ENCLOSURE

U.S. NUCLEAR REGULATORY COMMISSION
REGION IV

Docket Nos.:	50-368
License Nos.:	NPF-6
Report No.:	50-368/98-17;72-13/98-01
Licensee:	Entergy Operations, Inc.
Facility:	Arkansas Nuclear One Unit 2
Location:	Junction of Hwy. 64W and Hwy. 333 South Russelville, Arkansas
Dates:	September 14 - 18, 1998
Inspector(s):	J. Vincent Everett, Sr., Radiation Specialist Fuel Cycle and Decommissioning Branch Division of Nuclear Materials Safety Michael T. Anderson, Consultant Lockheed Martin Idaho Technologies Company
Accompanied By:	Ross A. Scarano, Director Division of Nuclear material Safety
Approved By:	Dr. D. Blair Spitzberg, Chief Fuel Cycle and Decommissioning Branch Division of Nuclear Materials Safety

EXECUTIVE SUMMARY

Arkansas Nuclear One Unit 2
NRC Inspection Report 50-368/98-17; 72-13/98-01

On September 4, 1998, Arkansas Nuclear One (ANO) was given authority by the Nuclear Regulatory Commission to begin loading additional spent fuel into storage casks for placement at the Independent Spent fuel Storage Installation (ISFSI) located within the protected area of the ANO site. ANO had previously loaded four casks, which were currently being stored at the ISFSI. Due to concerns related to weld cracking, the NRC imposed restrictions on May 16, 1997, concerning loading additional VSC-24 storage casks sold by Sierra Nuclear Corporation. As a result of extensive analysis and evaluation, coupled with NRC inspections at the vendor shops and three reactor sites, the NRC determined on September 4, 1998, that the corrective actions identified by Sierra Nuclear Corporation and ANO were sufficient to resolve the weld cracking problem. On September 13, 1998, ANO initiated the loading of a fifth cask with Unit 2 spent fuel. The NRC conducted an inspection of the loading operations to verify that the corrective actions identified had been incorporated into ANO procedures and were being effectively implemented. The NRC found that procedure changes were complete and the ANO staff was knowledgeable of and understood the basis for the changes. NRC observation of the loading of the fifth cask, the welding of the lids, and the implementation of the new ultrasonic testing (UT) technique provided good assurance of the integrity of the welds. Examination of the ultrasonic test data indicated that the structural lid weld was of very high quality.

Annual Inspection of the ISFSI

- The licensee was completing the required surveillances for the ISFSI in accordance with the Technical Specifications in the VSC-24 Certificate of Compliance. Four casks were located on the ISFSI pad. The casks were properly roped off and posted. Radiological surveys indicated dose rates of less than 1 mR/hr in the general area around the casks with radiation levels as high as 38 mR/hr at the cask air inlet screens. Environmental TLD data measured an annual dose rate of 4300 mrem at the edge of the pad near the four casks (Section 1).

- Safety evaluations were being performed by the licensee related to both ISFSI operations and the loading of additional casks. Of the safety screenings and evaluations reviewed, no issues or concerns were identified (Section 1).

Observation of Cask Loading Activities

- The loading of the fifth cask at ANO was observed during this inspection. The licensee completed the required procedural activities and Technical Specification compliance requirements for the VSC-24 Certificate of Compliance. Work was performed safely. Radiation controls were effectively established and implemented (Section 2).

Assessment of Licensee Improvements to Welding Process

- Welding methods and nondestructive examination results for both the shield and structural lid welds were found to be acceptable. In particular, the UT data showed only a limited number of minor imperfections in the structural lid weld. For this reason, the inspection team concluded that process improvements implemented by the licensee resulted in excellent weld quality and provide reasonable assurance of the structural integrity of VSC-24 (Section 3).

Confirmation of Commitments Incorporated into the ANO Program

- On July 22, 1998, the NRC issued a letter to Sierra Nuclear Corporation which closed Confirmatory Action Letter 97-7-001. This letter incorporated a number of required changes to be made to the Certificate of Compliance for the VSC-24 cask. A review of the ANO program was completed against these new requirements. The licensee had incorporated the requirements into site procedures and was observed implementing the requirements during the loading of the fifth cask at ANO (Section 4).

