July 16, 2003

Mr. John L. Skolds
Chairman and CEO
AmerGen Energy Company, LLC
4300 Winfield Road
5th Floor
Warrenville, IL 60555

SUBJECT: OYSTER CREEK GENERATING STATION- NRC INSPECTION REPORT 50-219/03-006

Dear Mr. Skolds:

On June 6, 2003, the U. S. Nuclear Regulatory Commission (NRC) completed an engineering team inspection at your Oyster Creek reactor facility. The enclosed report presents the results of that inspection. The results of this inspection were discussed on June 6, 2003, with Mr. Ernie Harkness and other members of your staff.

This inspection examined activities conducted under your license as they relate to safety and compliance with the Commission's rules and regulations and with the conditions of your operating license. The inspectors reviewed selected procedures and records, observed activities, and interviewed personnel.

Based on the results of this inspection no findings of significance were identified.

In accordance with 10 CFR 2.790 of the NRC's "Rules of Practice," a copy of this letter and its enclosure will be available electronically for public inspection in the NRC Public Document Room or from the Publicly Available Records (PARS) component of NRC's document system (ADAMS). ADAMS is accessible from the NRC Web site at http://www.nrc.gov/reading-rm/adams.html (the Public Electronic Reading Room). We appreciate your cooperation.

Sincerely,

**/RA/ by Joseph G. Schoppy for**

Lawrence T. Doerflein, Chief
Systems Evaluation Branch
Division of Reactor Safety

Docket No. 50-219
License No. DPR-16

Enclosure: Inspection Report 50-219/03-006
w/Attachment: Supplemental Information

cc w/encl:
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Senior Vice President - Nuclear Services, Exelon
Vice President - Mid-Atlantic Regional Operations Support, Exelon
Senior Vice President - Mid-Atlantic Regional Operating Group, Exelon
Vice President - Licensing and Regulatory Affairs, Exelon
Site Vice President, Oyster Creek Nuclear Generating Station, AmerGen
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REGION I

| | |
|---|---|
| Docket No: | 50-219 |
| License No: | DPR-16 |
| Report No: | 50-219/03-006 |
| Licensee: | AmerGen Energy Company, LLC (AmerGen) |
| Facility: | Oyster Creek Generating Station |
| Location: | Forked River, New Jersey |
| Dates: | May 19 - 23, and June 2 - 6, 2003 |
| Inspectors: | Michael Modes, Senior Reactor Inspector, Team Leader<br>Stephen Pindale, Senior Reactor Inspector<br>Mel Gray, Senior Reactor Inspector<br>Paul Kaufman, Senior Reactor Inspector<br>Leonard Cheung, Senior Reactor Inspector<br>Thomas Burns, Reactor Inspector<br>Fred Jaxheimer, Reactor Inspector<br>Jennifer Bobiak, Intern (Accompaniment only) |
| Approved by: | Lawrence T. Doerflein, Chief<br>Systems Evaluation Branch<br>Division of Reactor Safety |

Enclosure

## SUMMARY OF FINDINGS

IR 05000219/2003-006; 5/19/2003 - 5/23/2003 and 6/2/2003 - 6/6/2003; Oyster Creek Generating Station; engineering team inspection.

The inspection was conducted by a team of region based inspectors during the period May 19, 2003, to June 6, 2003. No findings of significance were identified. The NRC's program for overseeing the safe operation of commercial nuclear power reactors is described in NUREG-1649, "Reactor Oversight Process," Revision 3, dated July 2000.

A. NRC-Identified and Self-Revealing Findings

No findings of significance were identified

B. Licensee-Identified Violations

None.

REPORT DETAILS

## 1. REACTOR SAFETY

Cornerstones: Initiating Events, Mitigating Systems, and Barrier Integrity

1R21 Safety System Design and Performance Capability (IP 71111.21)

a. Inspection Scope

The team reviewed the Oyster Creek design and performance capability of the isolation condenser (IC) system and selected interfacing and supporting systems. Using risk insights derived from the NRC "Risk Informed Inspection Notebook for Oyster Creek Generation," the inspectors focused on the IC system capability to remove decay heat from the reactor coolant system in response to a postulated reactor trip and loss of the normal power conversion system. The likelihood of the initiating event of a plant transient is one in ten years. The team focused on components and procedures that would mitigate the consequences of a transient without the plant power conversion system. Systems interfacing with the IC during this accident sequence are: the AC motor-operated isolation valves, the DC motor-operated isolation valves, the shell-side vent lines, the control rod drive (CRD) pumps, IC make-up, and the diesel fire pumps. The team also reviewed the core spray system in the alternate path of IC make-up alignment.

