UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION II
SAM NUNN ATLANTA FEDERAL CENTER
61 FORSYTH STREET, SW, SUITE 23T85
ATLANTA, GEORGIA 30303-8931

~~OFFICIAL USE ONLY - SECURITY-RELATED INFORMATION~~

November 20, 2006

EA-06-013

Southern Nuclear Operating Company, Inc.
ATTN: Mr. L. M. Stinson
Vice President - Hatch Project
P. O. Box 1295
Birmingham, AL 35201-1295

SUBJECT: EDWIN I. HATCH NUCLEAR PLANT - NRC MATERIAL CONTROL AND ACCOUNTING PROGRAM INSPECTION REPORT NO. 05000321/2006-401 AND 05000366/2006-401

Dear Mr. Stinson:

On August 18, 2006, the U.S. Nuclear Regulatory Commission (NRC) completed an inspection of the material control and accounting program at the Edwin I. Hatch Nuclear Plant. The purpose of the inspection was to review the circumstances pertaining to the reported discovery of fragments of irradiated fuel rods in the Unit 1 Spent Fuel Pool which were not included in your annual physical inventories of Special Nuclear Material (SNM) and the reported loss of SNM in the form of approximately 18 inches (in the aggregate) of an irradiated fuel rod. The enclosed inspection report documents the inspection findings, which were discussed during an exit meeting on August 18, 2006, with Mr. Dennis Madison and other members of your staff. The inspection results were further discussed with members of your staff during a telephone conversation on September 27, 2006.

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 a selected examination of procedures and representative records, observations of activities, and interviews with personnel.

Based on the results of this inspection, an apparent violation of 10 CFR 74.19 was identified and is being considered for escalated enforcement action in accordance with the NRC Enforcement Policy. The current Enforcement Policy is included on the NRC's Web site at www.nrc.gov; select **What We Do**, **Enforcement**, then **Enforcement Policy**. The circumstances surrounding the apparent violation, the significance of the issues, and the need for lasting and effective corrective action were discussed with members of your staff at the inspection exit meeting. As a result, it may not be necessary to conduct a predecisional enforcement conference in order to enable the NRC to make an enforcement decision.

~~OFFICIAL USE ONLY - SECURITY-RELATED INFORMATION~~

Before the NRC makes its enforcement decision, we are providing you an opportunity to either: (1) respond to the apparent violation(s) addressed in this inspection report within 30 days of the date of this letter or (2) request a predecisional enforcement conference. If a conference is held, it will be open for public observation. Please contact Scott Shaeffer at (404)562-4521 within 7 days of the date of this letter to notify the NRC of your intended response.

If you choose to provide a written response, it should be clearly marked as a "Response to An Apparent Violation in Inspection Report No. 50-321/2006-401, 50-366/2006-401; EA-06-013" and should include for each apparent violation: (1) the reason for the apparent violation, or, if contested, the basis for disputing the apparent violation; (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 response is not received within the time specified or an extension of time has not been granted by the NRC, the NRC will proceed with its enforcement decision or schedule a predecisional enforcement conference.

In accordance with 10 CFR 2.390 and the NRC's "Rules of Practice," a copy of this letter 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 Website at http://www.nrc.gov/reading-rm/adams.html (The Public Electronic Reading Room). However, because of the security-related concerns contained in the enclosure, and in accordance with 10 CFR 2.390, a copy of this letter's enclosure will not be available for public inspection.

Should you have any questions concerning this letter, please contact Mr. Shaeffer.

Sincerely,

/RA/

Charles A. Casto, Director
Division of Reactor Projects

Docket Nos. 50-321, 50-366
License Nos. DPR-57, NPF-5

Enclosure: Inspection Report No. 50-321/2006-401 and 50-366/2006-401
w/Attachment: Supplemental Information
(Official Use Only - Security-Related Information)

cc w/encl: (see page 3)

cc w/encl:
D. R. Madison
General Manager, Plant Hatch
Southern Nuclear Operating Company, Inc.
11028 Hatch Parkway North
Baxley, GA 31513

Bentina C. Terry
Southern Nuclear Operating Company, Inc.
Bin B-022
P. O. Box 1295
Birmingham, AL 35201-1295

Raymond D. Baker
Manager Licensing - Hatch
Georgia Power Company
P. O. Box 1295
Birmingham, AL 35201

cc w/o encl:
J. T. Gasser
Executive Vice President
Southern Nuclear Operating Company, Inc.
P. O. Box 1295
Birmingham, AL 35201

Arthur H. Domby, Esq.
Troutman Sanders
Nations Bank Plaza
600 Peachtree Street, NE, Suite 5200
Atlanta, GA 30308-2216

