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

September 14, 2007

Virginia Electric and Power Company
ATTN: Mr. David A. Christian
Sr. Vice President and
Chief Nuclear Officer
Innsbrook Technical Center - 2SW
5000 Dominion Boulevard
Glen Allen, VA 23060-6711

SUBJECT: SURRY POWER STATION - INSPECTION REPORT NOS. 05000280/2007006; 05000281/2007006; AND 07200055/2007001

Dear Mr. Christian:

This inspection report covers two visits made by the United States Nuclear Regulatory Commission (NRC) to your Surry Power Station Independent Spent Fuel Storage Installation (ISFSI) between June 18 and August 3, 2007. The purpose of the site visits was to inspect your dry fuel storage pre-operational testing activities and to observe your first loading of the NUHOMS-HD storage system. The first NUHOMS-HD canister was loaded and placed in storage at the ISFSI on August 6, 2007. The enclosed inspection report documents the results of the inspection, which were discussed on August 2, 2007, with Mr. B. L. Stanley and other members of your staff. Based on results of this inspection, no violations or findings of significance were identified.

In accordance with 10 CFR 2.390 of the NRC's "Rules of Practice," a copy of this letter, its enclosures will be available electronically for public inspection in the NRC Public Document Room or from the Publically Available Records (PARS) component of NRC’s document system

(ADAMS). ADAMS is accessible from the NRC Web site at http://www.nrc.gov/reading-rm/adams.html. (The Public Electronic reading Room).

Sincerely,

/RA/

Steven Vias, Chief
Technical Support Branch
Division of Reactor Projects

Docket Nos.: 50-280; 50-281; 72-055
License Nos.: DPR-32, DPR-37

Enclosure:
Surry Power Station - Independent Spent Fuel Storage Installation(ISFSI) Dry Run and Initial Loading Inspection Report
Attachments: 1. Supplemental Information
2. Inspector Notes

(ADAMS). ADAMS is accessible from the NRC Web site at http://www.nrc.gov/reading-rm/adams.html. (The Public Electronic reading Room).

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SUNSI Review Completed: SPA ADAMS: ■ Yes ☐ No Initials: SPA
■ Publicly Available ☐ Non-Publicly Available ☐ Sensitive ■ Non-Sensitive

DOCUMENT NAME:

RIV:DNMS:FCDB	RIV:DNMS:FCDB	RIV:DNMS:FCDB	RIV:DRP
SP Atwater	EM Garcia	RL Kellar	MA Sitek
SPA by email	EMG by email	RLK2 by email	MAS3 by email
09/13/07	09/06/07	09/13/07	08/31/07

SFST	SFST	SFST	C:TSB/DRP
BP Tripathi	ZL Cruz-Perez	MG Karmis	SJ Vias
BPT by email	ZLC by email	MGK by email	SJV
09/07/07	09/07/07	09/11/07	09/14/07

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Report to David A. Christian from Steven J. Vias dated September 14, 2007

SUBJECT: SURRY POWER STATION - INSPECTION REPORT NOS. 05000280/2007006; 05000281/2007006; AND 07200055/2007001

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U.S. NUCLEAR REGULATORY COMMISSION
REGION IV

Docket Nos.:	50-280, 50-281, 72-055	
License:	DPR-32, DPR-37	
Report No:	05000280/2007006; 05000281/2007006; and 07200055/2007001	
Licensee:	Virginia Electric and Power Company (VEPCO)	
Facility:	Surry Power Station, Units 1 & 2	
Location:	5850 Hog Island Road Surry, VA 23883	
Dates:	June 18 through August 3, 2007	
Inspectors:	Scott Atwater	Region IV DNMS Inspector - Team Leader
	Emilio Garcia	Region IV DNMS Inspector
	Mark Sitek	Region IV Resident Inspector - San Onofre
	Steven Vias	Region II DRS Inspector
	Michael Karmis	SFST Senior Safety Inspector
	Bhasker (Bob) Tripathi	SFST Technical Review Directorate
	Zahira Cruz-Perez	SFST Technical Review Directorate
Crane Licensing Research:	Ray Kellar, P.E.	Region IV DNMS Inspector
Approved By:	Steven Vias, Chief Technical Support Branch Division of Reactor Projects	
Attachments:	Supplemental Information Inspector Notes	

Enclosure

EXECUTIVE SUMMARY

Surry Power Station
NRC Inspection Report 05000280/2007006; 05000281/2007006; and 07200055/2007001

Virginia Electric and Power Company (VEPCO) had selected the NUHOMS-HD Horizontal Modular Storage System for dry storage of spent nuclear fuel at the Surry Power Station. The Nuclear Regulatory Commission (NRC) had certified the NUHOMS-HD cask system for storage of irradiated fuel under Certificate of Compliance No. 72-1030 on January 10, 2007.