Closure of Open items and Violations

- Seven open items were closed during this inspection. Only one open item remains concerning the evaluation of the first four casks loaded to verify the integrity of the structural lid welds (Section 5).

Report Details

Summary of Plant Status

Beginning in December 1996, Arkansas Nuclear One (ANO) began loading spent fuel into VSC-24 dry casks for storage at the ISFSI located within the protected area of the ANO nuclear site. By April 1997, four casks had been loaded. During the loading of the four casks, cracks on the shield lid welds had been detected and repaired on the first and third casks. In addition, a crack in a weld was detected on a VSC-24 cask during loading at another nuclear facility. As a result of concerns raised by the NRC over the weld cracking issue, Confirmatory Action Letters (CALs) were issued on May 16, 1997, to Sierra Nuclear, the vendor of the VSC-24 cask, and the nuclear power plants loading the casks. Loading of casks was suspended as part of the condition of the CALs.

Between May 1997 and September 1998, considerable effort was expended by all involved parties to resolve the concern over the weld cracking issue. On September 4, 1998, the NRC closed the CAL for ANO, which allowed ANO to resume loading casks. On September 13, 1998, ANO initiated loading of the fifth cask with Unit 2 fuel.

1 Annual Inspection of the ISFSI (60855)

1.1 Inspection Scope

Four casks had been placed in the ISFSI at ANO. The Technical Specifications in the Certificate of Compliance for the VSC-24 casks and ANO procedures contained surveillance and inspection requirements for the casks and ISFSI. Compliance with selected requirements was reviewed.

1.2 Observations and Findings

Technical Specification 1.3.1, "Visual Inspection of Air Inlets and Outlets," required daily surveillance of the wire mesh screens covering the air inlets and outlets. During the tour of the ISFSI pads, the screens were observed to be free of obstructions and in good condition. The daily surveillance records for 1997 through August 31, 1998, were reviewed and found to adequately document the daily surveillance of the screens.

Technical Specification 1.3.2, "Exterior VCC Surface Inspection," required the cask's external surface to be inspected annually for any damage. During the tour of the ISFSI, the casks were observed to be in good physical condition with no indication of weathering or degradation. The licensee had documented minor concrete chipping near one of the air inlets and had concluded that the damage did not affect the performance or safety of the cask. The pad and surrounding soil condition were also observed to be in good condition.

Technical Specification 1.3.4, "Cask Thermal Performance," required daily temperature measurements of the cask. The January 1997 through August, 1998, daily surveillance records were reviewed. No unusual temperature measurements were observed.

Temperature measurements were made during each shift. During July and August 1998, the highest cask temperatures were recorded. With an ambient temperature of 101 degrees F, a reading of 121 degrees F was recorded on one of the casks. This value was an average of the four thermocouple readings on the outlet vents.

The licensee conducted biweekly radiological surveys of the ISFSI pad. The area around the four casks stored on the pad was roped and posted as a radioactive material area and radiation area. A radiation work permit was established for entry into the roped off area. Selected radiological surveys for 1997 through July 1998 were reviewed. Radiation levels at the roped off area ranged from 0.2 to 0.6 mR/hr. Inside the roped off area, general radiation levels were less than 1 mR/hr. Radiation levels at the vents ranged from 8 to 38 mR/hr. On top of the casks, contact radiation levels ranged from 18 to 36 mR/hr. Neutron radiation was detected on the top of the casks, at levels below 1 mrem/hr. No contamination had been found on the pad or casks.

A thermoluminescent dosimeter (TLD) was located at the edge of the ISFSI pad within 3 feet of a cask. The data for the TLD was reviewed. Prior to placement of any casks on the pad, the background radiation levels were 18 mrem/quarter. For the 12-month period between the second quarter of 1997 through the first quarter 1998, a total dose at this TLD location was 4377 mrem. Subtracting out background, this represents an annual dose of approximately 4300 mrem above background with four casks placed on the pad.

A review of safety evaluations performed since the beginning of 1997 was completed. Most of the safety evaluations were related to the ongoing loading of casks as opposed to the annual operations of the ISFSI. During the time period between January 1997 and August 1998, 182 safety evaluation screenings were conducted which concluded that a 10 CFR 72.48 review was not required. Documentation for ten of the screenings was reviewed.

