UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION IV
611 RYAN PLAZA DRIVE, SUITE 400
ARLINGTON, TEXAS 76011-4005

February 13, 2006

Jeffery S. Forbes, Vice President,
Operations
Arkansas Nuclear One
Entergy Operations, Inc.
1448 S.R. 333
Russellville, Arkansas 72801-0967

SUBJECT: ARKANSAS NUCLEAR ONE - NRC INTEGRATED INSPECTION REPORT 05000313/2005010

Dear Mr. Forbes:

On January 10, 2006, the U.S. Nuclear Regulatory Commission (NRC) completed an inspection at your Arkansas Nuclear One, Unit 1 facility. No inspection of Unit 2 was performed under this report number. The enclosed report documents the inspection findings, which were discussed on January 10, 2006, with you and other members of your staff.

The 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 license. Within these areas, the inspection consisted of selected examination of procedures and representative records, observations of activities, and interviews with personnel. This inspection covers steam generator and reactor vessel head replacement activities.

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

In accordance with 10 CFR 2.390 of the NRC's “Rules of Practice,” a copy of this letter, its enclosure, and your response (if any) will be made 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).

Sincerely,

/RA/

David N. Graves, Chief
Project Branch E
Division of Reactor Projects

Docket: 50-313
License: DPR-51

Enclosure:
NRC Inspection Report 05000313/2005010
w/Attachments:
1. Supplemental Information
2. Security Related Information

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Only inspection reports to the following:
DRS STA **(DAP)**
J. Dixon-Herrity, OEDO RIV Coordinator **(JLD)**
**ROPreports**
ANO Site Secretary **(VLH)**

SUNSI Review Completed: __DNG____ ADAMS: / Yes ☐ No Initials: NG_____
/ Publicly Available Non-Publicly Available Sensitive / Non-Sensitive

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| RIV:RI:DRP/E | SRI:DRP/E | RE:DRS/EB1 | C:DRS/PSB |
|---|---|---|---|
| JLDixon | RWDeese | JAClark | MPShannon |
| T-DNG | T-DNG | E-DNG | E-DNG |
| 02/13/06 | 02/13/06 | 02/10/06 | 02/10/06 |

| C:DRS/EMB2 | C:DRS/OB | C:DRP/E | |
|---|---|---|---|
| LJSmith | ATGody | DNGraves | |
| GDReplogle | /RA/ | /RA/ | |
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**U.S. NUCLEAR REGULATORY COMMISSION**
**REGION IV**

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|---|---|
| Dockets: | 50-313 |
| Licenses: | DPR-51 |
| Report: | 05000313/2005010 |
| Licensee: | Entergy Operations, Inc. |
| Facility: | Arkansas Nuclear One, Unit 1 |
| Location: | Junction of Hwy. 64W and Hwy. 333 South<br>Russellville, Arkansas |
| Dates: | January 1 through December 31, 2005 |
| Inspectors: | E. Crowe, Resident Inspector<br>R. Deese, Senior Resident Inspector<br>J. Dixon, Resident Inspector<br>G. Guerra, Jr., CHP, Health Physicist<br>W. McNeill, P.E., Reactor Inspector<br>C. Stancil, Resident Inspector, Browns Ferry<br>N. Taylor, Resident Inspector, Cooper Nuclear Station |
| Approved By: | David N. Graves, Chief, Project Branch E<br>Division of Reactor Projects |

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## SUMMARY OF FINDINGS

IR 05000313/2005010; 1/01/05 - 12/31/05; Arkansas Nuclear One, Unit 1; Integrated Resident and Regional Report of Steam Generator and Reactor Vessel Closure Head Replacement Activities.

This report covered a 12-month period of special inspection by resident and regional inspectors. No findings were identified. The significance of most findings is indicated by their color (Green, White, Yellow, or Red) using Inspection Manual Chapter 0609, "Significance Determination Process." Findings for which the significance determination process does not apply may be Green or be assigned a severity level after NRC management's review. 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

Summary of Plant Status

Unit 1 began the inspection period at 100 percent rated thermal power and remained there until March 18 when the unit down powered to approximately 85 percent rated thermal power to replace a main turbine governor valve. The unit returned to 100 percent rated thermal power on March 19 and remained there until May 6 when the unit down powered to approximately 84 percent rated thermal power to perform main turbine throttle/governor valve testing. The unit returned to 100 percent rated thermal power on May 7 and remained there until October 4, when the unit was shut down for refueling and to replace the reactor vessel (RV) head and steam generators (SGs). The unit was restarted on December 21 and achieved 95 percent rated thermal power on December 25. The unit was holding at 95 percent rated thermal power to resolve emergency feedwater initiation and control indication problems when on December 26, the unit tripped due to a turbine trip on low turbine bearing oil pressure. The unit was restarted on December 29, achieved 95 percent rated thermal power on December 31, and remained there for the remainder of the inspection period.