Laurence Bergen
Oglethorpe Power Corporation
2100 East Exchange Place
P. O. Box 1349
Tucker, GA 30085-1349

Director
Department of Natural Resources
205 Butler Street, SE, Suite 1252
Atlanta, GA 30334

Manager, Radioactive Materials Program
Department of Natural Resources
4244 International Parkway
Suite 114
Atlanta, GA 30354

Chairman
Appling County Commissioners
69 Tippins St., Suite 201
Baxley, GA 31513

Resident Manager
Oglethorpe Power Corporation
Edwin I. Hatch Nuclear Plant
11028 Hatch Parkway North
Baxley, GA 31513

Senior Engineer - Power Supply
Municipal Electric Authority
of Georgia
1470 Riveredge Parkway NW
Atlanta, GA 30328-4684

Reece McAlister
Executive Secretary
Georgia Public Service Commission
244 Washington Street, SW
Atlanta, GA 30334

Distribution w/encl: (See page 4)

Letter to L. M. Stinson from Charles A. Casto dated November 20, 2006

SUBJECT: EDWIN I. HATCH NUCLEAR PLANT - NRC MATERIAL CONTROL AND ACCOUNTING PROGRAM INSPECTION REPORT NO. 05000321/2006-401 AND 05000366/2006-401

Distribution w/encl:
B. Westreich, NSIR
E. McNiel, NSIR

Distribution w/o encl:
R. Martin, NRR
PUBLIC

Before the NRC makes its enforcement decision, we are providing you an opportunity to either:

(1) respond to the apparent violation(s) addressed in this inspection report within 30 days of the date of this letter or (2) request a predecisional enforcement conference. If a conference is held, it will not be open for public observation. Please contact Scott Shaeffer at (404)562-4521 within 7 days of the date of this letter to notify the NRC of your intended response.

If you choose to provide a written response, it should be clearly marked as a "Response to An Apparent Violation in Inspection Report No. 50-321/2006-401, 50-366/2006-401; EA-06-013" and should include for each apparent violation: (1) the reason for the apparent violation, or, if contested, the basis for disputing the apparent violation; (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 response is not received within the time specified or an extension of time has not been granted by the NRC, the NRC will proceed with its enforcement decision or schedule a predecisional enforcement conference.

In accordance with 10 CFR 2.390 and the NRC's "Rules of Practice," a copy of this letter 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 Website at http://www.nrc.gov/reading-rm/adams.html (The Public Electronic Reading Room). However, because of the security-related concerns contained in the enclosure, and in accordance with 10 CFR 2.390, a copy of this letter's enclosure will not be available for public inspection.

Should you have any questions concerning this letter, please contact Mr. Shaeffer.

Sincerely,

/RA/

Charles A. Casto, Director
Division of Reactor Projects

Docket Nos. 50-321, 50-366
License Nos. DPR-57, NPF-5

Enclosure: Inspection Report No. 50-321/2006-401 and 50-366/2006-401
w/Attachment: Supplemental Information
(Official Use Only - Security-Related Information)

cc w/encl: (see page 3)

☐ PUBLICLY AVAILABLE X NON-PUBLICLY AVAILABLE X SENSITIVE ☐ NON-SENSITIVE

ADAMS: ☐ Yes ACCESSION NUMBER: ML063250206

OFFICE	RII:DFFI	NSIR:DSO/MS	RII:EICS	NSIR:DSO/MS	RII:DRP	
SIGNATURE	DWF /RA/	MSW /RA/	CFE /RA/	BCW /RA/	SMS /RA/	
NAME	DJones	MWilliams	CEvans	BWestreich	S.Shaeffer	
DATE	11/15 /2006	11/14 /2006	11/14/2006	11/14/2006	11/15/2006	8/ /2007
E-MAIL COPY?	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO

OFFICIAL RECORD COPY DOCUMENT NAME: C:\MyFiles\Copies\Hatch Report - Public.wpd

~~OFFICIAL USE ONLY - SECURITY-RELATED INFORMATION~~

U.S. NUCLEAR REGULATORY COMMISSION
OFFICE OF NUCLEAR SECURITY AND INCIDENT RESPONSE

Docket Nos:	50-321, 50-366
License Nos:	DPR-57, NPF-5
Report No:	05000321/2006401, 05000366/2006401
Licensee:	Southern Nuclear Operating Company, Inc.
Facility:	Edwin I. Hatch Nuclear Plant
Inspection Locations:	Birmingham, Alabama 35201 Baxley, Georgia 31515
Dates:	August 8 - 11, 2006 (Birmingham) August 14 - 18, 2006 (Baxley)
Inspectors:	D. Jones, Senior Fuel Facilities Inspector, RII M. Williams, Senior MC&A Physical Scientist, NSIR G. Tuttle, MC&A Physical Scientist, NSIR D. Votolato, MC&A Physical Scientist, NSIR C. Graves, MC&A Physical Scientist, NSIR
Approved by:	Charles A. Casto, Director Division of Reactor Projects

SUMMARY OF FINDINGS

IR 05000321/2006-401, 05000366/2006-401; 08/08/2006 - 08/18/2006; Edwin I. Hatch Nuclear Plant Unit 1 and Unit 2; Team Inspection of the Licensee's Material Control and Accounting (MC&A) Program.