- inspection of multisealed basket (MSB) component, dated 11/5/97
- fuel handling and radwaste ventilation system, dated 11/20/97
- operation of fuel handling equipment, dated 3/24/97
- VSC, Safety Analysis Report (SAR), and fabrication specification for MSB, dated 4/21/97
- MSB vessel wall inspection by acid etching, dated 6/11/97
- ANO MSB valve cover weld tolerance conformance, dated 10/2/97
- exclude all 1053 series procedures and 1000.028 from 50.59/72.48 reviews, dated 8/13/98
- dry fuel equipment preparation, dated 8/6/98
- spent fuel removal and dry storage operations, dated 8/26/98
- inspection of MSB components, dated 6/1/98

The conclusions reached by the licensee concerning the above noted screening evaluations were appropriate.

The licensee determined that 15 issues had been identified that required evaluation in accordance with 10 CFR 72.48. Of these, the following six were reviewed.

- ANO VCC-24-03 base plate/storage pad gap, dated 2/12/97
- ANO VCC ground strap screen penetration DC No. ANO-150, dated 4/6/97
- ANO VCC-24-06 air inlet concrete damage "Use As Is," dated 4/6/97
- preheat-post weld soak, nondestructive examination and hydrogen control requirements for MSB lid welds, dated 9/8/97
- ANO MSB bottom plate flatness out-of-tolerance "Use as Is," AMSB-2, 7, and 12, dated 2/3/98
- removal of external restraints for L-3 and 2L-35 cranes, dated 6/12/98

The safety evaluations appeared to be comprehensive and effectively addressed the issues identified. No concerns were identified during the review of the safety evaluations.

1.3 Conclusion

The licensee was completing the required surveillances for the ISFSI in accordance with the Technical Specifications in the VSC-24 Certificate of Compliance. Four casks were located on the ISFSI pad. The casks were properly roped off and posted. Radiological surveys indicated dose rates of less than 1 mR/hr in the general area around the casks with radiation levels as high as 38 mR/hr at the cask air inlet screens. Environmental TLD data measured an annual dose rate of 4300 mrem at the edge of the pad near the four casks.

Safety evaluations were being performed by the licensee related to both ISFSI operations and the loading of additional casks. Of the safety screenings and evaluations reviewed, no issues or concerns were identified.

2 Observation of Cask Loading Activities (60855)

2.1 Inspection Scope

Loading of the fifth cask was initiated by the licensee on September 13, 1998. This inspection included observation of activities associated with cask loading, including verification of compliance with selected Certificate of Compliance Technical Specifications and effective implementation of health physics controls.

2.2 Observations and Findings

The fifth cask loaded by ANO consisted of Unit 2 fuel. Heat load was calculated to be 10.8 kw. This was well below the 24 kw limit specified in Technical Specification 1.2.1.

Water temperature in the cask was measured at 86.8 degrees F when the cask was raised out of the spent fuel pool. Time to drain was calculated to be 104 hours based on the formula in the current Certificate of Compliance. The new calculation method specified in Appendix D to the July 22, 1998, letter from the NRC to Sierra Nuclear Corporation required consideration of the initial pool temperature on drain time. ANO committed to use the most conservative time calculation with consideration taken for the initial temperature of the water in the cask when it was removed from the spent fuel pool. When considering the effect of the initial water temperature in the cask, the calculated time to drain was reduced to 92.7 hours.

ANO performed periodic temperature measurements, typically every 6 hours, to confirm that cask water temperature remained below boiling. After 20 hours, the water temperature had stabilized at approximately 105 degrees F. Based on the equation from Appendix D of the July 22, 1998, letter, the time to drain was calculated to be 125 hours from the time of the sample. The time to drain estimate continued to increase as the temperature stabilized. After approximately 48 hours, the water temperature was 106 degrees F and the time to drain was calculated as 262 hours. After 70 hours, the cask temperature had reached 109 degrees F. During the inspection period of Monday through Thursday, the cask water temperature had not exceeded 110 degrees F. The cask was drained on September 18, 1998 after 89 hours, meeting the initial 92.7 hour time limit. During the draining of the cask, one water sample was measured at 146 degrees F.