1. REACTOR SAFETY

Cornerstones: Initiating Events, Mitigating Systems, Barrier Integrity

1R02 Evaluation of Changes, Tests, or Experiments (71111.02)

a. Inspection Scope

The inspectors reviewed five design change packages that contained four 10 CFR 50.59 evaluations to verify that the licensee had appropriately considered the conditions under which the licensee may make changes to the facility, procedures, or conduct tests or experiments without prior NRC approval. The inspectors reviewed the one design change package without an evaluation to ensure consistency with the requirements of 10 CFR 50.59 in the licensee's exclusion of a full evaluation. The inspectors found the licensee had one major package for the SG replacement, one for the RV head replacement, and separate packages for the transportation, lifting, and rigging. In addition, there were packages on such items as downgrading the reactor building insulation and increasing the rating on the polar crane. The inspectors interviewed the cognizant design and system engineers for the identified modifications to gain their understanding of the design change packages. The inspectors' review addressed material compatibility, functional properties, classification, environmental and seismic qualification of the replacement components and the transportation of the components into the reactor building. The inspectors also addressed the heat removal parameters for the new insulation to be installed.

b. Findings

No findings of significance were identified.

1R08 Inservice Inspection Activities (71111.08)

a. Inspection Scope

The inspectors accomplished the inspection requirements of Inspection Procedure 71007, "Reactor Vessel Head Replacement Inspection," by reviewing the quality data package supplied by the fabrication vendor. The quality data package provided the certificate of conformance and ASME data report for the replacement RV head. The inspectors reviewed the applicable Contract Variation Approval Requests. The package included all the certified material test reports for all materials used in the assembly, such as the closure head forging, control rod drive housing flange and control rod drive housing body certified material test reports, material heat treatment records, material machining, material supplier shop operation records and applicable nonconforming reports. The package also included the fabrication records of cladding, welding, heat treatments, machining, drilling, stress relieving, nondestructive testing, inspection, repair (as applicable), hydrostatic testing, cleaning, packaging and associated fabrication vendor nonconformance reports. In addition, the inspectors reviewed the Entergy contract and specifications, drawings, functional specification, ASME Design Specification, Design Report and ASME Code reconciliation reports. The inspectors reviewed the documentation of the licensee's approval of the vendor's quality plan and special process procedures, such as heat treatment, welding and nondestructive testing used by the material supplier and the fabrication vendor. The licensee obtained a sample of personnel qualification reports on welding and nondestructive personnel from the fabrication vendor at the request of the inspectors for review. The inspectors reviewed the radiographic film of the control rod drive housing to flange weld and the ultrasonic preservice inspection of the control rod drive mechanism (CRDM) penetration welds.

Inspection Procedure 71111.08P, "Inservice Inspection Activities," required a minimum sample size of four activities. This inspection satisfied the baseline inspection procedure with regard to three activities (02.01, 02.02, and 02.04) and did not address boric acid corrosion control. This inspection reviewed the ultrasonic inspections of the control rod drive head penetrations (J-groove welds) and the penetrant and radiographic examination of the control rod drive housing to flange welds. Other activities performed under Inspection Procedure 71111.08 are documented in NRC Inspection Report 05000313/05000368-2005005 Section 1R08.

b. Findings

No findings of significance were identified.

1R13 Maintenance Risk Assessments and Emergent Work Control (71111.13)

a. Inspection Scope

Risk Assessment and Management of Risk

The inspectors reviewed the assessment activities listed below to verify: (1) performance of risk assessments when required by 10 CFR 50.65 (a)(4) and

licensee procedures prior to changes in plant configuration for maintenance activities and plant operations; (2) the accuracy, adequacy, and completeness of the information considered in the risk assessment; (3) that the licensee recognizes, and/or enters as applicable, the appropriate licensee-established risk category according to the risk assessment results and licensee procedures; and (4) that the licensee identified and corrected problems related to maintenance risk assessments. See NRC Inspection Reports 05000313/05000368-2005004 and 05000313/05000368-2005005, Section 1R13 for more information.

- August 27 through December 31, 2005, construction of the temporary pads for the outside hatch and lift systems
- October 4 through December 31, 2005, reviewed procedures and plans for crane operation near common systems
- October 4 through December 31, 2005, evaluated controls and plans to minimize any adverse impact on Unit 2 and common systems
- October 26 through November 5, 2005, transport of the removed SG hot legs, the removed SGs, and the removed RV head to the storage facility

b. Findings

No findings of significance were identified.

1R17 Permanent Plant Modifications (71111.17)

a. Inspection Scope

The inspectors reviewed key affected parameters associated with energy needs, materials/replacement components, timing, heat removal, control signals, equipment protection from hazards, operations, flowpaths, pressure boundary, ventilation boundary, structural, process medium properties, licensing basis, and failure modes for modifications associated with the replacement SGs and RV head. The inspectors verified that: (1) modification preparation, staging, and implementation does not impair emergency/abnormal operating procedure actions, key safety functions, or operator response to loss of key safety functions; (2) postmodification testing will maintain the plant in a safe configuration during testing by verifying that unintended system interactions will not occur, structures, systems, and components (SSCs) performance characteristics still meet the design basis, the appropriateness of modification design assumptions, and the modification test acceptance criteria has been met; and (3) the licensee has identified and implemented appropriate corrective actions associated with permanent plant modifications. See NRC Inspection Reports 05000313/05000368-2005004 and 05000313/05000368-2005005, Section 1R17, for additional activities performed.

b. Findings

No findings of significance were identified.