This inspection was conducted in response to the licensee's report that sections of spent fuel rods were found in the Spent Fuel Pool (SFP) which were not included in the Special Nuclear Material (SNM) inventory. This inspection examined the adequacy of the licensee's investigation into unaccounted sections of spent fuel rods found in the SFP. The first week of inspection, conducted at the licensee's corporate office, consisted of a review of the results of the licensee's search of the Nuclear Fuel Department records to determine which fuel assemblies were no longer intact, which fuel rods were broken, and where the fuel rod pieces were stored. The second week of the inspection was conducted onsite and consisted of a review of the results from searches of the SFP for fuel rod and fuel pellet pieces and a review of the licensee's investigation of this issue.

The inspectors concluded that the methods used to measure the amount of fuel in the fuel rod pieces found in both SFPs were adequate and that the storage of the fuel rod pieces that had been recovered was adequate. The inspectors also concluded that the methods used to estimate the amount of fuel missing from the six assemblies examined were adequate; however, not all assemblies with the potential for undocumented damage were inspected. The review process did incorporate those assemblies which were known to be missing SNM.

The inspectors verified that the corrective actions taken by the licensee had been completed. These included (1) all located SNM-bearing pieces were included in the physical inventory records; (2) the SNM physical inventory procedure was revised to include instructions for administrative handling of SNM pieces; and (3) personnel assigned to SNM accounting activities had been trained on the new requirements for tracking and inventorying SNM and SNM-bearing pieces.

A. NRC-Identified and Self-Revealing Findings

Cornerstone: Physical Protection

- TBD. An apparent violation (AV) of 10 CFR 74.19(a), (b), and (c) was identified for failure to (1) maintain complete and accurate records of all SNM possessed, (2) implement procedures sufficient to account for all SNM possessed, and (3) conduct a physical inventory of all SNM possessed at least every 12 months.

  This finding is a performance deficiency because the licensee failed to: (1) keep complete accounting and inventory records (including location and unique identity) of all SNM, (2) establish, maintain, and follow written procedures that were sufficient to account for all SNM, and (3) conduct physical inventories that included all SNM in the form of fuel pieces. The significance of this finding is greater than minor because it is associated with MC&A program performance and degraded the ability to meet

the cornerstone objective to ensure the secure use and management of radioactive materials. Because the NRC's existing Significance Determination Process (SDP) does not apply, this finding was evaluated under the Traditional Enforcement Policy in accordance with direction from the Commission.

B. Licensee-Identified Violations

None

REPORT DETAILS

1. Background

On May 10, 2005, while performing visual verification of SNM items in the SFP in response to NRC Bulletin 2005-01, “Material Control and Accounting At Reactors and Wet Spent Fuel Storage Facilities,” and while identifying the SFP contents in anticipation of a planned cleanup campaign, the licensee found what appeared to be pieces of spent nuclear fuel rods in one of the large buckets in the Unit 1 SFP cask pit. The licensee documented the discovery in Condition Report (CR) 2005105177. The licensee initiated an effort to examine and characterize the contents of the bucket. Initial search of records indicated that there were no inventory or accounting records for these pieces. This was the first indication that a MC&A problem existed. The NRC monitored the licensee’s progress as additional fuel rod pieces were found and collected from the SFP. In June 2005, the licensee chartered a Special Nuclear Material Accounting Issue Resolution Team to develop and implement an action plan.

From July 2005 through October 2005, the licensee continued the search effort, extending it to cover the entire SFPs in both Unit 1 and Unit 2. During that time, the licensee discovered additional fuel rod pieces in other areas of the Unit 1 and Unit 2 SFPs. The licensee identified and characterized these pieces. The licensee also reviewed the historical accounting records to determine the source of the pieces, in particular, records of reconstitution campaigns and fuel failures that had occurred during the 1980s.

