS Emergency Diesel Generator Replacement"

(FORM 6)

Check if changed since Exit Meeting

Suprv. Review _____

Docket/Plant 50-029 Report No. 90-18 Input Date 10/4/90

A. Add New Items: Originator: R.K. MATHEW

Item No.	Type	Resp. Sec	Remarks
90-18-01	NCA	PSS	Inadequate Testing - failure to incorporate EDG frequency acceptance criteria for pre-op test and failure to adequately review the reliability test results.

B. Modify/Update:

Item No.	Type	Resp. Sec	Remarks
___-_____-___			
___-_____-___			
___-_____-___			

C. Close:

Item No.	Closing Remarks	Item No.	Closing Remarks
___-_____-___		___-_____-___	
___-_____-___		___-_____-___	
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TSS 1/90