1R20 Refueling and Outage Activities (71111.20)

a. Inspection Scope

The inspectors reviewed and observed selected portions of the following risk significant refueling items or outage activities to verify defense in depth commensurate with the outage risk control plan and compliance with the Technical Specifications: (1) the risk control plan; (2) tagging/clearance activities; (3) reactor coolant system (RCS) instrumentation; (4) electrical power; (5) decay heat removal; (6) spent fuel pool cooling; (7) inventory control; (8) reactivity control; (9) containment closure; (10) reduced inventory or midloop conditions; (11) refueling activities; (12) heatup and cooldown activities; and (13) licensee identification and implementation of appropriate corrective actions associated with refueling, outage, and replacement activities. Coverage of the full scope of Inspection Procedure 71111.20, "Refueling and Other Outage Activities," is documented in NRC Inspection Report 05000313/05000368-2005005, Section 1R20.

b. Findings

No findings of significance were identified.

1R23 Temporary Plant Modifications (71111.23)

a. Inspection Scope

For the temporary modifications listed below, the inspectors reviewed the Final Safety Analysis Report (FSAR), plant drawings, procedure requirements, and Technical Specifications to ensure that the four temporary modifications listed below were properly implemented. The inspectors: (1) verified that the modification did not have an affect on system operability/availability, (2) verified that the installation was consistent with the modification documents, (3) ensured that the postinstallation test results were satisfactory and that the impact of the temporary modification on permanently installed SSC's were supported by the test, (4) verified that the modifications were identified on control room drawings and that appropriate identification tags were placed on the affected drawings, and (5) verified that appropriate safety evaluations were completed. The inspectors verified the licensee identified and implemented any needed corrective actions associated with temporary modifications.

- Temporary containment opening
- SG removal and replacement
- Crane lifting and rigging preparations
- Containment building construction elevator

b. Findings

No findings of significance were identified.

2. RADIATION SAFETY

Cornerstone: Occupational Radiation Safety [OS]

2OS1 Access Control To Radiologically Significant Areas (71121.01)

a. Inspection Scope

This area was inspected to assess the licensee's performance in implementing physical and administrative controls for airborne radioactivity areas, radiation areas, high radiation areas, and worker adherence to these controls. The inspectors used the requirements in 10 CFR Part 20, the Technical Specifications, and the licensee's procedures required by Technical Specifications as criteria for determining compliance. During the inspection, the inspectors interviewed the radiation protection manager, radiation protection supervisors, and radiation workers. Additionally, using Inspection Procedure 71121.01, "Access Control to Radiologically Significant Areas," the inspectors reviewed activities associated with the SG and RV head replacement to fulfill the inspection requirements of Inspection Procedure 50001, "Steam Generator Replacement Inspection," and Inspection Procedure 71007, "Reactor Vessel Head Replacement Inspection." See NRC Inspection Report 05000313/05000368-2005005, Section 2OS1, for additional information.

b. Findings

No findings of significance were identified.

4. OTHER ACTIVITIES

4OA2 Identification and Resolution of Problems (71152)

.1 SG Replacement Inspection (50001)

a. Inspection Scope

The inspectors reviewed the daily condition report summaries and nonconformance reports issued during the replacement project for risk-significant issues to determine if the licensee was properly implementing the corrective action program. The inspectors verified that the licensee identified, evaluated, corrected, and trended in accordance with the program requirements. In addition, the inspectors reviewed the licensee's actions to identify and correct lessons learned from the Unit 2 SG replacement project.

b. Findings

No findings of significance were identified.

.2 RV Head Replacement Inspection (71007)

a. Inspection Scope

The inspectors reviewed the daily condition report summaries and nonconformance reports issued during the replacement project for risk-significant issues to determine if the licensee was properly implementing the corrective action program. The inspectors verified that the licensee identified, evaluated, corrected, and trended in accordance with the program requirements.

b. Findings

No findings of significance were identified.

4OA5 Other Activities

.1 SG Replacement Inspection (50001)

Design and Planning Inspections

a. Inspection Scope

The inspectors used the guidance in Inspection Procedure 50001, "Steam Generator Replacement Inspection," to perform the following SG design and planning inspection activities:

Engineering and Technical Support

Inspections to review engineering and technical support activities were performed prior to, and during, the SG replacement outage by resident and regional office-based specialist inspectors. The results of the inspection are documented in Sections 1R02, 1R17, and 1R23. See NRC Inspection Report 05000313/05000368-2005005, Sections 1R08 and 1R17, for additional activities performed as part of this review. This review verified that selected design changes and modifications to SSCs described in the FSAR were reviewed in accordance with 10 CFR 50.59. Additionally, key design aspects and modifications associated with the SG replacement were also reviewed.

Lifting and Rigging

Inspections to review engineering design, modification, and analysis associated with SG lifting and rigging activities were performed by resident and regional inspectors. This included: (1) crane and rigging equipment, (2) SG component drop analysis, (3) safe load paths, and (4) load lay-down areas.