On June 18-22, 2007, a team of 7 inspectors performed two evaluations. The first evaluation was to determine if the ISFSI personnel had been trained, the equipment had been tested, and the procedures had been developed to the extent necessary to safely load spent fuel into dry storage at the ISFSI. The second evaluation was to determine if the Surry station programs were adequate for continued maintenance and operation of the ISFSI once it was loaded. The results of these two evaluations were discussed during a debriefing on June 22, 2007, with Mr. Ken Grover and other members of the staff.

On July 23-27, 2006, a Region IV DNMS inspector performed two evaluations. The first was to determine if the Spent Fuel Cask Crane was in condition to safely handle the loaded transfer cask. The second evaluation was to determine if the deficiencies identified during the team evaluation conducted on June 18-22, 2007, had been adequately resolved and closed. The results of these two evaluations were discussed during a debriefing on July 26, 2007, with Mr. Matt Adams and other members of the staff.

On July 30 through August 3, 2007, a Region IV DNMS inspector observed the first loading of spent fuel into dry storage using the NUHOMS Storage System. The purpose was to verify the first loading was performed safely, in accordance with approved procedures, and within the Technical Specification limits. The results of this evaluation were discussed during the exit meeting on August 2, 2007, with Mr. B. L. Stanley and other members of the staff.

The following provides a summary of the results of the inspection. Details are provided in the Inspector Notes contained in Attachment 2 to this report.

Spent Fuel Cask Crane

- The crane design features for load control were intact, operable, and properly rated for the application. The design features included the hoist and trolley brakes, crane remote control system, and hoist minimum wire rope breaking strength
  (Attachment 2, Crane Design, Pages 1-2).

- The crane, hooks, and wire rope were inspected and maintained in accordance with the ASME Code and the crane manufacturer's instructions
  (Attachment 2, Crane Inspection/Maintenance, Pages 3-6).

- The crane configuration had been maintained in conformance with its licensing basis
  (Attachment 2, Crane Licensing Basis, Pages 6-7).

- The crane had been load tested and operated in accordance with the ASME Code (Attachment 2, Crane Load Testing and Crane Operation, Pages 8-11).

Canister Drying and Helium Backfill Operations

- The canister was vacuum dried and backfilled with helium to the pressures specified by Technical Specifications. The drying and backfilling operations were completed within the time limits specified (Attachment 2, Drying/Helium Backfill, Pages 12-13).

Emergency Planning

- The Emergency Plan had been expanded to include the ISFSI. Emergency Action Levels (EALs) had been developed for accidents involving the ISFSI. (Attachment 2, Emergency Planning, Pages 13-14).

Fire Protection

- The Fire Protection Plan had been expanded to include the ISFSI, and emergency response training had been provided for off-site responders (Attachment 2, Fire Protection, Page 14).

Fuel Selection and Verification

- The spent fuel assemblies selected for loading into the first NUHOMS-HD canister met the Technical Specification requirements for assembly type, cladding integrity, decay heat load, and physical design characteristics (Attachment 2, Fuel Selection/Verification, Pages 15-17).

- A canister loading plan had been developed based on the combination of spent fuel assembly enrichment, burnup, cooling time and decay heat (Attachment 2, Fuel Selection/Verification, Page 17).

- The non-fuel assembly hardware (NFAH) selected for loading into the first NUHOMS-HD canister met the Technical Specification requirements for burnup and decay heat load (Attachment 2, Fuel Selection/Verification, Page 18).

- The Technical Specification actions required for spent fuel mis-loading had been incorporated into the loading procedure (Attachment 2, Fuel Selection/Verification, Page 18).

General License Conditions

- The NUHOMS-HD cask design was compatible with the Surry Power Station 10 CFR Part 50 requirements. There were no items identified that required NRC review or approval prior to use of the NUHOMS-HD system (Attachment 2, General License, Page 19).

- The licensee had calculated the dose to the public at the site boundary from a worst case accident during ISFSI operations. The dose was within the limits allowed by 10 CFR 72.106 (Attachment 2, General License, Page19).

- The licensee had calculated the dose to the public at the site boundary from normal ISFSI operations. The dose was within the limits allowed by 10 CFR 72.104 (Attachment 2, General License, Page 20).

- The soil structure under the ISFSI pad was determined not to be subject to liquefaction during a Safe Shutdown Earthquake (Attachment 2, General License, Page 21).

- The Horizontal Storage Modules (HSMs) were placed on the ISFSI pad in an array that was consistent with the Technical Specifications (Attachment 2, General License, Page 21).

