August 11, 2006

Mr. Dominique Grandemange, Manager
AREVA NP, Inc.
Mt. Athos Road Facility
1724 Mount Athos Road
P.O. Box 11646
Lynchburg, VA 24506-1646

SUBJECT: INSPECTION REPORT NO. 70-1201/2006-202

Dear Mr. Grandemange:

The U.S. Nuclear Regulatory Commission (NRC) conducted a routine announced criticality safety inspection at the facility in Lynchburg, VA, on July 14, 2006. The purpose of the inspection was to determine whether activities involving licensed materials were conducted safely and in accordance with NRC requirements. An exit meeting was held on July 14, 2006. The inspection observations and findings were discussed with members of your staff.

The inspection, which is described in the enclosure, focused on: (1) changed or new nuclear criticality safety (NCS) analyses, (2) NCS inspections, audits, and assessments, (3) criticality accident alarm system detector coverage and performance, and (4) observation of on-going plant operations. The inspection involved review of pertinent documents, facility walkdowns, and interviews with plant personnel. No violations of NRC requirements were identified during this inspection.

In accordance with 10 CFR 2.390 of NRC's "Rules of Practice," a copy of this letter and the enclosure will be made publicly available in the public electronic reading room of the NRC's Agency-Wide Documents Access and Management System (ADAMS). ADAMS is accessible from the NRC Web site at http://www.nrc.gov/reading-rm/ADAMS.html.

If you have any questions concerning this report, please contact Christopher Tripp, of my staff, at (301)-415-7733.

Sincerely,

/RA/

Dennis C. Morey, Acting Chief
Technical Support Section
Special Projects Branch
Division of Fuel Cycle Safety
and Safeguards

Docket No. 70-1201
License No. SNM-1168

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Docket No. 70-1201
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Enclosure: Inspection Report 70-1201/2006-202

cc: Charlie Holman, Manager
Environmental Health, Safety and Licensing

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U.S. NUCLEAR REGULATORY COMMISSION
OFFICE OF NUCLEAR MATERIAL SAFETY AND SAFEGUARDS

Docket No.:	70-1201
License No.:	SNM-1168
Report No.:	70-1201/2006-202
Licensee:	AREVA NP, Inc.
Location:	Lynchburg, VA
Inspection Date:	July 14, 2006
Inspectors:	Christopher S. Tripp, Senior Criticality Safety Reviewer Natreon Jordan, Criticality Safety Inspector Thomas Marenchin, Criticality Safety Inspector
Approved by:	Dennis C. Morey, Acting Chief Technical Support Section Special Projects Branch Division of Fuel Cycle Safety and and Safeguards

Enclosure

EXECUTIVE SUMMARY

AREVA NP, Inc.
NRC Inspection Report No. 70-1201/2006-202

Introduction

Staff of the U.S. Nuclear Regulatory Commission (NRC) performed a routine and announced nuclear criticality safety (NCS) inspection of the AREVA NP, Inc., Lynchburg, Virginia, facility on July 14, 2006. The inspection focused on risk-significant fissile material processing activities involved in the manufacture of low-enriched light-water reactor fuel. The inspection included an on-site review of licensee programs dealing with new or revised NCS analyses; NCS inspections, audits, and investigations; the criticality accident alarm system; and plant operations. The licensee programs were acceptably directed toward the protection of public health and safety and in compliance with NRC regulatory requirements.

Results

- The licensee agreed to revise criticality safety analyses (CSA's) to address specific housekeeping practices such as placing trash cans in the pellet loading room.

- The licensee agreed to clarify wording on NCS postings.

- With the exception of the previously identified NCS posting weakness, plant activities were conducted safely and in accordance with applicable postings and CSAs.

- Internal NCS audits were adequate for maintaining acceptable levels of safety.

- Licensee criticality detectors were found to be adequately positioned and the analytical basis was adequate.

REPORT DETAILS

1.0 NCS Program (88015)

a. Scope

The inspectors reviewed new and recently revised NCS analyses to determine whether criticality safety of risk-significant operations was adequately assured. The inspectors reviewed selected aspects of the following documents:

