UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION IV
611 RYAN PLAZA DRIVE, SUITE 400
ARLINGTON, TEXAS 76011-8064

January 12, 2001

Ms. Beverly A. Cook, Manager
Idaho Operations Office
U.S. Department of Energy
850 Energy Drive
Idaho Falls, ID 83401-1563

SUBJECT: NRC INSPECTION REPORT 72-20/00-03 AND NOTICE OF VIOLATION

Dear Ms. Cook:

A Nuclear Regulatory Commission (NRC) inspection was conducted December 4-6, 2000, at your Three Mile Island Unit 2 (TMI-2) Independent Spent Fuel Storage Installation (ISFSI). The enclosed report presents the scope and results of that inspection. On January 9, 2001, a followup telephonic exit briefing was held between Region IV and your staff concerning the two violations cited in this report.

The purpose of this inspection was to review the status of activities at the TMI-2 ISFSI with particular emphasis on the oversight function performed by your quality assurance department and the adequacy of your safety evaluation process to identify, document and evaluate potential problems.

Based on the results of this inspection, the NRC has determined that two violations of NRC requirements occurred related to the storage of cask #5 at the TMI-2 ISFSI. The violations were evaluated in accordance with the "General Statement of Policy and Procedure for NRC Enforcement Actions" (Enforcement Policy), NUREG-1600. The current Enforcement Policy is included on the NRC's website at www.nrc.gov/OE. The violations are cited in the enclosed Notice of Violation (Notice) and the circumstances surrounding them are described in detail in the subject inspection report.

You are required to respond to this letter and should follow the instructions specified in the enclosed Notice when preparing your response. The NRC will use your response, in part, to determine whether further enforcement action is necessary to ensure compliance with regulatory requirements.

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/NRC/ADAMS/index.html (the Public Electronic Reading Room).

Should you have any questions concerning this inspection, we will be pleased to discuss them with you.

Sincerely,

/RA/

Dwight D. Chamberlain, Director
Division of Nuclear Material Safety

Docket No.: 72-20
License No.: SNM-2508

Enclosures:
1. Notice of Violation
2. NRC Inspection Report
   72-20/00-03

cc w/enclosure:
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bcc w/enclosure to DCD (IE08)

bcc w/enclosure (ADAMS via-e-mail distrib)::
EWMerschoff
MDWaters, NMSS/SFPO
BLKaras, NMSS/SFPO
VLTharpe, NMSS/SFPO
DDChamberlain
DBSpitzberg
LLHowell
JVEverett
RSCarr
FCDB File
MIS System
RIV Files-5th floor file room (Docket 72-20)

DOCUMENT NAME: Draft: S:\dnms\fcdb\jve/doe003jve.wpd Final: r:_dnms\DOE\doe003jve.wpd

RIV:DNMS:FCDB	RIV:DNMSFCDB	C:FCDB	D:DNMS
JVEverett	RSCarr	DBSpitzberg	DDChamberlain
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01/11/01	***01/11/01***	***01/11/01***	***01/12/01***

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ENCLOSURE 1

NOTICE OF VIOLATION

United States Department of Energy
Idaho Operations Office

Docket No 72-20
License No. SNM-2508

During an NRC inspection conducted on December 4-6, 2000, two violations of NRC requirements were identified. In accordance with the "General Statement of Policy and Procedure for NRC Enforcement Actions," NUREG-1600, the violations are listed below:

A. 10 CFR 72.48(b)(1) states, in part, "the licensee shall maintain records of changes in the ISFSI if these changes constitute changes in the ISFSI described in the safety analysis report (SAR). These records must include a written safety evaluation that provides the bases for the determination that the change, test or experiment does not involve an unreviewed safety question."

Contrary to the above, on October 14, 2000, the licensee made a change to the ISFSI as described in the SAR without performing a written safety evaluation. Specifically, dry shielded canister (DSC) #5 containing portions of a neutron start-up source was loaded into the TMI-2 ISFSI without performing a written safety evaluation. This was a change to the ISFSI as described in the SAR in Section 7 and Appendix E because the SAR did not include consideration for the storage of a neutron start-up source in the ISFSI. The SAR described ^{240}Pu in the irradiated fuel as the primary source of neutrons in the dry shielded canisters.

This is a Severity Level IV violation (Supplement VII).

B. 10 CFR 72.11(a) states, in part, that "information provided to the Commission by a licensee, certificate holder, or an applicant for a license or Certificate of Compliance, ... must be complete and accurate in all material aspects."

Contrary to the above, information provided to the Commission was not complete and accurate in all material aspects. Specifically, the licensee had not provided information in the application and the TMI-2 SAR submitted to the NRC on October 31, 1996, and as revised, concerning neutron start-up sources that would be contained in the TMI-2 canisters. This is material because these sources affect the results of calculations included in the SAR for radiological dose evaluations and accident analysis.

This is a Severity Level IV violation (Supplement VII).

Pursuant to the provisions of 10 CFR 2.201, the Department of Energy-Idaho Operations Office is hereby required to submit a written statement or explanation to the U.S. Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington, DC 20555, with a copy to the Regional Administrator, Region 4, within 30 days of the date of the letter transmitting this Notice of Violation (Notice). This reply should be clearly marked as a "Reply to a Notice of Violation" and should include for each violation: (1) the reason for the violation, or, if contested, the basis for disputing the violation or severity level, (2) the corrective steps that have been taken and the results achieved, (3) the corrective steps that will be taken to avoid further violations, and

(4) the date when full compliance will be achieved. Your response may reference or include previously docketed correspondence, if the correspondence adequately addresses the required response. If an adequate reply is not received within the time specified in this Notice, an order or a Demand for Information may be issued as to why the license should not be modified, suspended, or revoked, or why such other action as may be proper should not be taken. Where good cause is shown, consideration will be given to extending the response time.