On October 28, 2005, the licensee finished the initial SFP assessment. Based on the aggregate length of fuel rod pieces retrieved and the records of damaged fuel rods, the licensee determined that they could not account for the equivalent of approximately 68" (inches) of fuel rods containing SNM. On November 10, 2005, the licensee notified the NRC in accordance with 10 CFR 20.2201(a)(1)(ii) (Event Notification 42135).

On November 7, 2005, the NRC began a scheduled MC&A inspection consisting of headquarters and regional staff as part of the on-going inspections conducted under Phase III of Temporary Instruction 2515/154, "Spent Fuel Material Control and Accounting at Nuclear Power Plants." The inspection was scheduled following the licensee's initial SFP search effort and records review. The inspection examined the adequacy of measures taken by the licensee to control the risk of loss, theft, or diversion of SNM, except for the unaccounted fuel rod pieces. The inspectors determined that the licensee had adequately accounted for and controlled the remaining SNM.

From November 2005 to July 2006, the licensee continued to investigate the unaccounted 68" of irradiated fuel rods looking in areas of both SFPs which were originally deemed inaccessible. During that time, the licensee identified and characterized additional fuel rod pieces discovered in other areas of the SFPs. The licensee also continued to review the historical accounting records to determine the source of these pieces. The licensee completed its investigation and issued its Special Nuclear Material Control and Accountability Final Report on October 10, 2006.

2. Review of Fuel History Records

a. Inspection Scope

The inspectors reviewed a sample of licensee fuel history records which included reconstitution campaigns, fuel inspection, receipt, inventory, fuel movement, and shipment records. The inspectors reviewed licensee activities to (1) determine the quantity and physical form of SNM in the accounting records (or book inventory) and (2) identify the sources of irradiated rod pieces found in the SFPs.

b. Observations and Findings

The licensee failed to document all SNM activities. For example:

- There was no record to indicate that the fuel rod in position C5 of assembly LY8027 was broken although a piece of the rod was found during the search of the SFPs and subsequent inspection of the assembly revealed that the fuel rod was broken in three pieces.

- There were no fuel movement or inventory records to indicate that pieces had been stored in a fuel rod thimble although several fuel rod pieces were found in the fuel rod thimble during the search of the SFPs.

- Accounting and physical inventory records indicated incorrectly that six bundles were intact when in fact pieces of fuel rods from these six bundles were stored in other locations in the SFP.

The inspectors found that licensee records concerning inventory (including location and unique identity), acquisition, and transfer of SNM were not complete. This finding is included in the violation described in Section 4.

The inspectors noted that licensee records for the reconstitution campaign that included assembly LY8027 were incomplete. The vendor performing the reconstitution campaign did not document that fuel rod C5 had broken, that pieces had become separated from the assembly, and incorrectly characterized the assembly as being intact. The inspectors noted that there were seven assemblies used as donor assemblies during this reconstitution campaign. The licensee inspected only two of the donor assemblies from this reconstitution campaign, LY8027 and LY8026, for possible damage. The remaining five assemblies were not inspected by the licensee. The inspectors did consider that, based on the undocumented damage found, the potential for damaged fuel rods and missing fuel may exist for other donor assemblies. However, considering the licensee's inspection efforts and the increased risk to health and safety of additional inspections, the inspectors determined that the licensee's corrective actions were acceptable.

3. Review of Licensee's SNM Accounting Issue Resolution Project

   a. Inspection Scope

      The inspectors reviewed the scope and implementation of the licensee's SNM accounting issue resolution project. The review included project control documents that consisted of the licensee's Charter and the SNM Accountability Punchlist. The inspectors reviewed the project activities for adequacy in identifying previous SNM control issues and the corrective actions to ensure the extent of condition of the SNM control problem was properly reviewed

   b. Observations and Findings

      The purpose of the licensee's Charter, approved by the site Vice President on June 16, 2005, was to ensure that timely and effective actions were implemented to characterize and document SNM not currently documented in the physical inventory. The stated mission of the project was to develop and implement an action plan to characterize and confirm all SNM in the SFPs, to reconcile the confirmation and characterization with existing records, to review SNM accounting practices, and to incorporate best practices as applicable in order to conservatively assure that positive physical inventory control of all SNM is maintained. Teams were established to provide mission oversight, direct activities on the refueling floor, provide regulatory guidance, to ensure information was communicated to interested stakeholders, conduct root cause investigations, and review activities for completeness.

      The licensee's SNM Accountability Punchlist was used to track work activities and assigned tasks. The status of the various work activities and tasks were discussed during periodic teleconferences between the teams identified in the Charter. The Punchlist was then revised and updated to reflect issues discussed during the calls. The Independent Oversight Team was briefed periodically on the project and provided observations and directions to the project team members.