Boron levels in the water in the cask were monitored throughout the work effort as required by Technical Specification 1.2.6. This Technical Specification required water boron levels to be maintained above 2850 parts/million (ppm). The licensee conducted boron sampling every 6 hours utilizing two independent samples. For the period of September 14 -17, 1998, the sample results exceeded the minimum boron levels for all samples taken. Typical levels were between 2950 to 3000 ppm.

Health physics practices during the cask loading activities were observed to be effectively implemented. Health physics personnel monitored activities, implemented various ALARA strategies, and were very knowledgeable of the radiation levels in the areas where work was underway. Surveys were routinely taken and personnel were kept informed of radiological conditions. The following table provides examples of the gamma radiation levels for the cask during certain stages of work. The neutron doses were less than 1 mrem/hr when the cask was filled with water. With the cask drained, neutron dose rates increased to 6 mrem/hr. The neutron doses were not a radiological concern during the loading of this cask. The licensee recognized that future casks with higher heat loads may have more significant neutron dose rates.

CONDITION	CONTACT GAMMA
shield lid after cask raised from pool and cask full of water	38 mR/hr
shield lid with 75 gallons of water drained from cask	159 mR/hr
shield lid with 99 gallons of water drained from cask	280 mR/hr
structural lid with 30 gallons of water drained from cask	3.4 mR/hr
structural lid with 55 gallons of water drained from cask	18 mR/hr
structural lid with cask half drained	20 mR/hr
structural lid with all water drained	20 mR/hr

The dose rates in the gap between the MSB and the transfer cask went from 25 mR/hr with the shims in place and the cask full of water to 260 mR/hr with the water drained and the shims removed. Dose rates in the work area around the cask were typically a few mR/hr. With the water removed from the cask, dose rates around the cask trunnions were 25 to 40 mR/hr gamma and 2 mrem/hr neutron. The total dose accumulated for the work effort through the welding of the shield lid and structural lid was 370 mrem.

A number of positive observations were made by the inspectors during the work associated with the cask loading. Procedures were being followed and sign-off of required activities was being completed. Time dependent activities were being tracked and completed. Monitoring to detect the presence of hydrogen was conducted during the welding of the shield lid. An effective foreign material exclusion program was being implemented and personnel were monitored to ensure compliance. Cask pre-heat and post-heat temperatures were monitored to ensure the required time frames were being met. Health physics personnel were actively involved with all work activities around the cask and were constantly observing personnel to ensure they were staying in low dose rate areas.

2.3 Conclusion

The loading of the fifth cask at ANO was observed during this inspection. The licensee completed the required procedural activities and Technical Specification compliance requirements for the VSC-24 Certificate of Compliance. Work was performed safely. Radiation controls were effectively established and implemented.

3 Assessment of Licensee Improvements to Welding Process (60855)

3.1 Inspection Scope

Welding and nondestructive examination activities implemented for the shield and structural lid welds on the VSC-24 cask loaded during this inspection were observed to assess whether the licensee's improvements to the welding process were effective in ensuring structural integrity of the welds.

3.2 Observations and Findings

The inspection team observed that specific welding enhancements committed to by the Sierra Nuclear Owners Group were properly implemented at ANO. These included: (1) pre-heating the weld to a minimum of 200 degrees F and maintaining interpass temperatures, (2) using low hydrogen filler material, (3) using a staggered welding sequence to limit constraint, and (4) completing post-weld hold times to allow hydrogen dissolution.

The inspectors reviewed procedure SI-UT-105, Revision 3, "Time-of-Flight Ultrasonic Examination of VSC-24 Dry Fuel Storage Cask Structural Lid-to-Shell Weld," dated 8/25/98. This was an ultrasonic testing procedure developed by the licensee's vendor and demonstrated to be acceptable to the NRC staff during an earlier inspection.