If you contest this enforcement action, you should also provide a copy of your response, with the basis for your denial, to the Director, Office of Enforcement, United States Nuclear Regulatory Commission, Washington, DC 20555-0001.

Because your response will be made available to the Public, to the extent possible, it should not include any personal privacy, proprietary, or safeguards information so that it can be made available to the Public without redaction. If personal privacy or proprietary information is necessary to provide an acceptable response, then please provide a bracketed copy of your response that identifies the information that should be protected and a redacted copy of your response that deletes such information. If you request withholding of such material, you must specifically identify the portions of your response that you seek to have withheld and provide in detail the bases for your claim of withholding (e.g., explain why the disclosure of information will create an unwarranted invasion of personal privacy or provide the information required by 10 CFR 2.790(b) to support a request for withholding confidential commercial or financial information). If safeguards information is necessary to provide an acceptable response, please provide the level of protection described in 10 CFR 73.21.

In accordance with 10 CFR 19.11, you may be required to post this Notice within two working days.

ENCLOSURE 2

U.S. NUCLEAR REGULATORY COMMISSION
REGION IV

Docket No.:	72-20
License No.:	SNM-2508
Report No.:	72-20/00-03
Licensee:	United States Department of Energy
Facility:	TMI-2 Independent Spent Fuel Storage Installation
Location:	Idaho Operations Office 850 Energy Place Idaho Falls, Idaho 83401
Dates:	December 4-6, 2000
Inspectors:	J. V. Everett, Senior Health Physics Inspector R. S. Carr, Health Physics Inspector
Approved By:	D. Blair Spitzberg, Ph.D., Chief Fuel Cycle & Decommissioning Branch, Region IV
Attachments:	1. Supplemental Information 2. Casks Loaded at the TMI-2 ISFSI
ADAMS Entry:	IR 07200020-00-03; on 12/04/00-12/06/00; U. S. Dept. of Energy; TMI-2 ISFSI. High Level Waste Report. Safety Evaluations and SAR Information.

EXECUTIVE SUMMARY

United States Department of Energy
NRC Inspection Report 72-20/00-03

The licensee had loaded seven casks into their Independent Spent Fuel Storage Installation (ISFSI). A review of records generated by the licensee to document and evaluate problems encountered with the seven casks was found to be detailed and thorough. Interviews with personnel assigned responsibility for reviewing the completeness of records prior to shipment of the casks to the ISFSI and for performing safety evaluations when non-conformances were found demonstrated a strong knowledge of the safety analysis report and the requirements of 10 CFR Part 72. Since the first inspection was conducted of the Department of Energy-Idaho Operations Office in February 1999, the licensee has shown steady growth in the performance of activities related to the TMI-2 ISFSI. This is represented through the quality and detail of the self-assessment programs being implemented by the quality assurance department and by the recognition and appropriate corrective actions identified by site personnel for problems encountered. Though violations were identified during this inspection related to one particular cask, overall the licensee's performance was rated high in the areas of quality assurance, audits and surveillances, design change analysis and safety evaluations.

Operation of an ISFSI (60855)

- The licensee conducted periodic audits and surveillances as required by their procedures. The documentation was thorough and adequately identified conditions adverse to quality (Section 1).

- Training records for several lead auditors were reviewed and found to be satisfactory (Section 1).

- Documentation for the inspections of the transfer trailer used for the shipment of the OS-197 transfer cask was reviewed for two shipments and found to be complete (Section 1).

Design Control of ISFSI Components (60851)

- The licensee had implemented an effective safety evaluation program to comply with the requirements of 10 CFR 72.48. Reviews of procedures and completed safety evaluations for each of the casks currently loaded in the ISFSI and interviews conducted with personnel assigned to perform the safety evaluations, confirmed that the licensee had established an adequate program and personnel were knowledgeable of regulatory requirements and the design basis for the TMI-2 ISFSI. Except for the neutron source issue related to DSC #5, the licensee's process of recognizing, documenting and analyzing design change issues was thorough and technically strong (Section 2).

- The licensee loaded DSC #5 into the ISFSI containing a neutron start-up source. Neutron start-up sources had not been analyzed in the safety analysis report for storage

in the ISFSI. A written safety evaluation, prior to loading DSC #5 in the ISFSI was not performed. This was determined to be a violation. In addition, the omission of information in the safety analysis report related to the neutron start-up sources and their effect on the design basis for the ISFSI was also determined to be a violation (Section 2).

Report Details

Summary of Facility Status

The Three Mile Island Unit 2 (TMI-2) Independent Spent Fuel Storage Installation (ISFSI) was constructed at the Idaho National Engineering and Environmental Laboratory for storage of the core debris removed from the TMI-2 reactor. The ISFSI is located at the Idaho Nuclear Technology and Engineering Center approximately 42 miles west of Idaho Falls, Idaho. A license was issued to the Department of Energy-Idaho Operations Office (DOE-ID) by the U. S. Nuclear Regulatory Commission (NRC) on March 19, 1999. On March 31, 1999, the first cask containing the core debris was moved from the test area north facility to the ISFSI. As of this inspection, a total of seven casks were in storage at the ISFSI. Twenty-nine casks are planned for eventual storage at the ISFSI. The licensee plans to complete the loading of all 29 casks into the ISFSI by June 1, 2001.