      The licensee's issue resolution project ensured that timely and effective corrective actions were implemented in response to the MC&A issues. The licensee provided a summary of activities conducted in the final report. The inspectors noted that the licensee's conclusions were based on the assumption that all accounting records were complete and accurate and that all assemblies were intact with the exception of the six assemblies identified in the licensee's final report as missing SNM. However, the inspectors noted that the licensee's discovery of the record discrepancy concerning assembly LY8027, described in Section 2, challenged this assumption.

4. Searches and Inspections Conducted by the Licensee and Results

   a. Inspection Scope

      The inspectors reviewed vendor reports issued to the licensee which documented activities completed by the vendor, the amounts (in inches) of fuel rod pieces retrieved

from the SFP, and the amounts of fuel rod pieces determined to be missing from damaged assemblies. The inspectors reviewed video documentation of the vendor inspections of the fuel rod pieces found in the SFP and the assemblies suspected to be missing rods or pieces. The inspectors reviewed the methodology used to measure the amount of fuel retrieved in the form of chips and fines. The inspectors reviewed records used to document the SNM items found during SFP searches and their disposition.

b. Observations and Findings

Observations

The licensee contracted two vendors to conduct the SFP search, the characterization of the fuel pieces retrieved, and the estimation of the amount of SNM missing from assemblies. The inspectors verified, through interviews, that the characterization of the fuel pieces was conducted by fuel handlers experienced in visually identifying fuel and non-fuel pieces. The inspectors noted that the licensee adhered to a management expectation to maintain a reactor engineer on the SFP floor to provide oversight of the vendors although written procedures did not require direct oversight by a reactor engineer.

The licensee collected 33 “items of interest” from various locations in the SFPs of which 20 were determined to be fuel rod pieces containing SNM. The vendors used a ruler taped to a submerged platform to measure the length of the fuel rod pieces found. The 20 fuel rod pieces contained a total of approximately 197" of fuel.

The licensee also collected fuel and cladding chips and fines from various locations in the SFP. The vendor placed the chips and fines in a graduated cylinder to measure the volume of material. The vendor then estimated the void fraction of the material, sampled the fines, and sent the sample to a laboratory for radiological analysis. The laboratory reported the sample results in units of microcuries per gram of U^{238}. The licensee then used the sample results and the volume to calculate a conservative estimate of total SNM contained in the chips and fines. The licensee concluded that a total of approximately 18" of fuel were contained in the collected chips and fines.

The inspectors noted that the licensee inspected a total of 39 assemblies to determine which assemblies were damaged and to estimate the amount of fuel missing from those assemblies. These 39 assemblies were selected based on a review of fuel history records and fuel rod lower end plugs marked with serial numbers found in the SFP. The licensee determined that rod pieces or fragments were missing from six assemblies. The vendor used video cameras to record the inspection of the assemblies. The inspectors observed that the video camera the vendor used was programmed to make length measurements as it traveled along an assembly. The inspectors verified that a selection of the measurements were consistent with the lengths in vendor reports. The licensee determined that a total of approximately 233" of fuel was missing from the six assemblies.

The licensee allocated found fuel pieces to the six assemblies determined to be missing

fuel. A total of 215" was found; 197" in pieces plus 18" in chips/fines. Three of the pieces had bottom end plugs attached marked with a serial number and could be traced to their parent assemblies. This accounted for approximately 41" of the missing fuel pieces. The licensee then allocated the remaining 174" to the six assemblies by best fit analysis. The inspectors observed that the licensee could not account for approximately 18" of fuel rod from these six assemblies. The inspectors noted that this determination was based on the assumption that all uninspected assemblies were intact.

The inspectors verified that all fuel rod pieces collected during the SFP inspection were encapsulated in assemblies which was adequate for future control and accountability. The inspectors noted that the chips and fines were first placed into pellet capsules and then placed in vacant locations within a designated assembly. The ICA (Item Control Area) Transfer Authorization records, which documented the retrieval of the fuel rod pieces, recorded them into the book inventory, and transferred them to final storage within an assembly were completed as required by Procedure 42FH-ENG-030 (Rev. 9.4), “Special Nuclear Material Inventory & Transfer Control.”

The inspectors concluded that the methods used to measure the amount of fuel in the fuel rod pieces found in both SFPs were adequate and that the storage of the fuel rod pieces that had been recovered was adequate. The inspectors also concluded that the methods used to estimate the amount of fuel missing from the six assemblies examined were adequate; however, not all assemblies with the potential for undocumented damage were inspected. The review process did incorporate those assemblies which were known to be missing SNM.

Findings

Introduction. An apparent violation of 10 CFR 74.19(a), (b), and (c) was identified for failure to (1) maintain complete and accurate records of all SNM possessed, (2) implement procedures sufficient to account for all SNM possessed, and (3) conduct a physical inventory of all SNM possessed at least every 12 months.