The inspectors reviewed the Oyster Creek Safety Analysis Report, technical specifications, and docketed correspondence in order to understand the IC licensing basis and design function. The inspectors confirmed the IC safety function is to remove decay heat and depressurize the reactor coolant system in the event the main condenser heat sink is unavailable, because the main condenser is part of the normal power conversion system. System operating procedures, including emergency operating procedures and surveillance procedures, were reviewed to ensure they supported the IC system licensing, design bases, and technical specification requirements. The review included applicable surveillance test results and focused on the ability of the IC system to remove core decay heat, depressurize the reactor, and provide inventory control.

The inspectors confirmed the IC system consists of two redundant heat exchangers, or ICs. The shell side of each IC is filled with water to a level that covers the tube bundles and provides a minimum inventory for boil-off. The shell side is vented to the atmosphere. The IC tubes are connected to the reactor vessel steam dome. During normal power operation, the tube inlet headers are steam filled, but the submerged tube bundles themselves are filled with reactor coolant water, called condensate, at normal pressure and temperature. The tube bundle outlet headers return to the reactor vessel via normally closed power operated condensate return valves, such that the IC tube bundles form a closed loop with the reactor coolant system. The system automatically initiates on a high reactor coolant system pressure or low reactor vessel level signal by opening the normally closed condensate return valves. Reactor coolant flows through the IC tube bundles by natural circulation. The ICs cool the reactor coolant (and remove

decay heat) by boiling the shell side water inventory and venting the steam to the atmosphere. Operators can also manually initiate flow through the IC.

The inspectors reviewed design drawings to confirm the IC system configuration was consistent with the design assumptions for natural circulation. Plant walkdowns were completed to verify the IC configuration was in conformance with design documents. IC shell level indication was reviewed to ensure the configuration was consistent with calibration assumptions. The inspectors also walked down IC system equipment to ensure there were not significant indications of plant equipment problems, and to verify that minor equipment problems were being appropriately addressed in the Oyster Creek maintenance and corrective action program.

The inspectors reviewed IC shell side inventory thermal calculations to verify they correctly calculated the shell side water inventory necessary to provide for the decay heat levels assumed in the design basis. Calculation assumptions regarding IC shell water volume, temperature, level indication and decay heat load were reviewed and compared to monitored plant parameters to ensure the assumptions were technically justified. The inspectors compared the calculation conclusions to plant procedural guidance and acceptance criteria for IC level to verify the IC's capacity to absorb heat was being maintained as assumed in the calculations. Furthermore, the inspectors reviewed problems, identified by Oyster Creek personnel and entered into their corrective action program, regarding IC calculation and procedure issues. These issues were reviewed to determine the nature and extent of the problems and verify that the ICs remained capable of performing their safety function during design basis accident conditions.

The inspectors determined that portions of the condensate transfer, fire protection water, and core spray systems were credited in the design basis with refilling the IC shells to replenish water boiled off in removing decay heat and maintain the IC tubes covered. The nonsafety-related condensate transfer system was the preferred make-up path to the IC shells, providing flow from the condensate storage tank (CST). The inspectors reviewed plant historical data and pump and valve test data that demonstrated the condensate transfer system capability to provide adequate make-up. Since the CST provides water to multiple systems, including the CRD make-up to the reactor coolant system after a reactor trip, calculations tabulating system users were reviewed to verify the CST volume provides adequate make-up to multiple sources as assumed in the design basis.