The storage system currently used by DOE-ID at the TMI-2 ISFSI is the NUHOMS® -12T cask system. This design has several components. The debris from the reactor core is contained in canisters that are in wet storage at test area north. Each canister is removed from wet storage and dried. Then the canister is placed in a large steel container called a dry shielded cask (DSC). A DSC is designed to hold 12 canisters. The DSC is transported to the ISFSI in a large transfer cask on a special trailer. The transfer cask used by DOE-ID is the OS-197 transfer cask. Once at the ISFSI, the DSC is inserted into a concrete horizontal storage module (HSM) and the OS-197 transfer cask is returned to test area north for the next shipment.

1 Operation of an ISFSI (60855)

1.1 Inspection Scope

Oversight of activities by the quality assurance organization were reviewed. Selected audits and surveillences were examined. Documents related to the pre-shipment inspections of the trailer, used for the OS-197 transfer cask, were also reviewed.

1.2 Observations and Findings

DOE-ID used the national spent nuclear fuel program as the basis for their quality management plan for the ISFSI. The quality management plan (DOE/SNF/QMP-002, Revision 0) and the quality assurance program plan (PLN-466, Revision 2) provided guidance for implementing the quality assurance plan at the ISFSI.

The following program management procedures were reviewed. These procedures provided guidance for planning and conducting audits and surveillances.

- PMP 18.01, Planning and Scheduling Assessments, Revision 3
- PMP 18.02, Administration and Conduct of Audits, Revision 4
- PMP 18.03, Administration and Conduct of Surveillances, Revision 4

The procedures contained appropriate requirements and guidance for planning, scheduling, conducting and documenting an audit or surveillance. The procedures included references and commitment documents to support compliance with all aspects of the licensee's quality assurance program.

The following completed audits and surveillances were selected for review.

- Surveillance 00-ISFSI-S-012, *Overview of Actions taken by TMI-2 Operations to Ensure Readiness for Fuel Shipments*
- Surveillance 00-ISFSI-S-013, *Unannounced Surveillance on Dry Shielded Canister Welding Practices for TMI-2*
- Surveillance 00-ISFSI-S-014, *Unscheduled Surveillance on TMI-2 Dry Shielded Canister's Non-Conformance Report*
- Audit 00-ISFSI-AU-018, *Technical Safety Audit, which included Maintenance, Health Physics, ALARA*
- Surveillance 00-ISFSI-S-019, *Unscheduled Surveillance for Review of Work Planning on OS-197 Cask Trunnion Repair*
- Surveillance 01-ISFSI-S-001, *Observation of Licensed Activities at TAN*

The documentation for each surveillance and audit provided the basis for a well planned inspection. The documentation contained supporting information and objective evidence to support the conclusions drawn. Required records and personnel contacts were adequately documented. Historical information was provided as appropriate for the area inspected. The documentation indicated good observations and identification of conditions adverse to quality as well as noteworthy practices and opportunities for improvement. When deficiencies were identified by the quality assurance staff, the respective department personnel were responsive and carried through on actions to resolve concerns, sometimes prior to the conclusion of the surveillance or audit. As a result of the audits and surveillances conducted, there were several deficiency reports and one corrective action request generated.

The training requirements and the continued proficiency requirements for a selected number of lead auditors were reviewed. The individuals training documentation met the training requirements of procedure PMP 18.04, "Qualification of Audit Personnel," Revision 3.

A review was also conducted of the inspections performed on the trailer used to transport the OS-197 transfer cask. The trailer was inspected prior to each shipment. Technical procedure TPR-1213, "Receipt of the TMI Transfer Cask into the Test Area North Hot Shop," Revision 8, was reviewed. The procedure provided guidance for documenting the mechanical inspection of the trailer prior to shipment of the OS-197 transfer cask to the ISFSI pad. The inspection was performed by the equipment operators and included items such as the upper and lower trunnion support, skid positioning system I-beam frame, trailer deck, leveling jacks, hydraulic fluid and pneumatic brake system. The trailer inspection packages for DSC #8 completed on November 13, 2000, and for DSC #10, completed on November 21, 2000, were reviewed in detail. The documentation was satisfactory and met the procedure requirements.

1.3 Conclusion

The licensee conducted periodic audits and surveillances as required by their procedures. The documentation was thorough and adequately identified conditions adverse to quality. Training records for several lead auditors were reviewed and found to be satisfactory. Documentation for the inspections of the transfer trailer used for the shipment of the OS-197 transfer cask was reviewed for two shipments and found to be complete.

2 Design Control of ISFSI Components (60851)

2.1 Inspection Scope

A review of safety evaluations conducted in accordance with 10 CFR 72.48 for the loaded casks was completed. The objective of this review was to determine if the licensee was adequately recognizing and documenting changes to the ISFSI and completing the required safety evaluations.

2.2 Observations and Findings

The licensee reviewed changes to procedures, equipment and the facility using Management Control Procedure MCP-2925, "ISFSI Changes, Tests and Experiments," Revision 7. When a proposed change or modification to the ISFSI or ISFSI facility procedures was needed, a screening was conducted to determine if a 10 CFR 72.48 safety evaluation was required for the proposed change. Procedure MCP-2925 provided criteria for performing both screenings and safety evaluations. Definitions of key terms were provided and responsibilities of requesters, evaluators and screeners were identified. The procedure also listed record requirements. The licensee had established three categories of personnel trained to implement portions of Procedure MCP-2925. These categories included trained screeners, qualified screeners and qualified evaluators. Trained screeners initiated the screening forms. Qualified screeners completed the screening process and signed-off on the forms. Qualified evaluators performed safety evaluations, if determined necessary by the screening process. Interviews were conducted with two of the qualified evaluators trained to conduct safety evaluations. The individuals were found to be very knowledgeable of the SAR, demonstrated a good knowledge of the requirements of 10 CFR 72.48 and understood when safety evaluations were required.