Description. On May 10, 2005, while performing visual verification of SNM items in the SFP in response to NRC Bulletin 2005-01 and while identifying the SFP contents in anticipation of a planned SFP cleanup campaign, the licensee found pieces of fuel rods in one of the large buckets in the Unit 1 SFP cask pit. The licensee documented the discovery in CR 2005105177 and initiated an effort to examine and characterize the contents of the bucket. Initial records search indicated that there were no inventory or accounting records for these pieces. A detailed review of fuel history records and an expanded search of the SFPs was initiated by the licensee. The fuel history records review identified five fuel assemblies (LY5171, LY5085, LY2639, LYK034, and LJZ968) with broken fuel rods and missing fuel. The records indicated that the fuel rods had been broken during inspection and reconstitution activities conducted during the 1980s. The SFP search identified a section of another fuel rod that was missing from a sixth fuel assembly (LY8027). There was no documentation in the fuel history records to indicate that a rod from LY8027 had been broken. Those six fuel assemblies were recorded in the SNM accounting records as intact.

The licensee examined the six assemblies and determined that a total of approximately 233" of fuel rod were missing from the six assemblies. During the SFP search activities, fuel rod and fuel pellet pieces were collected, characterized, and allocated to the six assemblies. After that allocation, the licensee determined that a total of approximately 18" of fuel rod which remained unaccounted.

The SNM accountability records were adjusted to reflect the changes to the book inventory. On August 8, 2006, the licensee issued a Nuclear Material Transaction Report (DOE/NRC Form 741) to document a loss of 347 grams of low enriched uranium and two grams of plutonium corresponding to the approximate 18" of fuel rod that remained unaccounted.

Analysis. This finding is a performance deficiency because the licensee failed to: (1) keep complete accounting and inventory records (including location and unique identity) of all SNM, (2) establish, maintain, and follow written procedures that were sufficient to account for all SNM, and (3) conduct physical inventories that included all SNM in the form of fuel pieces. The significance of this finding is greater than minor because it is associated with MC&A program performance and degraded the ability to meet the cornerstone objective to ensure the secure use and management of radioactive materials. Because the NRC's existing SDP does not apply, this finding was evaluated under the Traditional Enforcement Policy in accordance with direction from the Commission.

Enforcement. 10 CFR 74.19(a)(1) requires each licensee to keep records showing the receipt, inventory (including location and unique identity), acquisition, transfer, and disposal of all SNM in its possession. 10 CFR 74.19(b) requires each licensee to establish, maintain, and follow written MC&A procedures that are sufficient to enable the licensee to account for the SNM in its possession. 10 CFR 74.19(c) requires each licensee to conduct a physical inventory of all SNM in its possession at intervals not to exceed 12 months. Contrary to the above, the licensee failed to keep complete records concerning inventory and acquisition of all SNM; to establish MC&A procedures that included provisions for inventorying and accounting for all SNM; and to include pieces of fuel rods in the physical inventory of all SNM possessed. Pieces of fuel rods were found in the SFPs which were not part of the physical inventory and accounting records. This failure of the MC&A program resulted in the loss of SNM which was reported by the licensee to consist of approximately 347 grams of low enriched uranium and two grams of plutonium (~18" of a fuel rod).

Because this finding is a potentially significant failure of the MC&A program designed to prevent or detect the theft, loss or diversion of SNM, it is being considered for escalated enforcement action pending further review by NRC management. This apparent violation (AV) will be tracked a AV 05000321/2006-401, 05000366/2006-401, Special Nuclear Material Control Issues. Accordingly, Unresolved Item (URI) 05000321,366/2005003-02 is closed.

5. Scenarios for Missing Material

a. Inspection Scope

The inspectors discussed with the licensee various scenarios by which the loss of SNM may have occurred. The inspectors reviewed the scenarios discussed by the licensee in the final report.

b. Observations and Findings

The licensee indicated, in Licensee Event Report (LER) 05000321/2005-003, the possibility of theft or diversion was not plausible because of the plant's radiation monitoring instrumentation, physical security measures, and the size and type of container required for transporting nuclear material of this nature. The licensee concluded that the remaining unaccounted SNM was still in the SFPs or had been mistakenly shipped to a facility licensed to receive radioactive waste. The inspectors accepted the licensee's conclusions as described in the LER.