Hydraulic calculations were reviewed for the fire protection system make-up source. The inspectors determined that the diesel driven fire pumps were credited as a back-up make-up source, providing fire water to the IC shells via either of two diesel driven fire pumps. The inspectors reviewed the hydraulic calculations to verify they were technically adequate, and that the fire protection system design matched the assumed configuration. Periodic valve and pump test procedures were reviewed to ensure they confirmed manual and automatic equipment functions could be completed as assumed in the calculations.

The inspectors further determined that the Oyster Creek licensing basis credited make-up to the IC from the torus via a core spray pump during certain natural external events, because the torus provides a water source protected from tornado and flooding effects. The inspectors reviewed hydraulic and pipe stress calculations to verify they were technically correct, and that the core spray system design matched the plant configuration. The inspectors also reviewed the implementing plant operating procedures to ensure they were consistent with the licensing basis. Specifically, procedural controls were reviewed that prevented a core spray topping pump from automatically starting as assumed in the pipe stress calculations.

The inspectors determined that the installed IC make-up sources to each IC flow through an air operated valve that operators control remotely. The valve actuators were provided with air accumulators so the valves remain available on loss of normal control air. The inspectors reviewed calculations to verify the accumulators were sized to provide adequate air to operate the make-up valves during a loss of control air. Additionally, the inspectors verified that the valves were accessible in the plant and could be manually operated by handwheel if required.

The team reviewed the IC's automatic initiation logic (elementary diagrams) to verify that the initiation signal was generated, based on a one-out-of-two twice logic using four sets of instruments, by a persistent (>1.5 seconds) reactor pressure above 1060 psig or reactor pressure vessel (RPV) water level below the low-low set point of 86 inches above the top-of-fuel. The team also reviewed the control circuitry for the normally-closed IC outlet isolation valves (DC motor operated) to verify that the valves could be opened or closed by the automatic initiation signal or by manual actions. In addition, the team reviewed the pipe rupture protection logic to verify that when a high flow of greater than 300% normal flow was detected for more than 27 seconds, as sensed by two inlet (steam) and two outlet (condensate) flow switches for each condenser, all isolation valves would be closed. The team also reviewed the instrument and time delay relay calibration records to verify that the required set point accuracy was maintained.

The inspectors reviewed a temporary modification implemented in May 2002 to replace a section of a degraded multi-conductor underground control cable for the diesel fire pumps. The team reviewed the diesel fire pump wiring diagrams to verify that a failure of this control cable could only affect the remote start capability and status indications in the control room for Fire Pump 1-1 and that the other diesel fire pump would not be affected.

The inspectors further reviewed hydraulic calculations applicable to the CRD system make-up function to the reactor coolant system. The team verified the CRD pump design had adequate margin to provide the required flow through the system, and that sufficient minimum pump flow protection was provided. Test results were also reviewed that indicated valves in the flow path can be manually operated at the make-up flows consistent with the design basis.

The design and testing of the automatic IC's start circuitry was reviewed to verify the tests were being completed in accordance with technical specification requirements, and

that sensing instruments that provided initiation signals were calibrated within the accuracy assumed in the design basis. The inspectors further reviewed the high energy line break protection circuitry that automatically isolates the ICs on indications of a pipe rupture. The inspectors' review focused on the setpoint time delays to verify that they ensured the system would isolate as required, but would not cause spurious isolations during normal IC system initiation.

The inspectors reviewed a sample of permanent modifications, repairs, and replacements to the selected systems to assure these activities maintained the design basis of the systems. In addition, the inspectors reviewed preventive and corrective maintenance activities were performed as scheduled using controlled procedures. The inspectors evaluated a sample of surveillance and post maintenance test results to verify system capability was verified and design basis maintained. The inspectors reviewed selected reports of nondestructive examination of system components, where degradation would result in an increase in risk to core damage, to verify compliance with the American Society for Mechanical Engineers Boiler and Pressure Vessel Code, Section XI.

b. Findings

No findings of significance were identified.

4OA2 Identification and Resolution of Problems

a. Inspection Scope

The inspectors reviewed a sample of corrective action reports associated with the IC system, condensate transfer, CRD and fire protection system, as identified in the Documents Reviewed section, to verify that AmerGen was identifying issues at an appropriate threshold, entering them in the corrective action program, and taking appropriate corrective actions. Also, the inspectors evaluated corrective actions to confirm that repairs and/or modifications to components had no adverse impact on the system design basis.

b. Findings

No findings of significance were identified.