Procedure MCP-2925 identified three document types that could be used to initiate the process for a screening or safety evaluation. These included the initiation of a document action request (DAR) for a procedure change, an engineering change form (ECF) for a design change and an engineering design file (EDF) for a design analysis or calculation. Three procedures related to these processes were reviewed. These included MCP-538 "Control of Nonconforming Items," Revision 10, MCP-2811 "Design and Engineering Change Control," Revision 5 and MCP-135 "Creating, Modifying and Canceling Procedures and other DMCS Controlled Documents," Revision 5. These

procedures were found to have adequate guidance to direct the user to implement MCP-2925 for required safety evaluations.

Nonconformance reports (NCR) were used by the licensee to document hardware related problems. The NCR process was described in procedure MCP-538 "Control of Nonconforming Items," Revision 10. If an NCR was issued, the licensee would determine if the nonconforming condition would be returned to its original specification or design, (i.e. rework) or if the problem would be repaired. Repair involved fixing the problem, but not returning the nonconforming condition to its original specification or design. If the item was returned to it's original specification or design, then no safety evaluation was required. If the item was repaired, then an engineering change form was required and procedure MCP-2811 was initiated. Procedure MCP-2811 required a safety screening of the activity using procedure MCP-2925.

The licensee also documented problems using deficiency reports per procedure MCP-598 "Corrective Action System," Revision 13. Deficiency reports (DR) described process problems, such as work activities. A deficiency report, in itself, would not initiate a safety screening, however it could result in the issuance of a DAR or an NCR which would then lead to a safety evaluation.

Twenty-three document action requests and the associated 10 CFR 72.48 screenings issued since February 1999 were reviewed. The screening documentation was determined to contain the necessary information, in both depth and scope to support the final conclusions.

The licensee had loaded seven DSCs into the ISFSI at the time of this inspection. A review of each DSC and the associated issues documented in nonconformance reports, deficiency reports and safety evaluations was completed. Each DSC had unique issues that required evaluation by the licensee. The issues are described in the following sections.

a. Ultrasonic Testing Deficiency Affecting DSC #1

DSC#1 was fabricated prior to DOE-ID requiring ultrasonic testing on the bottom cover plate weld to the cylindrical shell joint. DOE-ID had requested an exemption from the American Society of Mechanical Engineers (ASME) code requirements for volumetric weld examinations of this weld. However, the NRC did not approve the exemption request. The fabrication schedule precluded the ultrasonic testing on DSC #1, which was accepted by the licensee with a provisional certificate denoting that the ultrasonic testing exam had not been completed. On December 5, 2000, a purchase order was issued to complete the ultrasonic testing examination of DSC #1 and, as necessary, perform any required repairs. Estimated completion of this work is March 8, 2001. DSC #1 was stored at the test area north facility and will not be used for storage of core debris until after completion of the ultrasonic testing examination and any required repairs.

b. Thaxton Plug Failure for Canisters Stored in DSC #2 (Event Notification 36694, LER issued March 15, 2000)

On December 12, 1999, one of the plugs on the top of a canister was observed to be missing after the heated vacuum drying process was completed. This observation was made at the test area north facility and documented as NCR #9775. It was determined that the loss of the plug was caused by inadequate torque of the plug prior to dewatering the canister.

The canisters were designed to have openings that facilitated the loading of the core debris at the TMI-2 reactor facility. The plugs were used to seal these openings. During evaluation of the corrective actions for the missing plug, the question was raised whether this issue could affect the canisters already stored at the ISFSI in DSC #2. NCR #10089 was issued on January 13, 2000, to evaluate this possibility. Examination of the video records of the canisters placed in DSC #2 indicated that the plugs were in place; however, some of the plugs in the canister were of an early design that was known to have problems. Because of the design problem, the plugs could not be assured of remaining in place during a design basis event such as an earthquake. This condition was determined to affect at least three of the canisters in DSC #2. On February 15, 2000, the licensee determined that the design basis for the canisters in DSC #2 could not be assured and notified the NRC of the problem. NRC Event Notification # 36694 was issued by NRC Headquarters.

The licensee issued Licensee Event Report (LER) 00-001 on March 15, 2000, concerning the problem with the plug. Engineering Design File (EDF) #2203 was completed on May 10, 2000, analyzing the requirements for the plugs and determined that the confinement boundary created by the plugs for the canisters stored in DSC #2 were not required for storage. This was primarily due to the low radioactive material inventory contained in the canisters in DSC #2 and the lack of any credible driving force for the movement of the radioactive material. The licensee designed a mechanical closure for use on future canisters.

The licensee completed a safety evaluation of the issue identified in LER 00-001 on August 30, 2000, and determined that a change to the physical configuration of the canisters, as described in the SAR, had occurred. However, the change did not meet the criteria of 10 CFR 72.48 requiring a license amendment. Section 3.3.2.1 of the SAR was revised and issued as Revision 1I on September 28, 2000. The SAR revision documented the issue related to the plugs.

c. Cask Trunion Damage and Paint on Shield Plug Weld Area During Loading of DSC #3

The licensee issued NCR #13368 on July 6, 2000, identifying a problem with paint on top of the shield plug intruding into the weld area of the purge and vent ports. Welding procedures did not allow welding over painted surfaces. The paint was removed per work order #30940 and all other DSCs were checked for the same problem. This NCR did not require a safety evaluation because the DSCs were returned to original design.

DR #13375 was issued July 8, 2000, concerning the top cover plate weld and the possibility of the weld interferring with the sealing of the purge and vent filter assemblies. Procedure TPR-1216, DSC Seal Welding, required the weld to be flush with the sealing surface or slightly less than the top of the machined surface. The length of the flush surface area was not defined. The licensee revised the welding procedures to include acceptance criteria for the weld crown. A safety screening was completed on July 19, 2000.