6. Other MC&A Issues

a. Inspection Scope

The inspectors interviewed reactor engineers regarding the disposition and documentation of SNM found during the current SFP cleanup campaign and reviewed relevant written procedures. The inspectors also interviewed reactor engineers concerning future cleanup preparations.

b. Observations and Findings

The inspectors noted that Procedure 42FH-ENG-030 did not state how items of SNM of less than a complete fuel rod would be tracked in the licensee's physical inventory. The procedure stated that once an SNM item was stored in an assembly, the item would not be tracked individually in the physical inventory. The licensee stated that information concerning the location of these pieces would be available at the corporate office for isotopic tracking. The information would not be readily available as part of the site records.

The licensee stated that a SFP cleanup was scheduled for mid-2007, but that no procedures for that activity had been written and approved. To preclude the possibility of irradiated fuel being shipped as radioactive waste, the licensee indicated the intent to use personnel who were experienced in visually distinguishing between fuel and non-fuel materials during the SFP cleanup.

7. Licensee Reports and Corrective Actions

a. Inspection Scope

The inspectors reviewed the licensee's initial, interim, and final LERs, which reported the identified discrepancy in SNM inventory.

b. Observations and Findings

On December 9, 2005, the licensee submitted an initial report, LER 05000321/2005-003, indicating that a discrepancy existed between the amount of spent fuel in the SFP and the amount recorded in the SNM physical inventory records. The report indicated that the discrepancy was caused by fuel rod pieces not being tracked as separate, individual items in the SNM inventory and that the applicable plant procedures had been revised to prevent recurrence of this problem. The licensee reported that additional review of pertinent records was in progress and the search of the SFPs for additional fuel rod pieces was continuing.

On April 14, 2006, the licensee submitted an interim report, LER 05000321/2005-003-1, to report that most of the fuel rod pieces had been retrieved, quantified, and added to the SNM inventory. However, some potential SNM bearing pieces had been observed in highly inaccessible areas of the SFP and efforts to retrieve that material would resume after the current refueling outage. The interim report indicated that the corrective actions identified by the licensee's root cause analysis had been completed. Those corrective actions were: (1) all located SNM-bearing pieces were included in the physical inventory records; (2) the SNM physical inventory procedure was revised to include instructions for administrative handling of SNM pieces; and (3) personnel assigned to SNM accounting activities had been trained on the new requirements for tracking and inventorying SNM and SNM-bearing pieces.

On September 19, 2006, the licensee submitted a report, LER 05000321/2005-003-2, indicating that after an extensive review of records, a thorough inspection of the SFPs, and inspection of fuel assemblies, licensee staff had determined that approximately 18" of fuel rod and/or fuel pellet pieces were unaccounted for. The report also indicated that, given the nature of the material and the barrier provided by the in-plant radiation monitoring instrumentation, a high degree of confidence existed that the unaccounted SNM was either still in the SFPs or had been inadvertently shipped to a licensed low level waste disposal facility. The corrective actions described in the interim report were also reiterated.

The inspectors determined that the licensee had submitted the reports in accordance with the requirements in 10 CFR 74.11 and 10 CFR 20.2201(b)(1) and that the reports included the information required to be provided. Accordingly, LER 05000321/2005-003 and its supplements are closed.

8. Root Cause Analysis

a. Inspection Scope

The inspectors reviewed the licensee's Root Cause Determination Report concerning the unaccounted for SNM event.

b. Observations and Findings

The licensee's root cause analysis team determined that six fuel rods had been broken into pieces during inspection and reconstitution activities conducted between 1981 and 1986. Fuel handling records indicated that some pieces were placed in baskets located in an SFP cask pit and that other pieces were reinserted in their parent assemblies. The team determined that the basic reason the licensee could not account for all SNM was because the fuel rod pieces were not entered into the SNM inventory as separate items when they were created and therefore were not made subject to SNM accounting controls and physical inventories. Through barrier analysis the team identified four root causes of this event: (1) Inadequate procedure - Procedure 42FH-ENG-030 provided instructions for inventorying whole fuel assemblies but did not include provisions for inventorying fuel rods or fuel rod pieces, (2) Lack of experience - Responsible personnel lacked experience with proper methods for accounting for fragments and pieces of SNM, (3) Lack of precedent - Responsible personnel had no precedent for adding broken fuel rods to the SNM inventory, (4) Failure to use operating experience - Personnel failed to use operating experience to determine the proper administrative handling of fuel rod pieces. The team also identified three recommended corrective actions which have been or will be taken to prevent recurrence: (1) The physical inventory records were updated to include all of the SNM bearing fragments and pieces as they were found in the SFP, (2) Procedure 42-FH-ENG-030 was revised to require that all SNM bearing fragments and pieces be included in physical inventory records, (3) Personnel assigned to SNM accounting activities would receive training on the new requirements in procedure 42-FH-ENG-030 regarding tracking of SNM bearing fragments and pieces.