4OA6 Meetings, including Exit

On June 6, 2003, the inspection team presented the inspection results to Mr. E. Harkness and other members of AmerGen management. AmerGen management acknowledged the findings presented. The inspectors confirmed that proprietary information was not provided or examined during the inspection.

## SUPPLEMENTAL INFORMATION

## KEY POINTS OF CONTACT

Licensee Personnel

| | |
|---|---|
| E. Harkness | Site Vice President |
| M. Newcomer | Acting Manager Engineering |
| T. Quintenz | Mgr Mechanical Structural Design |
| P. Bloss | Mgr Electrical, I & C, NSSS |
| T. Powel | Mgr Balance of Plant |
| D. Garnes | Mgr. Electrical, I & C Design |

New Jersey State Representative

| | |
|---|---|
| R. Pinney | NJ Department of Environmental Protection |

NRC Personnel

| | |
|---|---|
| S. Dennis | Acting Senior Resident Inspector |
| R. Summers | Senior Resident Inspector |

## LIST OF ITEMS OPENED, CLOSED, AND DISCUSSED

Opened and Closed

None

Closed

None

## LIST OF ACRONYMS

| | |
|---|---|
| AC | Alternating Current |
| AmerGen | AmerGen Energy Company, LLC |
| CRD | Control Rod Drive |
| CST | Condensate Storage Tank |
| DC | Direct Current |
| IC | Isolation Condenser |
| NRC | Nuclear Regulatory Commission |
| RPV | Reactor Pressure Vessel |

Attachment

## LIST OF DOCUMENTS REVIEWED

Drawings

| | |
|---|---|
| GE148F262 | Emergency Condenser Flow Diagram |
| GE885D781 | Core Spray Flow Diagram |
| GE237E798 | Recirculation System Flow Diagram |
| JC19479 | Fire Protection Water System Flow Diagram |
| BR2004 | Condensate Transfer System Flow Diagram |
| BR2013 | Control Instrument Air System Flow Diagram |
| BR 3029 | Emergency Condenser Isolation Control: Sheet 2, Revision 22; Sheet 2A, Revision 23; |
| GE 157B6397 | Emergency Condenser Isolation Outlet Valve V-14-0034 Elementary Diagram, Sheet 15, Revision 29. |
| GE 157B6350 | Emergency Condenser Return Isolation Outlet Valve V-14-0036 Elementary Diagram, Sheet 152A, Revision 3. |
| GE 157B6350 | Emergency Condenser Inlet Isolation Valve V-14-0030 Elementary Diagram, Sheet 151A, Revision 4. |
| BR E1102 | Emergency Condenser Isolation Outlet Valve V-14-0035 Elementary Diagram, Sheet 15, Revision 29. |
| GE 237E566 | Reactor Protection System (for Isolation Condenser Actuation) Elementary Diagram, Sheet 9, Revision 4. |
| DJP 3D-811-18-1003 | Fire Diesel Pump 1-1 Electrical Connection Diagram, Revision 1. |
| DJP 3D-811-17-1001 | Fire Diesel Pump 1-1 Electrical Elementary Diagram, Revision 1. |
| DJP DWG-H750-003 | Fire Diesel Pump 1-1 Electrical Modification Elementary Diagram, Revision 0 |
| NU5060E6003 | Core Spray Drywell Isolation Electrical Elementary Diagram, Sheet 2, Revision 23. |
| E1132 | CRD Feed Pump NC08A Elementary Diagram, Revision 13. |