Radiation Protection

The review of radiation protection program controls, planning, and preparation in: (1) as low as reasonably achievable (ALARA) planning, (2) dose estimates and tracking, (3) exposure and contamination controls, (4) radioactive material management,

(5) radiological work plans and controls, (6) emergency contingencies, and (7) project staffing and training plans is scheduled to be completed as part of the upcoming ALARA planning and controls inspection and documented in an upcoming integrated resident inspection report. Part of these activities were performed and are documented in Section 2OS1, as well as in NRC Inspection Report 05000313/05000368-2005005, Section 2OS1.

Additional Activities

Additional activities performed are documented in Attachment 2 which is designated and marked as "Security Related Information."

b. Findings

No findings of significance were identified.

SG Removal and Replacement Inspections

a. Inspection Scope

The inspectors used the guidance in Inspection Procedure 50001 to perform the following SG removal and replacement inspection activities:

Welding and Nondestructive Examination (NDE) Activities

Inspections were conducted to review welding and NDE activities including: (1) special procedures, (2) training and qualifications, (3) radiography results and work packages, and (4) completion of preservice NDE requirements for welds, and (5) completion of baseline eddy current examination of new SG tubes. This inspection was performed as part of Inspection Procedure 71111.08, "Inservice Inspection Activities," and was documented in NRC Inspection Report 05000313/05000368-2005005 in Section 1R08.

Lifting and Rigging

Inspections were conducted to review the preparations and procedures for rigging and heavy lifting including crane and rigging inspections, testing, equipment modifications, lay-down area preparations, and training for the following activities:

- Area preparation for the outside systems
- Manitoc 2250 crane assembly, operation
- Outside lift system
- Hatch transfer system
- Reactor cavity decking
- Temporary lifting device
- Upending device
- Old SG removal
- New SG placement
- Transport of old SGs to storage facility

Major Structural Modifications

The inspectors observed the implementation and reviewed documentation related to structural modifications to facilitate SG replacement, including the structural supports for the SG, the temporary RCS piping structural supports, and all attached piping during all phases of removal and installation of the SGs.

Containment Access and Integrity

The inspectors reviewed or observed the cutting of the containment wall, rebar mat and the liner plate to allow for the SGs to be removed and installed. Also, the inspectors observed the restoration of the containment opening and containment leakage testing. These activities were also performed under Inspection Procedures 70307, "Containment Integrated Leak Rate Test Procedure Review;" 70313, "Containment Integrated Leak Rate Test;" and 70323, "Containment Leak Rate Test Results Evaluation;" Sections 4OA5.2, 4OA5.3, and 4OA5.4, respectively.

Outage Operating Conditions

The inspectors observed the establishment of operating conditions, including (1) defueling; (2) RCS draindown; (3) system isolation; (4) safety tagging; (5) radiation protection controls; (6) controls for excluding foreign material; and (7) installation, use, and removal of temporary services. Section 1R20 contains additional activities that were performed. NRC Inspection Report 05000313/05000368-2005005, Section 1R20, also documents activities performed during the SG replacement outage.

Storage of Removed SGs

The inspectors observed the transport, storage, and radiological surveys of the removed SGs to the onsite storage facility. The radiological safety plans were also reviewed.

b. Findings

No findings of significance were identified.

Postinstallation Verification and Testing Inspections

a. Inspection Scope

The inspectors used the guidance in Inspection Procedure 50001 to perform the following postinstallation verification and testing inspection activities. Selective inspections were performed on the following areas: (1) containment testing, (2) licensee's postinstallation inspections and verifications program and its implementation, (3) RCS leakage testing and review of test results, (4) conduct of SG secondary side leakage testing and review of test results, (5) calibration and testing of instrumentation affected by SG replacement, (6) procedures required equipment performance testing to confirm the design and to establish baseline measurements, and (7) preservice inspection of new welds.

b. Findings

No findings of significance were identified.

.2 Containment Integrated Leak Rate Test Procedure Review (70307)

a. Inspection Scope

The inspectors reviewed the licensee's containment integrated leak rate test procedure to verify that the test complies with regulatory requirements, guidance, and licensee commitments to evaluate the technical adequacy to determine containment leak tight integrity. The inspectors ensured that the procedure contained sufficiently detailed guidance for: (1) the alignment and operation of all systems and equipment inside and penetrating containment, (2) inspections of the accessible portions of containment, (3) verification of equipment calibration, and (4) appropriate success criteria.

b. Findings

No findings of significance were identified.

.3 Containment Integrated Leak Rate Test Surveillance (70313)

a. Inspection Scope

The inspectors verified through observation, records review, and independent calculations whether the containment integrated leak rate test was being properly conducted. In addition, the inspectors independently verified the acceptability of the test results through real time observations and analysis and further indepth independent analysis. The inspectors: (1) ensured that the alignment and operation of all systems and equipment inside and penetrating containment was appropriate, (2) conducted inspections of the accessible portions of containment, (3) verified equipment calibration, and (4) ensured appropriate success criteria were being followed per the approved procedure.

b. Findings

No findings of significance were identified.