The team reviewed the personnel qualifications for the licensee's vendor (Structural Integrity Associates, Inc.) who performed the ultrasonic testing (UT) on the structural lid weld. Documentation packages included resumes, general UT certifications, specialized dry fuel storage cask training records, and Electric Power Research Institute performance demonstration certifications for each UT examiner. The inspectors determined that the UT examiner qualifications satisfy the commitments made by the licensee, as defined in the inspection guidelines document, "Guideline Requirements for The Time-Of-Flight Diffraction Ultrasonic Examination of The VSC-24 Structural Lid to Shell Weld," Revision 5, dated August 1998.

The UT data acquired on the structural lid weld was reviewed. The data showed the presence of approximately 40 minor imperfections located intermittently along the weld circumference. The weld anomalies, with a few exceptions, tended to occur in a mid-wall location on the lid side of the weld. All indications were found to meet the initial flaw screening acceptance criteria.

3.3 Conclusions

Welding methods and nondestructive examination results for both the shield and structural lid welds were found to be acceptable. In particular, the UT data showed only a limited number of minor imperfections in the structural lid weld. For this reason, the inspection team concluded that process improvements implemented by the licensee resulted in excellent weld quality and provide reasonable assurance of the structural integrity of VSC-24.

4 Confirmation of Commitments Incorporated into the ANO Program (60855)

4.1 Inspection Scope

The July 22, 1998, letter from the NRC to Sierra Nuclear Corporation which closed CAL 97-7-001, incorporated a number of changes required for the Certificate of Compliance for the VSC-24 cask. During this inspection, a review was completed of selected corrective actions applicable to the loading of the fifth cask at ANO to verify incorporation of the actions into the ANO program.

4.2 Observation and Findings

Appendix C of the July 22, 1998, letter from the NRC to Sierra Nuclear Corporation listed 10 required changes to the VSC-24 Safety Analysis Report (SAR). A review of each of these changes against the licensee's program was completed.

SAR Change No. 1 required the examination of the MSBs to verify that no flaws or defects existed in the top 4 inches of the cask. The licensee initiated the required examination of the unloaded casks. This effort was observed by the NRC and documented as adequate in Inspection Report No. 72-013/97-215.

SAR Change No. 2 required the shield lid and structural lid to be tack welded in such a way as to prevent movement of the lids and better distribute shrinkage forces from cooling of the weld. The licensee incorporated the requirement for large tack welds and a balanced weld sequence into Procedure 1302.025, Revision 9, Step 9.1.1.A. The process established by the licensee was discussed with the welders prior to welding. The welders understood the purpose of the new requirements and the changes necessary to the welding process for the lids.

SAR Change No. 3 required the water level inside the MSB to be drained sufficiently below the shield lid to prevent water contamination of the weld. The licensee incorporated a requirement into Step 9.2.55 of Procedure 1302.025 to drain 75 gallons of water from the cask prior to welding. Completion of this action was verified by reviewing the sign-off of Procedure 1302.025. Radiological dose rates were documented as being higher by the radiation protection staff after the water was removed. Radiation levels increased from 38 mR/hr to 159 mR/hr.

SAR Change No. 4 required the air space below the shield lid to be vented and monitored for hydrogen in accordance with commitments made in response to Bulletin 96-04 "Chemical, Galvanic, or Other Reactions in Spent Fuel Storage and Transportation Casks." The licensee had responded to Bulletin 96-04 on June 21, 1996, and committed to maintain an air flow through the air gap under the shield lid through the welding of the root pass and nondestructive examination acceptance of the weld. If hydrogen levels were detected equal to or above 10 per cent of the lower explosive limit of hydrogen, welding would be stopped. The licensee incorporated this requirement into Procedure 1302.025, Step 9.2.64, including Notes 1 and 2 of that step. Monitoring the gap below the shield lid for hydrogen was observed by the inspectors during the welding of the shield lid.

SAR Change No. 5 required the shield lid and structural lid welds to be preheated to 200 degrees F. The licensee incorporated this change into Procedure 1302.025, Step 9.1.1.B. Readouts for the thermocouples were monitored by the inspectors prior to welding.

SAR Change No. 6 required the welds for the shield lid and structural lid to use weld consumables of low hydrogen levels. This requirement was incorporated into Procedure 1302.025, Step 9.1.1.D. The weld consumables used by the licensee and the controls for ensuring the correct material was used was discussed with the welders and found acceptable.