On July 13, 2000, NCR #13436 and DR #13642 were issued relating to the discovery of several arc strikes on the outside of the OS-197 transfer cask. The arc strikes were discovered by a mechanic while transferring the OS-197 transfer cask from the trailer into the test area north facility. The trailer had returned from transferring DSC #3 to the ISFSI. The damage to the OS-197 transfer cask occurred due to the placement of the welding unit ground clamp on the OS-197 trunnion and trunnion sleeve during welding. Welding of the shield plug and cover plate for DSC #3 had been performed at test area north from July 5-8, 2000. The ground clamp had become detached on more than one occasion from the trunnion resulting in arc strikes to the OS-197 trunnion and sides. A magnetic ground connector had been purchased for use in connecting the ground welding clamp to the DSC; however, a more successful technique was found to involve attachment of a grounding cable eye connector to the shield plug/cover plate using a bolt screwed into one of the available threaded holes. Though training had been conducted at test area north with the assigned welders on mockups before actual welding on the loaded DSCs, specific requirements concerning placement of the grounding clamp was not covered or discussed with the welders. The pre-job briefing for welding DSC #3 also did not cover acceptable placement configurations for the grounding clamp. When the welders began preparations for tack welding DSC #3, the welder assigned to perform the weld determined that the best location to place the grounding “pinch type” clamp was on the OS-197 trunnion flange. During the welding over a period of 3 days and several shifts, the ground clamp had to be re-attached on several occasions. During the welding, no reports were made concerning damage to the OS-197 transfer cask.

Upon discovery of the arc strike damage, the OS-197 transfer cask was taken out of service. Ten arc strikes on the trunnion sleeve and four on the trunnion itself were identified. Transnuclear West, owner of the OS-197 transfer cask, was notified of the problem. The licensee formed an investigation team to evaluate the problem and Transnuclear West initiated engineering calculations to analyze the effect of the damage on the structural capability of the trunnions. The most severe damage to the cask was 0.06 inches in depth. Calculations by Transnuclear West determined that the maximum depth of damage that was allowed without structural concern was 0.125 inches. The licensee performed the required safety evaluation, revised the welding procedures and conducted additional training with the staff. On October 10, 2000, the licensee received a release letter from Transnuclear West allowing use of the OS-197 transfer cask for future cask movements.

As documented in NRC Inspection Report 72-20/00-01 dated August 15, 2000, a non-cited violation was issued to DOE-ID for failure to follow procedures related to the placement of the ground clamp.

d. Misalignment of DSC with HSM and Failure to Perform Temperature Measurements on DSC #4 (LER issued November 21, 2000)

During insertion of DSC #4 into HSM #20 at the ISFSI pad, the vent and purge ports did not align with the openings in the back of the HSM specifically design to accommodate the ports. Initial placement of a DSC into the OS-197 transfer cask involved alignment of the DSC with a "4-inch key" such that during insertion of the DSC into the HSM, the ports on the DSC would align with the openings in the back of the HSM. The misalignment was due to the DSC rotating from it's original position during insertion. The rotation was the result of an unbalanced load in the DSC.

Consideration of the weight distribution of the canisters during placement into the DSC was not a requirement during loading. The problem of a DSC rotating during insertion with the resulting position of the ports not aligning properly in the HSM had not been anticipated. For DSC #4, the rotational moment acting on the DSC was determined to be approximately 12,000 in-lbs. This was three times greater than any of the previous DSCs. As a result of the rotation of the DSC, NCR #20650 was initiated. Engineering Change Form (ECF) # 2402 was initiated to modify the size of the openings in the HSM to account for the new position of the ports. Approximately 1" of concrete was removed from the openings in the HSM. A safety evaluation was performed on the proposed modification.

Future loadings will consider the weight distribution of the canisters during placement into the DSC to reduce the potential for rotation during insertion. DOE was also evaluating modifications that will be needed to the OS-197 transfer cask, if it is used for future retrieval of a rotated DSC.

On November 21, 2000, DOE-ID issued LER 00-003 for DSC #4. The LER documented the failure to perform a temperature measurement on the DSC prior to movement. Technical Specification 3.1.2 required the temperature of the DSC to be at or above 20°F and the ambient temperature at or above 0°F anytime the loaded DSC is handled or transferred. Technical Specification SR 3.1.2.2 required measurement of the DSC temperature or cask temperature immediately before commencing transfer operations. During loading of DSC #4 into the HSM, the work was stopped on two occassions. One due to weather and the second due to the misalignment of the DSC ports with the openings on the HSM. During these work stoppages, the temperature measurements were also suspended. On the second occasion when work resumed, the temperature of the DSC was not verified as being above the required technical specification value before the cask was moved. This was recognized during a review of the completed operating procedure on October 24, 2000. Deficiency Report #20877 was issued on October 31, 2000 documenting the failure to perform the temperature measurements. Subsequent evaluation of weather data confirmed that temperatures were above the 20°F limit throughout the time period the DSC was being moved. The minimum temperature recorded between October 12, 2000, and October 14, 2000, was 29°F. The licensee revised their operating procedure to include an attachment for use when work was suspended and then restarted. Attachment E to procedure TPR-P3.6-G1 "Unload TMI-2 Fuel at ISFSI," provided a checklist of activities to be completed prior to re-entry into the unloading procedure. Attachment E required temperature

measurements to verify compliance with Technical Specification 3.1.2. Failure to perform the required temperature surveillance prior to moving DSC #4 is a violation of Technical Specifications. This Severity Level IV violation is being treated as a Non-Cited Violation, consistent with Section VI.A of the NRC Enforement Policy.