.4 Containment Leak Rate Test Results Evaluation (70323)

a. Inspection Scope

The inspectors verified through direct observation and records review that the licensee had adequately performed, reviewed, and evaluated the as-found and as-left containment integrated leak rate test. This review was to ensure that the containment building function was not impacted by the temporary opening which allowed for the replacement of the SGs and the RV head.

b. Findings

No findings of significance were identified.

.5 RV Head Replacement Inspection (71007)

Design and Planning Inspections

a. Inspection Scope

The inspectors used the guidance in Inspection Procedure 71007 to perform the following RV head design and planning inspection activities.

Engineering and Technical Support

Inspections were conducted by resident and regional office-based specialist inspectors to review engineering and technical support activities performed prior to, and during, the RV head replacement outage. The results of the inspection are documented in Sections 1R02, 1R17, and 1R23. See NRC Inspection Reports 05000313/05000368-2005004 and 05000313/05000368-2005005, Section 1R17, for additional activities performed as part of this review. This review verified that selected design changes and modifications to SSCs described in the FSAR for transporting the new and old RV heads were reviewed in accordance with 10 CFR 50.59. Additionally, key design aspects and modifications associated with the RV head replacement were also reviewed. Finally, the inspectors determined if the licensee had confirmed that the existing RV head conformed to design requirements and that there were no fabrication deviations from design requirements.

Lifting and Rigging

The inspectors reviewed engineering design, modification, and analysis associated with RV head lifting and rigging activities. This included: (1) crane and rigging equipment, (2) RV head component drop analysis, (3) safe load paths, and (4) load lay-down areas.

Radiation Protection

The review of radiation protection program controls, planning, and preparation in: (1) ALARA planning, (2) dose estimates and tracking, (3) exposure and contamination controls, (4) radioactive material management, (5) radiological work plans and controls, (6) emergency contingencies, and (7) project staffing and training plans is scheduled to be completed as part of the upcoming ALARA Planning and Controls inspection and documented in an upcoming integrated resident inspection report. Part of these activities were performed and are documented in Section 2OS1, as well as, in NRC Inspection Report 05000313/05000368-2005005, Section 2OS1.

Additional Activities

Additional activities performed are documented in Attachment 2 which is designated and marked as “Security Related Information.”

b. Findings

No findings of significance were identified.

RV Head Fabrication Inspections at Licensee Facility

a. Inspection Scope

The inspectors used the guidance in Inspection Procedure 71007 to perform the following RV head fabrication inspection activities.

Heat Treatment

The inspectors verified that the material heat treatment used to enhance the mechanical properties of the RV head material carbon, low alloy, and high alloy chromium steels is conducted per ASME code and approved vendor procedures consistent with the applicable ASME Code, Section III requirements. Also, inspections were performed to verify that adequate heat treatment procedures were available to assure that the following requirements were met: (1) furnace atmosphere, (2) furnace temperature distribution and calibration of measuring and recording devices, (3) thermocouple installation, (4) heating and cooling rates, (5) quenching methods, and (6) record and documentation requirements.

NDE

Inspections were conducted to ensure the manufacturing control plan included provisions for monitoring NDE to ascertain that the NDE was performed in accordance with applicable code, material specification, and contract requirements.

Welding

The inspectors reviewed the documentation for the weld overlay welding operations that established a layer of stainless steel cladding on the inside of the RV head to determine if it was accomplished per design. The inspectors also selected a sample of dome-to-flange and CRDM flange-to-nozzle welds and reviewed the following items: (1) certified mill test reports of the dome, flange, weld material rods, and CRDM nozzles; (2) certified mill test reports for the welding material for the RV head cladding; (3) cladding weld records, weld rod material control requisitions, traceability of weld material rods, weld procedure qualification, welder qualifications, and nonconformance reports; (4) CRDM nozzle cladding welding inspection records, weld rod material control requisitions, traceability of weld material rods, weld procedure qualification, welder qualifications, and nonconformance reports; (5) CRDM to nozzle welding and welds inspection records, weld rod material control requisitions, traceability of weld material rods, weld procedure qualification, welder qualifications, and non-conformance reports; and (6) NDE procedures, NDE records of the welds, NDE personnel qualifications, and certification of the NDE solvents.

Procedures

Inspections were completed to ensure that repair procedures had been established and that these procedures were consistent with applicable ASME Code, material specification, and contract requirements by verifying: (1) repair welding was conducted in accordance with procedures qualified to Section IX of the ASME Code, (2) all welders had been qualified in accordance with Section IX of the ASME Code, (3) records of the repair were maintained, and (4) that requirements had been established for the preparation of certified material test reports and that the records of all required examinations and tests were traceable to the procedures to which they were performed.

Code Reconciliation

The inspectors reviewed the required documentation, supplemental examinations, analysis, and ASME Code documentation reconciliation to ensure that the original ASME Code N-Stamp remains valid, and that the replacement head complies with appropriate NRC rules and industry requirements. The inspectors also ensured that the design specification was reconciled and a design report was prepared for the reconciliation of the replacement head, verifying that they were certified by professional engineers competent in ASME Code requirements.