- The NUHOMS-HD cask system design parameters were bounded by the Surry Power Station reactor site parameters (Attachment 2, General License, Pages 21-24).

Heavy Loads and Rigging

- All lifts of the transfer cask and canister were made under the Surry Power Station heavy loads requirements and procedures, as documented through a 10 CFR 50.59 evaluation (Attachment 2, Heavy Loads and Rigging, Page 25).

- A safe load path had been established for transfer cask movements, meeting the requirements of NUREG 0612 (Attachment 2, Heavy Loads and Rigging, Page 25).

- Maximum lifting heights had been established for the transfer cask to ensure that a drop would not result in dose rates at the site boundary in excess of the 10 CFR Part 100 limits. These lifting heights were consistently implemented during the first NUHOMS cask system loading (Attachment 2, Heavy Loads and Rigging, Page 26).

Procedures and Technical Specifications

- Procedures were established to ensure that the NUHOMS-HD cask storage system technical specification requirements for inspection, maintenance, operation and surveillance were implemented. These procedures were implemented during the first NUHOMS cask system loading (Attachment 2, Procedures and Tech Specs, Pages 27-29).

Quality Assurance

- The licensee's 10 CFR Part 50 Quality Assurance Program had been expanded to include the ISFSI. The licensee had established measures for ensuring that: instruments used to verify compliance with the Technical Specifications were calibrated; conditions adverse to quality were promptly identified and corrected; dry fuel storage components were properly stored to prevent degradation; and purchased material equipment and services conformed to procurement documents (Attachment 2, Quality Assurance, Pages 30-32).

Radiation Protection

- Measures were established to limit personnel exposures to as low as reasonably achievable (ALARA). Considerations for exposure and contamination control had been incorporated into the procedures for canister gas sampling and reflooding during unloading. The transfer cask annulus seal survey was accomplished in the proper sequence to ensure the canister did not exit the building with contamination above the limits. The total exposure projected for the first canister was 0.703 person-rem and the actual was 0.581 person-rem. This was consistent with an industry range of 0.300 to 0.700 person-rem for first loadings (Attachment 2, Radiation Protection, Pages 33-34).

- Criticality prevention and monitoring during cask loading was implemented. The minimum spent fuel pool boron concentration required by Technical Specifications was established. Criticality monitoring and alarm systems were installed in all areas where spent fuel was handled (Attachment 2, Radiation Protection, Pages 35-36).

- The licensee had performed an analysis to confirm that the limits of 10 CFR 72.104 would not be exceeded during normal operation of the ISFSI when fully loaded. The Horizontal Storage Module (HSM) dose rates had been established based on the analysis (Attachment 2, Radiation Protection, Page 37).

Records

- The licensee had established measures to ensure the 10 CFR 72.212 Report, Certificate of Compliance, and related documents were maintained for as long as spent fuel was stored at the ISFSI (Attachment 2, Records, Page 38).

- The licensee had made the required 90 day notification to the NRC prior to loading their first cask, and had established procedural requirements to register each cask with the NRC within 30 days after loading (Attachment 2, Records, Pages 38-39).

- The licensee had established records for Special Nuclear Material (SNM) accountability. The records were complete and included transfer of spent fuel to the ISFSI (Attachment 2, Records, Page 39).

Special Lifting Devices

- The licensee had ensured that all special lifting devices were subjected to initial load testing and were incorporated into the Surry Power Station 10-year In-Service Inspection (ISI) program for continuing compliance (Attachment 2, Special Lifting Devices, Pages 39-41).

- The licensee had established procedures to ensure that all special lifting devices were inspected prior to use and had established programs to ensure that all major maintenance or alterations were followed by a repeat of the initial load testing (Attachment 2, Special Lifting Devices, Pages 41-42).

Training

- The NUHOMS-HD vendor (AREVA) provided training to the Surry Power Station ISFSI personnel. The licensee had reviewed and accepted the vendor training under the Surry Power Station 10 CFR Part 50 Training Program. Only those personnel who had completed all phases of the training were certified to operate the ISFSI equipment and systems (Attachment 2, Training, Pages 43-44).

- The training had been conducted in the classroom and in the field. The classroom training used the training modules that were developed in conformance with the NUHOMS FSAR requirements. The field training had been conducted during the dry run training exercise (pre-operational testing). The tasks that were taught during the dry run were consistent with the conditions of the Certificate of Compliance. All ISFSI personnel had completed the training (Attachment 2, Training, Pages 45-46).

Welding

- Hydrogen monitoring was implemented during welding of the first NUHOMS-HD canister. The canister unloading procedure required hydrogen monitoring during lid cutting. (Attachment 2, Welding and Weld Testing, Page 48).