e. Neutron Source Detected in DSC #5

A radiological survey was performed on the OS-197 transfer cask containing DSC #5 at the test area north facility prior to shipment to the ISFSI on October 26, 2000. Gamma dose rates were measured at a maximum rate of 5 mR/hr and were within expected levels. However, a higher than expected neutron dose rate of 96 mrem/hr was measured on the side of the OS-197 transfer cask seven feet from the bottom. The licensee documented the surveys on Form #441.45 "Radiological Survey Report," Rev. 3, dated October 26, 2000. Expected radiological dose rates for the OS-197 transfer cask were provided in Appendix E, "On-Site Fuel Transportation" of the TMI-2 SAR and included information concerning radiation protection and shielding for the OS-197 transfer cask. The SAR, Sections 7.3.2.2.C and D of Appendix E discussed neutron shielding. Section 7.3.2.2.D stated that "Table 7.3.2-5 provides conservative estimates of the peak neutron and gamma dose rates for the OS-197 cask based on the results of the simplified shielding models." The value listed in Table 7.3.2-5 for the neutron dose rate on the side of the cask was 44.6 mrem/hr. The 96 mrem/hr neutron dose rate measured on the side of DSC #5 exceeded the conservative estimate listed in Table 7.3.2-5.

After several internal discussions concerning the neutron dose rate, the licensee determined that the shipment could proceed to the ISFSI. DSC #5 was loaded into the ISFSI on October 27, 2000.

After DSC #5 was loaded into the ISFSI, the licensee performed a review of the records for the canisters to determine the reason for the higher than expected neutron dose rate. Records indicated that neutron start-up sources were in the TMI-2 reactor core when the accident occurred. Three canisters were identified as potentially containing portions of the neutron start-up sources. These were canisters D-154, D-206 and D-122. Canister D-154 had been dewatered and dried and was ready for placement into a DSC. Canister D-206 was still in the test area north pool. Canister D-122 was one of the canisters placed in DSC #5 now in storage at the ISFSI. The licensee issued DR #21089 on November 6, 2000, NCR #21268 on November 10, 2000, and NCR #21406 on November 16, 2000, documenting the issue with the neutron sources. The licensee recognized in NCR #21268 and #21406 that the bounding neutron source terms provided in the SAR in Tables 1.2-1 and 3.1-3 did not incorporate the neutron start-up source terms and energy spectrum.

NRC regulations in 10 CFR 72.48 allow a licensee to make changes to an ISFSI, as described in the SAR, as long as the changes do not involve an unreviewed safety question. In accordance with 10 CFR 72.48(b)(1), the licensee is required to make a written safety evaluation that provides the basis for the determination that the change to the ISFSI does not involve an unreviewed safety question. Placement of DSC #5 containing a neutron start-up source into the ISFSI is a change to the ISFSI as

described in the SAR. A written safety evaluation was not performed by the licensee prior to placing DSC #5 into the ISFSI, to ensure the change did not involve an unreviewed safety question. Failure to perform a written safety evaluation prior to the change made to the ISFSI, as described in the SAR, is identified as a violation of 10 CFR 72.48 (VIO 0003-01).

Subsequent to the placement of DSC #5 into the ISFSI on December 13, 2000, the licensee performed a safety screening of DSC #5 to determine if a safety evaluation was necessary for DSC #5 to remain in the ISFSI. The licensee determined that no unreviewed safety question existed related to DSC #5 and that a license amendment was not necessary. This was based on the license allowing storage of radioactive material from the TMI-2 accident, which the neutron start-up sources would be considered part of, the determination that the accident consequences described in the SAR had not been increased, and the increase in radiation levels due to the neutron sources, as compared to the storage limits specified in Technical Specifications 3.2.1 and 3.2.2 were insignificant for DSC #5. The neutron dose rates on the outside of the HSM and at the filter housing had been measured at less than 2 mrem/hr.

The SAR provided information related to the neutron source term assumed for the canisters. Section 7.2.1 stated that the design basis neutron and gamma-ray sources for the canisters were calculated using the ORIGEN 2.1 computer code based on an intact Babcock & Wilcox 15x15 fuel assembly with a burnup of 3,175 Megawatt-days per metric ton Uranium and an initial enrichment of 1.98 weight percent ^{235}U. Section 7.2.1 also stated that the neutron energy spectrum for the TMI-2 canisters corresponded to the neutron spectrum from the spontaneous fission of ^{240}Pu, which was the primary neutron source. Table 7.2-1, "Neutron Energy Spectrum and Flux-to-Dose Conversion Factors for PWR Spent Fuel," provided a source strength of 6.895×10^5 neutrons per second per canister (n/sec/can). This same value, rounded to 6.9×10^5 n/sec/can, was listed in Table 3.1-3, "TMI-2 Summary of Bounding Canister Source Term Characteristics" and Table 1.2-1, "Key Design Parameters for the NUHOMS®-12T System." Calculations by the licensee in Engineering Design File (EDF) #1793 determined that if the neutron start-up source contained in DSC #5 was a standard Americium-Beryllium (AmBe) start-up source, then the neutron source strength in DSC #5 could exceed the values listed in the tables in the SAR. A canister containing as little as 0.5 Ci of an AmBe neutron source could equate to the 6.9×10^5 n/sec described in the SAR. For canister D-122, loaded in DSC #5, the value calculated in EDF #1793 for the neutron flux was estimated to be between 5×10^7 n/sec and 2×10^8 n/sec. These values exceeded the design basis neutron source of 6.9×10^5 n/sec/can described in the SAR.