SAR Change No. 7 required a post heat temperature of 200 degrees F to be maintained for a minimum of 1 hour after completion of the final weld pass. The licensee incorporated this change into Procedure 1302.025, Step 9.1.1.C. Post weld heating was confirmed for the shield lid.

SAR Change No. 8 required the addition of a volumetric weld examination for the structural lid. This new requirement involved a technique called "time-of-flight diffraction ultrasonic examination." The licensee incorporated this requirement into Procedure 1302.025, Step 6.1.33 and developed a new Procedure 1415.056, "TOFD Ultrasonic Examination of MSB Structural Lid-To-Shell Welds," Revision 0. A significant portion of this inspection was directed toward the review of this technique, qualification of the examiners, observation of the ultrasonic test, and review of the test data. The program being implemented by the licensee was found to be acceptable.

SAR Change No. 9 required the use of the new drain time concept described in Appendix D of the July 22, 1998, letter. The licensee had incorporated the new technique into Procedure 1302.025 as Step 9.2.29 and Attachment 11. The licensee took water samples every 6 hours and continued to monitor progress of work activities against tne drain time limit.

SAR Change No. 10 required the minimum temperature of the MSB during movement in the ventilated storage cask, as specified in Technical Specification 1.2.13 "Minimum Temperature for Moving the MSB," to be increased from 0 degrees F to 30 degrees F. The licensee had incorporated this change into Procedure 1302.025, Step 6.1.11.

Appendix D to the July 22, 1998, letter established new requirements for the nondestructive examination of the MSB shield and structural lid welds. Two required actions were identified as required if the liquid penetrant test indicated that the weld was unacceptable. Both required actions had been incorporated by the licensee into Procedure 1415.056, Steps 5.5.2 D and 5.5.2.E. In addition, Appendix D established four required actions if indications were found as the result of the ultrasonic testing. These requirements had been incorporated by the licensee into Procedure 1415.056, Steps 5.5.2.A, 5.5.2.B, 5.5.2.D, and 5.5.2.E.

4.3 Conclusion

On July 22, 1998, the NRC issued a letter to Sierra Nuclear Corporation which closed CAL 97-7-001. This letter incorporated a number of required changes to be made to the Certificate of Compliance for the VSC-24 cask. A review of the ANO program was completed against these new requirements. The licensee had incorporated the requirements into site procedures and was observed implementing the requirements during the loading of the fifth cask at ANO.

5 Closure of Open Items and Violations (92701/92702)

5.1 (Closed) Violation 50-313/9625-01: Failure to complete 72.48 safety evaluations. This violation involved the interpretation of requirements for conducting safety evaluations related to cask design. The NRC's position concerning the requirements specified in 10 CFR 72.48(a) and (b) is that any change to the VSC-24 system, whether it is a one-time change to one cask or a design change to several casks, required a 10 CFR 72.48 evaluation if the change affects the design as described in the safety analysis report. The licensee had performed engineering safety evaluations for several components and determined that the components could be used as-is, but had not implemented the criteria of 10 CFR 72.48 concerning the evaluation against unreviewed safety questions. The licensee responded to this violation by letter dated February 21, 1997. The licensee conducted a review of condition reports and non-conformance reports associated with the 14 casks owned by ANO and completed any additional 10 CFR 72.48 evaluations needed. The licensee revised Procedure 1000.104, "Condition Reporting and Corrective Actions," to require engineering evaluations for a "use as-is" determination in accordance with Procedure 1000.153, "Engineering Request." Procedure 1000.104, Section 6.6.2.D.3 required an engineering evaluation per Procedure 1000.153 for a "use-as-is or repair" disposition where the item did not conform to original requirements. Procedure 1000.153 required a 10 CFR 50.59 and 10 CFR 72.48 review of the dispositions. Procedure 1000.153, Section 6.9.3.A required the completion of Attachment A, "Configuration Checklist," in Procedure 5010.004, "Design Document Updates." The configuration checklist included the ventilation storage cask SAR, certificate of compliance, and conditions for system use documents to be considered as documents affected by a change. If the documents were affected, then a 10 CFR 50.59 evaluation was required per Procedure 1000.131, "10 CFR 50.59 Review Program." Step 6.1.6 of Revision 3 of Procedure 1000.131 required any changes related to the VSC-24 casks to also be evaluated under Procedure 1022.039 "Ventilated Storage Cask 10 CFR 72.48 Reviews."