Supplemental Information

PARTIAL LIST OF PERSONS CONTACTED

Licensee Personnel

D. Anderson - Health Physicist
L. Baker - Supervisor, Nuclear Shift Operations
A. Barbee - Manager, Training
W. Belcher - Nuclear Security Shift Supervisor
T. Brookmire - Supervisor, Nuclear Engineering
J. Costello - Supervisor, Emergency Preparedness
J. Curry - Supervisor, Materials Verification
R. Dillard, Jr. - Fire Protection Engineering Programs - Appendix R
A. Ewell - Supervisor, Fuel Handling
M. Fanguy - Lead Reactor Engineer
W. Ford - Senior Instructor
B. Garber - Supervisor, Licensing
J. Grau - Manager, Nuclear Oversight
F. Grover - Manager, Operations
D. Jernigan - Site Vice President
R. Johnson - Supervisor, Operations Support
L. Jones - Manager, Radiation Protection and Chemistry
J. Keithley - Supervisor, Health Physics Technician Services
J. Knapp - Nuclear Specialist
J. Kubovcik - Unit Supervisor
M. Laidlow - Fuel Accountability and Inspection Specialist
A. LeClerc - Supervisor, Materials Verification
J. Lyons - Control Room Operator
T. Nieme, Nuclear Engineer III, Licensing
T. Ragland - Supervisor, Health Physics Operations
C. Redman - Supervisor, Records
R. Robins - Engineer, Nuclear Fuels
K. Robinson - Mechanic
L. Rollings - Station ALARA Coordinator
R. Savedge, Emergency Preparedness Specialists-Offsite Coordinator
L. Hilbert-Semmes - Corrective Action Program Manager
R. Simmons - Acting Plant Manager
K. Sloane - Plant Manager
B. Stanley - Acting Plant Manager
J. Sukosky - Health Physicist II
B. Taylor - Senior Instructor
B. Wakeman - Engineer III, Corporate Nuclear Analysis and Fuels
D. Williams - Supervisor, Nuclear Site Safety
J. Wright - Health Physics Shift Supervisor
A. Xenakis - Control Room Operator
C. Zalesiak, Engineer III, Corporate Civil Engineering
R. Szczypinski, Jr. - Mechanic

Contractor Personnel

J. Boshoven - Senior Project Manager, Transnuclear
B. Cheek - Health Physics Technician
W. Rodgers - Project Engineer, Transnuclear
B. Speckline - Supervisor, Fuel Handling - North Anna

INSPECTION PROCEDURES USED

60854.1 Pre-operational Testing of Independent Spent Fuel Storage Installations at Operating Plants

60855.1 Operation of an Independent Spent Fuel Storage Installation at Operating Plants

60856.1 Review of 10 CFR 72.212(b) Evaluations at Operating Plants

LIST OF ITEMS OPENED, CLOSED, AND DISCUSSED

Opened and Closed

None.

Discussed

None.

LIST OF ACRONYMS USED

ALARA	As Low As Reasonably Achievable
ANSI	American National Standards Institute
ASME	American Society of Mechanical Engineers
BPRA	Burnable Poison Rod Assembly
CoC	Certificate of Compliance
dpm	Disintegrations Per Minute
DBE	Design Basis Earthquake
EAB	Exclusion Area Boundary
EAL	Emergency Action Level
EPIP	Emergency Plan Implementing Procedure
GWD/MTU	Gigawatt Days per Metric Ton Uranium
HSM	Horizontal Storage Module
ISFSI	Independent Spent Fuel Storage Installation
ISI	In-Service Inspection
JPM	Job Performance Measure
kW	Kilowatt
LLWSF	Low Level Waste Storage Facility

M&TE	Measuring and Test Equipment
MBR	Material Balance Report
msl	Mean Sea Level
NCR	Non-Conformance Report
NFAH	Non Fuel Assembly Hardware
NRC	Nuclear Regulatory Commission
ppm	Parts Per Million
psf	Pounds Per Square Foot
PT	Liquid Penetrant Testing
RCC	Rod Control Cluster
ref-cc/sec	Reference Cubic Centimeters Per Second
RWP	Radiation Work Permit
SAT	Systematic Approach to Training
SER	Safety Evaluation Report
SNM	Special Nuclear material
SSC	Structures, Systems, and Components
SSE	Safe Shutdown Earthquake
SSI	Soil Structure Interaction
TEDE	Total Effective Dose Equivalent
TER	Technical Evaluation Report
TPA	Thimble Plug Assembly
UFSAR	Updated Final Safety Analysis Report
VPI	Vibration Suppression Insert
wt. %	Weight Percent