- 32-5037975-003, "Pellet Loading Room/Vault Criticality Safety Analysis (CSA) for the MAR [Mount Athos Road] Facility," dated July 5, 2006.
- 32-5037974-001, "Fuel Rod Storage and Handling Criticality Safety Analysis (CSA) for the MAR Facility," dated July 5, 2006.
- 32-5012889-002, "Fuel Assembly Storage Rack Area Criticality Safety Analysis (CSA) for the MAR Facility," dated July 5, 2006.
- 32-5052962-002, "MAR Pit Area Criticality Safety Analysis (CSA)," dated November 11, 2005.
- 32-5055102-001, "Shipping/Receiving Bay Criticality Safety Analysis (CSA) for MAR," dated July 7, 2006.
- 32-9024206-000, "Process Ventilation System Criticality Safety Analysis (CSA) for the MAR Facility," dated June 28, 2006.
- 32-5012889-002, "Fuel Assembly Storage Rack Area Criticality Safety Analysis (CSA) for the MAR Facility," dated July 5, 2006.
- 32-5012889-00, "Fuel Assembly Storage Rack Area Criticality Safety Analysis (CSA) for the MAR Facility," dated May 9, 2001.

b. Observations and Findings

The licensee stated that it had recently revised most of its active CSAs to more clearly specify the controls relied on for double contingency, to clearly reference any supporting criticality safety calculations, and to clearly address normal conditions. The inspectors reviewed the revised analyses and concluded that they adequately described the NCS basis for the affected operations. In particular, the new CSAs described each scenario leading to a potential criticality and demonstrated that it met the double contingency principle; the inspectors noted that because the double contingency controls were identified as items relied on for safety (IROFS), there was a clear relationship between the double contingency discussion in the CSAs and the accident sequence evaluation in the Integrated Safety Analysis (ISA) Summary.

The inspectors examined the MAR Pit analysis (32-5052962-002) to determine whether calculations were done in accordance with the license requirements for use of the 0.98 abnormal condition limit. The CSA restated the conditions required for use of the 0.98 limit, including that only approved codes, cross section treatment options, and geometric shapes be used in models; that the calculations be limited to model a single, flooded, undamaged assembly; that no albedos or biasing be used; that the analyzed cases must be within the validated area of applicability on approved machines; and that

conservative modeling practices be employed. The conservative modeling practices included assuming that all fuel was enriched to the maximum of 5.1wt% ^{235}U, that fuel had a density of 97.5% of theoretical density, that geometric tolerances were added in a conservative direction, and that no materials of construction were included in models. The inspectors determined that these conditions were consistent with the limitations specified for the use of the 0.98 limit and that calculations performed were consistent with these conditions. The inspectors determined that the new CSAs were adequate to ensure public health and safety from the consequences of an accidental criticality.

During a walkdown of the pellet loading room, the inspectors noted that there was an unfavorable geometry trash can situated next to a table on which loose pellets were removed from packaging and prepared for loading into rods. The trash can was partly filled with plastic sheeting and cardboard boxes used to transport pellets, among other items. During the course of the facility walkdown, the trash can was moved from this location to an area adjacent to another table in the pellet loading room, and appeared to be routinely moved about. The staff questioned whether the presence of this trash can challenged the NCS basis for the pellet loading room.

To resolve this issue, the inspectors reviewed CSA 32-5037975-003, "Pellet Loading Room/Vault Criticality Safety Analysis (CSA) for the MAR Facility." The inspectors noted that the sequence of spilling one or more boxes of pellets into the trash can was not evaluated in the CSA. Accident scenario PCSC-3, however, involved pellet boxes falling to the floor in the presence of water on the floor. Scenarios PCSC-4a and PCSC-4b involved the introduction of moderator into the pellet loading room, conveyor, or vault; the sources of moderator considered included packaging material, oil, and condensate from the air conditioning system. The IROFS applicable to these scenarios are:

PCSC-3 Boxes of pellets fall to the floor in the presence of water.

- IROFS #1: Concrete ceiling prevents water from leaking into pellet loading room, and doorways don't allow for significant accumulation (moderation).
- IROFS #2: If pellet boxes fall to the floor, or are in an otherwise unapproved location, they must be promptly picked up so as to maintain a 4-inch slab (geometry).

PCSC-4a Moderator in scrap boxes or air conditioning condensate leaks, or pellets with oil are stacked in pellet room or on conveyor.

- IROFS #1: Pellet boxes must not be stacked to exceed a 4-inch height (geometry).
- IROFS #2: Plastic in pellet boxes must not exceed 100 g, and no visible accumulation of oil, grease, water, etc., allowed in scrap boxes (moderation)

PCSC-4b Moderator in scrap boxes or pellets with oil are loaded and stored in the pellet vault.

IROFS #1: Pellet boxes must not be stacked to exceed a 4-inch height (geometry).

Neutron absorbing plates between vault storage shelves (neutron absorbers).