Quality Assurance Program

Inspections were conducted to ensure that machining was carried out under a controlled system of operation, a drawing/document control system was in use in the manufacturing process, and that part identification and traceability was maintained throughout processing and was consistent with the manufacturer's QA program. In addition, the inspectors ensured that only the specified drawing and document revisions were available on the shop floor and were being used for fabrication, machining, and inspection.

Compliance Inspection

The inspectors verified that the original ASME Code, Section III, data packages for the replacement RV head were supplemented by documents included in the ASME Code Section XI, (preservice inspection) data packages; examined selected manufacturing and inspection records of the finished machined RV head; and verified compliance with applicable documentation requirements.

b. Findings

No findings of significance were identified.

RV Head Removal and Replacement Inspections

a. Inspection Scope

The inspectors used the guidance in Inspection Procedure 71007 to perform the following RV head removal and replacement inspection activities:

Lifting and Rigging

The inspectors reviewed preparations and procedures for rigging and heavy lifting including crane and rigging inspections, testing, equipment modifications, lay-down area preparations, and training for the following activities:

- Area preparation for the outside systems
- Manitoc 2250 crane assembly, operation
- Outside lift system
- Hatch transfer system
- Reactor cavity decking
- Temporary lifting device
- Upending device
- Old RV head removal
- New RV head placement
- Transport of old RV head to storage facility

Major Structural Modifications

The inspectors observed the implementation and reviewed documentation related to structural modifications to facilitate RV head replacement including increasing the rating of the polar crane from 150 tons to 190 tons to remove the engineered lift restrictions.

Containment Access and Integrity

The inspectors observed or reviewed the cutting of the containment wall, rebar mat, and the liner plate to allow for the RV head to be removed and installed. Also, restoration of the containment opening and containment leakage testing was observed. These activities were also performed under Inspection Procedures 70307, 70313, and 70323, see Sections 4OA5.2, 4OA5.3, and 4OA5.4, respectively.

Outage Operating Conditions

The inspectors reviewed and observed the establishment of operating conditions including: (1) defueling; (2) RCS draindown; (3) system isolation; (4) safety tagging; (5) radiation protection controls; (6) controls for excluding foreign material; (7) controls regarding the suitability of reinstalled (reused) components for use; and (8) the installation, use, and removal of temporary services. Section 1R20 contains additional activities that were performed. NRC Inspection Report 05000313/05000368-2005005, Section 1R20, also documents activities performed during the RV head replacement outage.

Storage of Removed RV Head

The inspectors observed the transport, storage, and radiological surveys of the removed RV head to the onsite storage facility. The radiological safety plans were also reviewed.

b. Findings

No findings of significance were identified.

Postinstallation Verification and Testing Inspections

a. Inspection Scope

The inspectors used the guidance in Inspection Procedure 71007 to perform the following postinstallation verification and testing inspection activities. Selective inspections were performed of the following areas: (1) containment testing, (2) licensee's postinstallation inspections and verifications program and its implementation, (3) RCS leakage testing and review of test results, (4) procedures required for equipment performance testing to confirm the design and to establish baseline measurements, and (5) preservice inspection of new welds.

b. Findings

No findings of significance were identified.

4OA6 Meetings, Including Exit

The inspectors presented the inspection results to Mr. J. Forbes, Vice President, Operations, and other members of the licensee's management staff on January 10, 2006. The licensee acknowledged the findings presented. The inspectors noted that while proprietary information was reviewed, none would be included in this report.

ATTACHMENTS: SUPPLEMENTAL INFORMATION AND SECURITY RELATED INFORMATION

## SUPPLEMENTAL INFORMATION

## KEY POINTS OF CONTACT

Licensee Personnel

D. Adams, Engineer, Civil
R. Barnes, Manager, Planning and Scheduling
S. Bennett, Project Manager, Licensing
B. Berryman, Manager, Unit 1 Operations
A. Buford, Engineer, SG
B. Butzlaff, Quality, RV Head/SG Replacement Project
K. Dixon, Engineer, SG
J. Eichenberger, Manager, Corrective Actions and Assessments
M. Farmer, Unit 1 Operations
N. Finney, Technical Specialist IV, Non-Destructive Examination
J. Forbes, Vice President, Operations
M. Gohman, Unit 1 Operations
B. Graham, Manager Assistant, RV Head/SG Replacement Project
A. Hawkins, Licensing Specialist
M. Higgins, Manager, Security
J. Hoffpauir, Manager, Maintenance
L. Humphrey, Fabrication Lead, RV Head/SG Replacement Project
D. James, Manager, Licensing
W. James, Manager, Alloy 600 Group
J. Kowalewski, Director, Engineering
J. Miller, Manager, Systems Engineering
T. Mitchell, General Manager, Plant Operations
D. Moore, Manager, Radiation Protection
T. Morrison, Installation Manager, RV Head/SG Replacement Project
K. Nichols, Manager, Design Engineering
S. Pyle, Licensing Specialist
L. Rushing, Fabrication Manager, RV Head/SG Replacement Project
C. Reasoner, Manager, Engineering Programs and Components
R. Scheide, Licensing Specialist
C. Tyrone, Manager, Quality Assurance
B. Williams, Director, RV Head/SG Replacement Project
G. Woerner, Engineering Supervisor, RV Head/SG Replacement Project