Procedures

| | | |
|---|---|---|
| Isolation Condenser “B” Shell Water Level Level Instrument Calibration (1G06B) | 609.3.008 | Rev 20 |
| Isolation Condenser Automatic Actuation Bistable Calibration and Test | 609.3.113 | Rev 20 |
| Isolation Condenser Isolation Test and Calibration | 609.3.002 | Rev 51 |
| Core Spray System 1 Instrument Channel Calibration, Test and System Operability | 610.3.105 | Rev 48 |
| CRD Pump Operability Test | 617.4.001 | Rev 35 |
| Oyster Creek Site Fire Protection Program | 101.2 | Rev 49 |
| Control Rod Drive System | 302.1 | Rev 79 |
| Control Rod Drive Manual Control System | 302.2 | Rev 20 |
| Reactor Vessel Head Cooling System Operation | 306 | Rev 17 |
| Isolation Condenser System | 307 | Rev 81 |
| Emergency Core Cooling System Operation | 308 | Rev 71 |

| | | |
|---|---|---|
| Condensate Transfer System | 316.1 | Rev 38 |
| Isolation Condenser Makeup Line Check Valve In-service Test | 609.4.010 | Rev 4 |
| Isolation Condenser Valve Operability and In-service Test | 609.4.001 | Rev 49 |
| Condensate Transfer Pump Operability and In-service Test | 644.4.002 | Rev 31 |
| Condensate Storage Tank Level Indicator LI-424-993 Calibration | 644.3.004 | Rev 2 |
| RPV Control - No ATWS | 2000-EMG-3200.01A | Rev 10 |
| RPV Control - With ATWS | 2000-EMG-3200.01B | Rev 12 |
| Emergency Depressurization - No ATWS | 2000-EMG-3200.04A | Rev 4 |
| Emergency Depressurization - With ATWS | 2000-EMG-3200.04B | Rev 4 |
| Steam Cooling | 2000-EMG-3200.05 | Rev 5 |
| RPV Flooding - No ATWS | 2000-EMG-3200.08A | Rev 4 |
| RPV Flooding - With ATWS | 2000-EMG-3200.08B | Rev 4 |
| Fire Protection Program | CC-AA-211 | Rev 0 |
| Isolation Condenser “B” Shell Water Level Instrument Calibration | 609.3.008 | Rev 21 |
| Operation of SEEDS Software | 820.4 | Rev 4 |
| Station Blackout | 200-ABN-3200.37 | Rev 13 |
| Core Spray Makeup to the Isolation Condensers | 308, Attachment 12 | Rev 71 |
| Plant Fire Protection System | 333 | Rev 73 |
| Low Voltage Power Circuit Breaker Corrective/Preventive Maintenance | 2400-SME-3915.08 | |
| Conduct of Installed Instrument Calibration and Maintenance | 2400-ADM-3660.01 | |

Operator Lesson Plans

8280.0.0023, Rev. 6, Isolation Condensers
828.0.0057, Rev. 2, Make-up, Demineralize Water and Condensate Transfer System

System Health Overview Report, Emergency ISO Condensers
System Health Overview Report, Core Spray/ADS
MA-MA-716-009, Rev 1, Preventive Maintenance (PM) Work Order Process

Work Orders

| | |
|---|---|
| C0551149, | Replace Relay RD68AX, CRD Pump NC08-A |
| C0551150, | Replace Relay RD68BX, CRD Pump NC08-B |
| C2002990, | Replace Bad Section of Cable 63-337, Fire Protection Diesel No. 1 |
| C2002178, | Replace Under Voltage Devices, CRD Pump P-15-1B |
| R0539289, | 480V SWGR Breaker Inspection, Cleaning and Testing, CRD Train "A" |
| C0535604, | Perform CKTBRK PM, CRD Pump P-15-1B |
| R2019642 | Isolation Condenser Isolation and Calibration, June 29, 2001. |
| AR2046885 | "A" Isolation Condenser Level Indication Loop Calibration. |
| AR2051570 | Isolation Condenser "B" Shell Water Level Instrument Calibration |
| R2035263/2035230 | CRD A & B Pump Operability Test, May 16, 2003 |
| R2031104 | CRD B Pump Operability Test, April 16, 2003. |

Action Request

A2010563, Local Leak Rate Testing of Isolation Condenser Isolation Valves
A2013593, Review of Scope of Relay Replacement Program
A2013591, Scram Derate Action Items
A2031857, Install Jumper for Cable 63-377, Fire Diesel Control Cable
A2025225, Install New Relay in Fire Diesel 1-2 Control Panel