The SAR also provided a description of the contents of the canisters. Section 3.1.1 listed rubble bed debris, partial intact fuel assemblies, debris bed stratified material, in core instrument assemblies and miscellaneous core component pieces such as fuel rod segments, spacer grids, end fittings, control rod assembly spiders and fuel pellets. Section 7.2.1 described the core material in the canisters as including fuel assemblies, fuel rods, axial power shaping rods, guide tubes, instrument tubes, spacer sleeves, spacer grids, end fittings, control rod spiders and coupling mechanisms. None of the descriptions included neutron start-up sources.

The SAR provided information on criticality analysis of the canisters in Section 3.3.4, "Nuclear Criticality Safety" and Appendix D "Criticality Model Input Decks." The various parameters used for the criticality analysis were identified. Since the effective multiplication factor (K_{eff}) calculated in the SAR would not be changed by the presence of a neutron start-up source, the documentation related to the criticality assumptions was not affected by the recognition that several of the canisters could contain portions of the neutron start-up sources.

The NRC issued a safety evaluation report (SER) and the TMI-2 ISFSI license on March 19, 1999. The SER discussed the content of the TMI-2 canisters in Sections 4.5.1,7.5.1.2 and 8.5.2. In particular, Section 7.5.1.2 stated that the primary source of neutrons for the fuel was ^{240}Pu. No mention of neutron startup sources was made in the SER. The TMI-2 ISFSI license did not specifically mention the neutron start-up sources, however, the license was issued for the "Radioactive material from the TMI-2 reactor core damaged by the March 28, 1979, accident."

The NRC has issued guidance subsequent to the issuance of the TMI-2 license, concerning storage of start-up sources at an ISFSI. Interim Staff Guidance (ISG) #9, issued July 6, 1999, states that start-up sources may be stored in an ISFSI if the applicant submits information and a safety/technical justification for the storage of the start-up sources. ISG #9 references NUREG 1536, "Standard Review Plan for Dry Cask Storage Systems," issued January 1997. Chapter 2 of NUREG 1536 specifies in Section IV.2.a that, "The applicant should define the range and types of spent fuel or other radioactive materials that the dry cask storage system is designed to store." For dry cask storage systems that will be used to store radioactive materials other than spent fuel, the applicant should specify the types and amounts of radionuclides, heat generation and relevant source strengths and radiation energy spectrum permitted for storage." This information should be provided in the SAR.

Based on the review of the SAR and the SER, there is no description provided or analysis performed by the licensee for the inclusion of neutron start-up sources in the canisters. In particular, the effect of these sources on shielding requirements, consequences of accidents and radiological controls for workers was not considered. 10 CFR 72.11(a) requires an applicant for a license to provide information that is complete and accurate in all material aspects. Failure to include the effects of the neutron start-up sources in the SAR related to the design and operations of the TMI-2 ISFSI is a violation of 10 CFR 72.11 (VIO 0003-02).

f. Damage to the HSM during alignment of DSC #8

While backing the OS-197 trailer into position for insertion of DSC #8 into HSM #29, contact was made between the OS-197 transfer cask lid lifting eye bolt and the front face of the HSM resulting in damage to the concrete on the HSM and bending of the eye bolt on the OS-197 transfer cask. On November 17, 2000, the licensee issued NCR # 21451 to document the damage to HSM #29, NCR #21437 to document the damage to the OS-197 transfer cask, and Deficiency Report #21454 to document the need to revise procedure INTEC-TPR-P3.6-G1 to prevent recurrence of this problem in future loading activities. The damaged eye bolt was replaced and DSC #8 was inserted

into HSM #27. Repair work had not been performed on HSM #29 at the time of this inspection.

g. Delayed Cracking on the Purge Port Weld on DSC #11

The weld on the DSC #11 purge port was discovered to have two cracks after inspections of the weld had been completed. One crack was 2 ½ inches long and the other was 1 ½ inches long The delayed cracking was recorded on NCR #21026 on November 3, 2000. Preheating of the weld area had not been performed for this weld. Discussions with the welders determined that cracking and popping had occurred during the welding. The area had been cleaned prior to welding with a liquid penetrant remover/cleaner in case vacuum grease contamination was present in the weld area. Since the weld of the purge port was performed soon after the welding of the cover plate, it was possible that cooling of the cover plate weld could have created stresses on the purge port weld. Discussions were held between the licensee's welders and the NRC welding expert to evaluate corrective actions. Corrective actions that were determined acceptable for this type of weld included performing a bead weld prior to placement of the main weld. The licensee repaired the weld on DSC #11 and verified that further delayed cracking did not occur.

2.3 Conclusion

The licensee had implemented an effective safety evaluation program to comply with the requirements of 10 CFR 72.48. Reviews of procedures and completed safety evaluations for each of the casks currently loaded in the ISFSI and interviews conducted with personnel assigned to perform the safety evaluations, confirmed that the licensee had established an adequate program and personnel were knowledgeable of regulatory requirements and the design basis for the TMI-2 ISFSI. Except for the neutron source issue related to DSC #5, the licensee's process of recognizing, documenting and analyzing design change issues was thorough and technically strong.

The licensee loaded DSC #5 into the ISFSI containing a neutron start-up source. Neutron start-up sources had not been analyzed in the safety analysis report for storage in the ISFSI. A written safety evaluation, prior to loading DSC #5 in the ISFSI was not performed. This was determined to be a violation. In addition, the omission of information in the safety analysis report related to the neutron start-up sources and their effect on the design basis for the ISFSI was also determined to be a violation.

3 Inspection Followup Items

3.1 (Closed) LER 00-003 issued November 21, 2000: Temperature Monitoring During Movement of DSC #4: This issue is discussed in Section 2.2.d of this report. Procedure TPR-P3.6-G1 was revised and Attachment E, "Re-Entry Pre-operational Checks," was added. Revision to the procedure included a statement in Step 2.1 of the "Precautions and Limitations" section which stated "If fuel handling operations are halted, the operation must be placed in a safe configuration per fuel handling supervisor and Attachment E must be completed prior to re-entering procedures." Attachment E

required verification of temperatures with the criteria in Technical Specification 3.1.2 prior to re-entering the unloading procedure.