## LIST OF ITEMS OPENED, CLOSED, AND DISCUSSED

Opened and Closed

None

Closed

None

Discussed

None

## LIST OF DOCUMENTS REVIEWED

In addition to the documents referred to in the inspection report, the following documents were selected and reviewed by the inspectors to accomplish the objectives and scope of the inspection and to support any findings:

Calculations

| | | | |
|---|---|---|---|
| 198 | 020538 E101-01 | 020538 E101-05 | 020538 E101-09 |
| | 020538 E101-02 | 020538 E101-06 | 020539 E101-03 |
| 11406-014 | 020538 E101-03 | 020538 E101-07 | 021381 E101-68 |
| | 020538 E101-04 | 020538 E101-08 | |

Condition Reports

| | | | |
|---|---|---|---|
| ANO-1-2004-2097 | ANO-1-2005-1748 | ANO-1-2005-2149 | ANO-1-2005-2687 |
| ANO-1-2005-0014 | ANO-1-2005-1751 | ANO-1-2005-2162 | ANO-1-2005-2717 |
| ANO-1-2005-0153 | ANO-1-2005-1776 | ANO-1-2005-2166 | ANO-1-2005-2739 |
| ANO-1-2005-0274 | ANO-1-2005-1795 | ANO-1-2005-2169 | ANO-1-2005-2756 |
| ANO-1-2005-0408 | ANO-1-2005-1799 | ANO-1-2005-2187 | ANO-1-2005-2786 |
| ANO-1-2005-0439 | ANO-1-2005-1820 | ANO-1-2005-2189 | ANO-1-2005-2798 |
| ANO-1-2005-0688 | ANO-1-2005-1821 | ANO-1-2005-2229 | ANO-1-2005-2832 |
| ANO-1-2005-1122 | ANO-1-2005-1829 | ANO-1-2005-2232 | ANO-1-2005-2833 |
| ANO-1-2005-1140 | ANO-1-2005-1852 | ANO-1-2005-2233 | ANO-1-2005-2853 |
| ANO-1-2005-1231 | ANO-1-2005-1853 | ANO-1-2005-2254 | ANO-1-2005-2931 |
| ANO-1-2005-1240 | ANO-1-2005-1879 | ANO-1-2005-2256 | ANO-1-2005-2999 |
| ANO-1-2005-1243 | ANO-1-2005-1881 | ANO-1-2005-2258 | ANO-1-2005-3000 |
| ANO-1-2005-1279 | ANO-1-2005-1887 | ANO-1-2005-2260 | ANO-1-2005-3021 |
| ANO-1-2005-1319 | ANO-1-2005-1946 | ANO-1-2005-2283 | ANO-1-2005-3072 |
| ANO-1-2005-1322 | ANO-1-2005-1954 | ANO-1-2005-2295 | ANO-C-2005-1627 |

| | | | |
|---|---|---|---|
| ANO-1-2005-1330 | ANO-1-2005-1982 | ANO-1-2005-2308 | ANO-C-2005-1628 |
| ANO-1-2005-1351 | ANO-1-2005-1994 | ANO-1-2005-2348 | ANO-C-2005-1796 |
| ANO-1-2005-1355 | ANO-1-2005-2003 | ANO-1-2005-2373 | ANO-C-2005-1798 |
| ANO-1-2005-1365 | ANO-1-2005-2026 | ANO-1-2005-2375 | ANO-C-2005-2012 |
| ANO-1-2005-1397 | ANO-1-2005-2048 | ANO-1-2005-2378 | ANO-C-2005-2024 |
| ANO-1-2005-1400 | ANO-1-2005-2049 | ANO-1-2005-2383 | ANO-C-2005-2056 |
| ANO-1-2005-1408 | ANO-1-2005-2052 | ANO-1-2005-2390 | ANO-C-2005-2081 |
| ANO-1-2005-1419 | ANO-1-2005-2065 | ANO-1-2005-2467 | ANO-C-2005-2173 |
| ANO-1-2005-1426 | ANO-1-2005-2089 | ANO-1-2005-2470 | ANO-C-2005-2258 |
| ANO-1-2005-1434 | ANO-1-2005-2093 | ANO-1-2005-2474 | ANO-C-2005-2260 |
| ANO-1-2005-1444 | ANO-1-2005-2106 | ANO-1-2005-2490 | ANO-2-2005-2282 |
| ANO-1-2005-1456 | ANO-1-2005-2117 | ANO-1-2005-2511 | ANO-2-2005-2305 |
| ANO-1-2005-1487 | ANO-1-2005-2124 | ANO-1-2005-2535 | ANO-2-2005-2312 |
| ANO-1-2005-1587 | ANO-1-2005-2131 | ANO-1-2005-2537 | ANO-2-2005-2391 |
| ANO-1-2005-1636 | ANO-1-2005-2135 | ANO-1-2005-2646 | |
| ANO-1-2005-1671 | ANO-1-2005-2140 | ANO-1-2005-2661 | |
| ANO-1-2005-1674 | ANO-1-2005-2146 | ANO-1-2005-2670 | |