5.2 (Closed) Unresolved Item 50-368/9712-02: The determination of whether hydrogen cracking occurred on the third cask. During the welding of the third cask by ANO, a crack was detected and repaired on the root pass weld to the shield lid during the dye penetrant testing. The NRC determined that a condition known as hydrogen cracking could not be excluded as a potential cause. The licensee, Sierra Nuclear Corporation, and a team of industry experts in welding, metallurgy, and nondestructive examination evaluated the crack and determined that it appeared to be hydrogen induced. This is documented in Section 2.3 of the Sierra Nuclear Corporation response to CAL 97-7-001, dated July 30, 1997. In a letter to Sierra Nuclear Corporation from the NRC dated July 22, 1998, the NRC agreed with these conclusions.

5.3 (Closed) Inspection Followup Item 50-368/9712-03: Licensee evaluation of the effects of preheating the MSB on drain time. In response to the problem of weld cracking during the welding of the lids, ANO committed to pre-heat and post-heat the weld areas. This had the potential to increase the water temperature in the cask. Technical Specification 1.2.10, "Time Limit for Draining the MSB," established a method for determining the length of time water could remain in the cask before the potential for boiling could occur. The licensee performed an evaluation of the effects of pre-heat and post-heat on the drain time limit specified in the technical specification. ANO Calculation 95-E-0083-05, Revision 1, determined that the overall impact would be minimal, reducing the drain time limit by only 5 minutes. Sierra Nuclear Corporation calculation WEP 109.003.20 concluded the time would be reduced by 1 hour. Sierra Nuclear Corporation provided a final response to the NRC request for additional information by letter dated July 9, 1998. This letter concluded that the impact on the time to drain would be small. Sierra Nuclear Corporation proposed a new formula for determining drain time which considered the actual water temperature heat-up rate. The NRC accepted this new method for determining drain time in the letter to Sierra Nuclear Corporation closing CAL 97-7-001 dated July 22, 1998. ANO Procedure 1302.025 "Spent Fuel Removal and Dry Storage Operations," Revision 9, Section 9.2.29 and Attachment 11 incorporated the new drain time concept.

5.4 (Closed) Unresolved Item 50-368/9712-04: Adequacy of the ANO corrective action for cask welding. ANO had made a number of improvements to their welding program to reduce the potential for cracking on the shield lid and structural lid welds and to provide further verification of the weld integrity on the structural lid. In a letter to the NRC concerning CAL 97-7-002, dated August 11, 1997, ANO provided a description of the corrective actions identified for their welding program. This description included:

- securing the lids with large tack welds to prevent movement of the lid and provide for distribution of the shrinkage forces over a large area
- use of weld consumables with low hydrogen levels (less than 10 ml/H_2/STP/100g)
- a minimum preheat temperature of 200 degrees F
- a post heat soak of 200 degrees F for a minimum cumulative time of 1 hour or greater than 150 degrees F for a minimum cumulative time of 4 hours
- final nondestructive examination to be conducted at least two hours after completion of the weld

The NRC found the proposed actions acceptable and included the changes in Appendix C to the NRC closure letter for CAL 97-7-001 dated July 22, 1998. ANO Procedure 1302.025 "Spent Fuel Removal and Dry Storage Operations," Revision 9, Section 9.1.1 had incorporated the requirements listed above.

5.5 (Discussed) Unresolved Item: 50-368/9712-05: Potential for hydrogen cracking on previously loaded casks. The conclusion as to the cracking mechanism for the first cask loaded at ANO was inconclusive. The cracking mechanism for the third crack has been accepted as hydrogen induced cracking. As a result, volumetric examination of the structural lid weld on the four casks currently loaded and on the ISFSI pad will be required. In the letter to the NRC dated August 28, 1998, ANO committed to complete the volumetric exam of the loaded casks by September 21, 1999. This unresolved item will remain open until completion of the exams.