Calculations

| | | |
|---|---|---|
| C-1302-735-E320-040 | C-1302-424-5360-003 | C-1302-811-E310-030 |
| C-1302-211-E320-126 | C-1302-424-5360-004 | C-1302-815-E310-001 |
| C-1302-421-5360-008 | C-1302-424-E170-012 | C-1302-211-5360-049 |
| C-1302-424-2253-002 | C-1302-424-E320-001 | C-1302-211-5360-033 |
| C-1302-424-5320-008 | C-1302-536-5360-003 | C-1302-211-E540-125 |
| C-1302-424-5320-010 | C-1302-810-5360-003 | 3731-71-11-002 |
| C-1302-424-5360-001 | C-1302-811-5360-004 | |

Corrective Action (CAP)

| | | | |
|---|---|---|---|
| O2003-0994 | O2000-2116 | O2003-0770 | O02003-1102 * |
| O2002-1954 | O2000-1562 | O2003-0980 | O02003-1110 * |
| O2002-1441 | O2001-0844 | O2003-0994 | O02003-1138 * |
| O2003-0995 | O1998-1668 | O1998-1790 | O02003-1146 * |
| O2002-0104 | O2001-0783 | O2001-1783 | O2003-1148 * |
| O2002-1089 | O2003-1732 | O2003-0867 | O2003-1149 * |
| O2002-0420 | O2003-0397 | O2003-0801 | O2003-1162 * |
| O2002-0116 | O2003-0444 | O2002-1904 | |

(*Generated as result of NRC questions)

Examination Summary Sheets

Attachment

OCR19-028, PT-031, Liquid Penetrant Examination of Weld NC-4-001B, Safe End, CRD
OCR19-046, D-053, Ultrasonic Examination of Weld NE-2-225, ISO Condenser
OCR19-046, PT-028, Liquid Penetrant Examination of Weld NE-2-225, ISO Condenser

Surveillance Test Procedures

Procedure 609.4.001, Isolation Condenser Valve Operability and In-Service Test, Rev 49, completed under work order R2026990, 1/17/03

Procedure 609.4.007, Fire Water Make-up to Isolation Condenser IST, Rev 13, completed under work order R2023802, 11/18/02

Procedure 619.3.004, Primary Containment Isolation Functional Test, Rev 42, completed under work order R0808506, 10/22/02

Procedure 609.3.003, Isolation Condenser Automatic Actuation Sensor Calibration and Test, Rev 46, completed 4/9/03 under work order R2019124

Procedure 609.3.012, Isolation Condenser Isolation Test and Calibration - A2/B2 Sensors First, Rev 7, completed 1/17/03 under work order R2022724

Test Procedure 247/11, Fire Diesel Pump 1-1 Functional Test, completed 514/02

Design Change Packages, and Safety Evaluations

| | |
|---|---|
| EJ2002-012, | Temporary Modification, 1-1 Fire Diesel Temporary Control Cable, Revision 1. |
| OC-2002-S-0306 | 50.59 Screening for 1-1 Fire Diesel Temporary Control/Alarm Cable, Revision 0. |

Miscellaneous

Safety Evaluation 315403-31, Justification for Revised Isolation Condenser High Flow Trip, Revision 1, September 30, 1994

Safety Evaluation 000661-017, Removal of Isolation Condenser Vent Radiation and Containment Spray/Emergency Service Water Heat Exchanger Monitoring System, Rev 2, 8/15/95

Post-Transient Report Number 97-148, 8/1/97

Design Specification 21A1607, Oyster Creek Emergency Condensers, Rev 1, July 1966

Vendor Manual VPF#1350-16-2, Instructions for Care and Operation of Emergency Condenser, January 1967

Operations Plant Manual, Module 23, Isolation Condenser System, Rev 2, 1/8/92

Isolation Condenser Make-up Log, 1/30/01 to 4/24/03

Oyster Creek, UFSAR, Section 6.3, Update 11, Emergency Core Cooling System

Oyster Creek, UFSAR, Section 10.4.7, Update 11, Condensate and Feedwater Systems

Oyster Creek, UFSAR, Section 9.5.1, Update 7, Fire Protection Program