Engineering Requests

| | | | |
|---|---|---|---|
| 980080 R305 | ANO-2002-1078-010 | ANO-2002-1078-019 | ANO-2002-1381-004 |
| ANO-2002-0638-000 | ANO-2002-1078-011 | ANO-2002-1078-020 | ANO-2002-1381-005 |
| ANO-2002-0639-000 | ANO-2002-1078-012 | ANO-2002-1078-021 | ANO-2002-1381-006 |
| ANO-2002-0640-000 | ANO-2002-1078-013 | ANO-2002-1078-022 | ANO-2002-1381-007 |
| ANO-2002-1078-006 | ANO-2002-1078-014 | ANO-1078-2002-023 | ANO-2002-1381-008 |
| ANO-2002-1078-007 | ANO-2002-1078-015 | ANO-2002-1078-025 | ANO-2002-1381-009 |
| ANO-2002-1078-008 | ANO-2002-1078-017 | ANO-2002-1381-000 | ANO-2003-0954-000 |
| ANO-2002-1078-009 | ANO-2002-1078-018 | ANO-2002-1381-003 | ANO-2005-0853-000 |

Miscellaneous

ANO-1, Fifteenth Year Tendon Surveillance - Evaluation in Response to US NRC Comments Regarding Horizontal Tendons Lift-Off Values, May 1989

ANO-1 SGT, Quality Execution Procedures

ANO-M-561, ANO-1 Reactor Vessel Closure Head Forging, Revision 0

ANO-M-565, ANO-1 Replacement Reactor Vessel Closure Head and Service Structure, Revision 1

ASLP-RPCT-0504, Radiation Protection Continuing Training - 1R19 Locked High Radiation Area Control Plan

BUQMAK/NCC1000, Arkansas Reactor Vessel Closure Head Replacement Quality Plan, Revision 1

COZLAK/NCC0001, Nondestructive Examination Program Plan, Revision A

Entergy Contract NHC00713 with change orders through 2

Entergy Contract 10008705 with change orders through 6

FN1-3055, Technical Manufacturing Program for Closure Forging, Revision E

Nondestructive Examination Personnel Qualification Reports for 9 Individuals

NRC Information Notice 99-10: Degradation of Prestressing Tendon Systems in Prestressed Concrete Containments, April 13, 1999

NRC Regulatory Guide 1.35.1, Determining Prestressing Forces for Inspection of Prestressed Concrete Containments, July 1990

Preservice RPVH Penetration Unit 1 Replacement Head Penetration Ultrasonic Examination Report, May 2004

QC-00005037, ANO Unit 1 Reactor Vessel Head Data Package, Revision 0

Radiographic Reports of the Control Rod Drive Mechanism Housing Welds

Unit 1 Mausoleum Radiological Survey Data, October 26 through November 5, 2005

Video of ANO Unit 1 SGR Alpha Hot Leg FOSAR

Welder Performance Qualification Reports - 13 records

Welding Procedure Qualification Reports - 2 records

03-9005544, Vendor FANP Procedure ANO SGR Alpha Hot Leg FOSAR Plan, Revision 2

08-5017445-05, Design Specification, Revision 5

18-1173987-04, Functional Specification, Revision 4

23-5041654-02, Quality Assurance Data Package, Revision 2

23-5063672-01, Quality Assurance Data Package, Revision 1

23-5063673-01, Quality Assurance Data Package, Revision 1

33-5018274-00, ASME Design Report, Revision 0

51-5028959-03, ANO-1 Replacement Reactor Vessel Closure Head Reconciliation, Revision 3

Operating Procedures

| Number | Title | Revision |
|---|---|---|
| EN-LI-101 | 10 CFR 50.59 Review Program | 7 |
| EN-LI-102 | Corrective Action Program | 3 |
| EN-LI-120 | Safety Review Committee | 0 |
| EN-OM-119 | On-Site Safety Review Committee | 0 |
| ENS-DC-105 | Configuration Management | 2 |
| ENS-DC-112 | Engineering Request and Project Initiation Process | 4 |
| ENS-DC-115 | ER Response Development | 6 |
| 1015.036 | Containment Building Closeout | 11 |
| 1203.025 | Natural Emergencies | 20 |
| 1502.004 | Control of Unit 1 Refueling | 34 |
| 5000.009 | Repair/Replacement Program Administration | 4 |
| 5120.400 | Unit One Integrated Leak Rate Test | 3 |
| 5120.400 | Unit One Integrated Leak Rate Test, Supplement 1 | 12/24/2005 |
| 5120.400 | Unit One Integrated Leak Rate Test, Supplement 1 | 12/25/2005 |
| 5220.011 | ANO 1& 2 Containment Building Tendon Surveillance and Concrete Inspection | 3 |

## LIST OF ACRONYMS

| | |
|---|---|
| ALARA | as low as reasonably achievable |
| ANO | Arkansas Nuclear One |
| CFR | *Code of Federal Regulations* |
| CRDM | control rod drive mechanism |
| FSAR | Final Safety Analysis Report |
| NDE | nondestructive examination |
| RCS | reactor coolant system |
| RV | reactor vessel |
| SG | steam generator |
| SSC | structures, systems, and components |