5.6 (Closed) Inspection Followup Item 72-13/97215-01: Review of the detailed welding work package for reinstallation of the shield lid support rings. The licensee had planned to develop a new procedure qualification record (PQR) for automatic flux core welding for reinstalling the shield lid support rings. Subsequent to Inspection Report No. 72-13/97215, the licensee decided to not develop the new PQR and to use the existing manual process. A review of PQR 398, Revision 1, "Manual Shielded Metal Arc Welding SMAW," and Welding Procedure Specification E-P1-A-A1-CUN-1, "SMAW Manual," did not identify any concerns for welding the shield lid support rings.

5.7 (Closed) Inspection Followup Item 72-13/97215-02: Review of the bottom plate minimum wall thickness calculation. During the acid etching and examination of the casks in November 1997, to determine if undocumented welding had been performed on the casks, it was realized that minimum wall thickness criterion for the bottom plate was not specified in procedures. This information was necessary to complete the determination of acceptability of the bottom plate for any areas where welding may have occurred. Sierra Nuclear Corporation was requested to provide the calculations for the base plate minimum wall thickness. This information was provided in calculation WEP-109-002.6, "MSB-24 Corrosion Calculation." The minimum thickness was determined to be 0.69 inches for the bottom plate. The nominal thickness for the bottom plate of the casks constructed for ANO was 0.75 inches.

5.8 (Closed) Inspection Followup Item 72-13/97215-03: Resolution of the vendor welding procedure specifications and PQR documentation issue. In response to CAL 97-7-002, the licensee reviewed the welding procedure specifications and supporting PQRs of the MSB fabricator, March Metalfab, related to the MSBs. The licensee identified incomplete documents and requested the missing documentation from the fabricator. On January 28, 1998, the licensee completed a review of all welding procedure specifications and supporting PQRs of the MSB fabricator related to the MSBs. This issue was incorporated into CAL 97-7-002A which referenced the "Request for Additional Information" for CAL 97-7-001 to Sierra Nuclear Corporation dated August 26, 1997. The NRC has accepted ANO's response to CAL 97-7-002A and closed the CAL by letter dated September 4, 1998. The NRC closed CAL 97-7-001 with Sierra Nuclear Corporation on July 22, 1998. The closure of these CALs satisfies the issues with the vendor welding procedure specifications and PQR documentation.

6 Exit Meeting Summary

The inspectors presented the inspection results to members of the licensee management at the exit meeting on September 18, 1998. The licensee acknowledged the findings presented. The licensee did not identify as proprietary any information provided to, or reviewed by, the inspectors.

ATTACHMENT

SUPPLEMENTAL INFORMATION

PARTIAL LIST OF PERSONS CONTACTED

Licensee

J. Dosa, Licensing Engineer
J. McWilliams, Manager, Modifications
N. Finney, NDE Level III
R. Kellar, High Level Waste Project Manager
B. Starkey, Radiation Protection Supervisor
D. Williams, Engineering

INSPECTION PROCEDURES USED

IP 60855 Operation of an ISFSI

LIST OF ITEMS OPENED AND CLOSED

Items Opened

None

Items Discussed

50-368/9712-05	URI	potential for hydrogen cracking on previously loaded casks

Items Closed

50-313/9625-01	VIO	failure to complete 72.48 safety evaluations
50-368/9712-02	URI	the determination of whether hydrogen cracking occurred on the third cask
50-368/9712-03	IFI	licensee evaluation of the effects of preheating the MSB on drain time
50-368/9712-04	URI	adequacy of the ANO corrective action for cask welding
72-13/97215-01	IFI	review of the detailed welding work package for reinstallation of the shield lid support rings
72-13/97215-02	IFI	review of the bottom plate minimum wall thickness calculation
72-13/97215-03	IFI	resolution of the vendor welding procedure specifications and PQR documentation issue

LIST OF ACRONYMS

ANO	Arkansas Nuclear One
CAL	Confirmatory Action Letter
IFI	inspection followup item
ISFSI	independent spent fuel storage installation
MSB	multisealed basket
PQR	procedure qualification records
SAR	Safety Analysis Report
TLD	thermoluminescent dosimeter
UT	ultrasonic testing
URI	unresolved item
VIO	violation