3.2 (Closed) URI 72-20/9901-06 Applicability of 10 CFR 72.48 to activities outside the ISFSI: Activities were being conducted at the test area north facility that were directly related to compliance with the requirements of the TMI-2 license and technical specifications. However, these activities were being performed under DOE-ID programs as opposed to NRC programs and did not require review of changes against the criteria specified in 10 CFR 72.48. The licensee has addressed this issue with several revisions to the SAR. On August 2, 2000, the licensee summarized the changes made to the SAR in a letter to the NRC. A review of the current SAR confirmed that the changes discussed in the August 2, 2000, letter have been issued as revisions to the SAR. The most pertinent change was made to Section 9.4.1. Section 9.4.1 was issued as Revision 1C on May 26, 2000, and included the requirement that 10 CFR 72.48 reviews will be conducted of any test area north procedure changes that could have an impact or bearing on the design basis or safety basis of TMI-2 ISFSI components, performance specifications or requirements in the SAR or technical specifications. In addition to the changes to the SAR, the licensee reviewed all test area north procedures related to the TMI-2 ISFSI activities and incorporated a statement into the affected procedures that any change to the procedure required a 10 CFR 72.48 review.

3.3 (Discussed and Re-Opened) VIO-72-20/9901-09 Failure to include Part 21 requirements in procurement documents: This violation was inadvertently closed in Inspection Report 72-20/00-01 and is reopened in this inspection. The licensee issued a letter to the NRC dated October 4, 2000, describing the actions that had been completed to close this violation. After review of the information provided by the licensee, the NRC determined that additional assurance of notification of 10 CFR Part 21 issues from subcontractors to the licensee was needed. The licensee is in the process of establishing a written commitment with the key subcontractors to ensure that identification of a defect or non-conformance by the subcontractors will be reported to DOE-ID.

3.4 (Closed) VIO-72-20/9901-10 Failure to verify implementation of suppliers QA program: The NRC reviewed and found acceptable the licensee's response to this violation documented in a letter from the NRC to DOE-ID on August 5, 1999. During Inspection 72-20/00-01, procedures changes and training were reviewed and found acceptable.

4 Exit Meeting

The inspector presented the inspection results to members of licensee management at the conclusion of the inspection on December 6, 2000, and during a subsequent telephone conversation on January 9, 2001. The licensee acknowledged the findings presented. The licensee did not identify as proprietary any information provided to, or reviewed by, the inspectors that had been incorporated into this inspection effort.

ATTACHMENT 1

PARTIAL LIST OF PERSONS CONTACTED

Licensee (DOE-ID)

B. Davis, QA Manager
M. Gardner, TMI-2 Facility Director
J. Hagers, TMI/FSV Licensing Manager
C. Maggart, TMI/FSV Licensing Engineer

Contractor (Bechtel BWXT Idaho, LLC)

A. Clark, Site Area Director, INTEC
M. Croson, Licensing Engineer
K. Custer, ISFSI Manager
T. Fallon, Program Manager, Quality Assurance
G. Hall, TMI-2 NRC Operations
B. Lonergan, Site Area Test Director, Test Area North
H. Lord, Safety Analyst
D. Peterson, Transportation Manager

INSPECTION PROCEDURES USED

60851	Design Control
60855	Operations of an ISFSI

ITEMS OPENED, CLOSED, AND DISCUSSED

Opened

72-20/0003-01	VIO	Failure to Perform Safety Evaluation
72-20/0003-02	VIO	Incomplete Information in SAR

Closed

72-20/9901-06	URI	Applicability of 10 CFR 72.48 to Activities Outside ISFSI
72-20/9901-10	VIO	Failure to Verify Implementation of Supplier QA Program
LER 00-003	NCV	Failure to Perform Temperature Measurements (Issued November 21, 2000)

Discussed and Re-Opened

72-20/9901-09	VIO	Failure to Include 10 CFR Part 21 Requirements in Procurement Documents

LIST OF ACRONYMS

AmBe	Americium-Beryllium
CFR	Code of Federal Regulations
DAR	Document Action Request
DOE-ID	Department of Energy-Idaho Operations Office
DR	Deficiency Report
DSC	Dry Shielded Canister
ECF	Engineering Change Form
EDF	Engineering Design File
HSM	Horizontal Storage Module
INEEL	Idaho National Engineering and Environmental Laboratory
INTEC	Idaho Nuclear Technology and Engineering Center
ISFSI	Independent Spent Fuel Storage Installation
ISG	Interim Staff Guidance (issued by NRC)
LER	Licnesee Event Report
MCP	Management Control Procedures
NCR	Non-Conformance Report
NRC	Nuclear Regulatory Commission
PMP	Program Management Procedures
Pu	Plutonium
QA	Quality Assurance
SAR	Safety Analysis Report
SER	Safety Evaluation Report
SNM	Special Nuclear Material
TMI-2	Three Mile Island Nuclear Power Plant Unit 2
TPR	Technical Procedure Requirement

ATTACHMENT 2

CASKS LOADED AT THE TMI-2 ISFSI
(as of December 6, 2000)

LOAD SEQUENCE	DATE LOADED INTO HSM	DSC#	HSM #
1	3/31/99	2	16
2	7/10/00	3	17
3	10/14/00	4	20
4	10/27/00	5	22
5	11/16/00	11	24
6	11/19/00	8	27
7	11/29/00	10	28