The licensee's root cause analysis team concluded that the failure to maintain the ability to control and account for all SNM in the SFP was the direct result of not adding the fuel rod pieces to the SNM inventory as they were created. The inspectors determined that the licensee's root cause analysis was thorough and adequate. The inspectors noted that the licensee's root cause analysis concluded that lack of oversight of vendors was not a root cause because the engineers providing oversight were not cognizant of the requirements.

9. Missed Opportunities

a. Inspection Scope

The inspectors reviewed activities conducted by the licensee in the SFP that provided opportunities to identify the fuel rod pieces containing SNM that were found in 2005.

b. Observations and Findings

The inspectors observed that exit reports and fuel movement records completed by vendors conducting reconstitution activities in the SFP in 1981, 1982, 1983, and 1984 indicated that rods had broken in the active fuel region. Vendor move sheets also indicated, for example, that a 10-inch and a 33-inch piece had been placed in a temporary disposal bucket. However, the licensee took no action to place these items on the inventory of record and to place them under the SNM control program. The licensee acknowledged in the final report that plant records retrieved during this project

show that the plant was aware of the vast majority of breaks; however, the inspectors noted that appropriate action was not taken to annotate the missing fuel in the inventory records.

Vendors were engaged in 1986 for a campaign to retrieve pellets and fuel pieces from the pool floor and place them in a capsule. Licensee documentation indicated that the campaign was only partially completed. However, the licensee confirmed, based on vendor documentation and the 2005 recovery of a fuel rod thimble containing three rod pieces, that some of the planned retrieval activities were performed. The thimble and its contents were not entered in the inventory records. During physical inventories conducted between 1981 and 2005, the licensee made no effort to identify the pieces of spent fuel in various locations of the SFP, which had been separated from their assemblies, or to determine their source of origin.

10. Exit Meeting

A summary of the inspection scope and preliminary results was presented to Mr. Dennis Madison and other members of his staff during a meeting on August 18, 2006. The licensee submitted their final report on October 10, 2006. The inspection results were further discussed with members of the licensee staff during a telephone conversations of September 27 and November 13, 2006. The licensee acknowledged the inspection findings. At the exit meeting, the licensee indicated that information contained in this inspection report was considered proprietary. In accordance with 10 CFR 2.390, this inspection report will be exempt from public disclosure.

ATTACHMENT: SUPPLEMENTAL INFORMATION

SUPPLEMENTAL INFORMATION

KEY POINTS OF CONTACT

Licensee Personnel
R. Baker, Licensing, Manager
M. Brazell, Reactor Engineering Supervisor
N. Folk, Senior Engineer
B. Hunt, Nuclear Fuel Manager
D. Madison, Assistant General Manager, Plant Operations
K. Underwood, Performance Analysis Supervisor
D. Williams, SNM Custodian

NRC Personnel
D. Simpkins, Senior Resident Inspector
J. Hickey, Resident Inspector

LIST OF ITEMS OPENED AND CLOSED

Opened

05000321, 366/2006401-01	AV	Failure to keep adequate records of all SNM possessed; failure to establish, maintain, and follow adequate material control and accounting procedures; failure to include all SNM possessed in annual physical inventories.

Closed

05000321, 366/2005003-02	URI	Special Nuclear Material Control and Accountability
05000321/2005-003-00	LER	Discrepancy in Special Nuclear Material Inventory
05000321/2005-003-001	LER	Discrepancy in Special Nuclear Material Inventory
05000321/2005-003-002	LER	Discrepancy in Special Nuclear Material Inventory

LIST OF DOCUMENTS REVIEWED

Procedures
246-GP-01, “Fuel Bundle Upper Tie Plate Removal/Replacement and Individual Rod Handling,” Rev. 19
246-GP-33, “Irradiated Fuel Bundle, Channel, and Individual Rod Length Measuring,” Rev. 7
246-GP-37, “Removal and Reinstallation of a Channel on an Irradiated Fuel Bundle,” Rev. 10
246-GP-43, “Fuel Rod Accountability,” Rev. 8
246-GP-46, “Fuel Pool Cleanup,” Rev. 2
42FH-ENG-030, “Special Nuclear Material Inventory & Transfer Control,” Rev. 9.4
42SP-09-12-05-QI-1, “Spent Fuel Pool Inspection and Debris Removal,” Rev. 2.0
62RP-RAD-055, “Underwater Storage and Inventory of Radioactive Materials in the Spent Fuel Pools,” Rev. 3.0

Reports
Root Cause Determination Report 2005106911
Special Nuclear Material Control and Accountability Final Report, October 10, 2006