IROFS #2: Plastic in pellet boxes must not exceed 100 g, and no visible accumulation of oil, grease, water, etc., allowed in scrap boxes (moderation)

The inspectors determined that the scenario of pellets being spilled into the trash can was similar to scenario PCSC-3, except that the pellets would not necessarily fall into the trash can so as to remain in a safe geometry slab. In addition, the requirement that the pellets be picked up "promptly" only provides for double contingency protection if there is not already moderator present. Because the trash can contained moderator, this would not be an effective control for the scenario of pellets spilling into the trash can. The inspectors also noted that the controls credited for scenarios PCSC-4a and PCSC-4b limited the amount of moderating material to 100 grams. While this did not directly apply to the trash can scenario, the trash can was capable of, and may have contained, more than 100 grams of moderating material in the form of plastic and cardboard. Thus the scenario of spilling pellets into the trash can appeared to be composed of parts of these three scenarios (i.e., it involved spilling material onto the floor, as in PCSC-3, but involved solid moderating materials, as in PCSC-4a and PCSC-4b). However, the NCS controls for these scenarios were not sufficient to protect against the trash can scenario, for the reasons stated above.

The licensee provided an analysis that showed that it would take approximately four boxes of pellets to exceed the abnormal condition k_{eff} limit of 0.95 at optimal conditions. This was based on criticality calculation 32-5055905-00, "Criticality Calculations for ISA Evaluations at MAR," dated May 11, 2006. The calculations contained in Table 7.7 of this document involved a hemispherical pile of optimally moderated scrap pellets, on top of a 12-inch thick concrete floor, with a 12-inch water reflector around the hemispherical surface. Based on this calculation, the inspectors determined that there was a very low likelihood of achieving a critical configuration even if multiple boxes of pellets spilled into the trash can. However, because the scenario was not considered in the CSA and the presence of the trash can introduced both an unfavorable geometry accumulation area and a ready source of significant quantities of moderator, the licensee agreed to place this into the facility's corrective action program. The corrective actions associated with the scenario of spilling multiple boxes of loose pellets into the unfavorable geometry trash can will be tracked as **Inspection Follow-up Item (IFI) 70-1201/2006-202-01**.

c. Conclusions

The licensee agreed to revise NCS analyses to address specific housekeeping practices such as placing trash cans in the pellet loading room.

2.0 NCS Inspections, Audits, and Investigations (88015)

a. Scope

The inspectors reviewed the last internal NCS audit that was performed. The inspectors reviewed selected aspects of the following document:

- "2005 Nuclear Criticality Safety Audit Framatome - ANP Mount Athos Road," dated October 2005.

b. Observations and Findings

The inspectors observed that the NCS audits conducted in the previous year covered: (1) open NCS issues from previous audits; (2) the adequacy of control implementation; (3) plant operations for compliance with the license, procedures, and postings; and (4) determining that past NCS evaluations remain adequate. The audit had one finding that addressed the adequacy of the wording of NCS postings. Through discussions with the licensee's staff, the licensee concurred and agreed to place this into its corrective action program. The inspectors concluded based on the risk-significance of the issue, that the corrective action would adequately resolve the concern.

c. Conclusions

The inspectors determined that internal NCS audits were adequate for maintaining acceptable levels of safety.

3.0 Criticality Accident Alarm System (88015)

a. Scope

Inspectors reviewed licensee detector placement and analytical basis for adequate implementation of the criticality accident alarm system (CAAS). Inspectors reviewed the following document before walking down the facility detectors:

- 32-5037974-001, "Fuel Rod Storage and Handling Criticality Safety Analysis (CSA) for the MAR Facility," dated July 5, 2006.

b. Observations and Findings

The licensee has installed detectors at each of 12 locations covering the facility operating areas. A high reading from any two detectors will automatically actuate the criticality alarm system. The alarms are tied into the licensee's public address system, but are set to override any address being distributed during alarm actuation.

Even through a maximum of 12 inches of concrete, the detectors could still maintain coverage up to 250 feet. However, for added conservatism they were positioned to provide coverage for up to 200 feet. Detectors are also placed at a minimum height of 8 feet, which was verified by inspectors. The inspectors had no safety concerns with the adequacy and positioning of the detectors.

c. Conclusions

Licensee criticality detectors were found to be adequately positioned and the analytical basis was adequate.

4.0 Plant Activities (88015)

a. Scope

The inspectors performed plant walkdowns to review activities in progress and to determine whether risk-significant fissile material operations were being conducted safely and in accordance with regulatory requirements. The inspectors discussed the activities with NCS staff during the walkdown.

b. Observations and Findings

The inspectors walked down the shipping and receiving areas, the pellet storage vault, the pellet loading room, the rod loading and fuel assembly fabrication areas, and final assembly storage area. Plant activities were conducted safely and in accordance with printed NCS postings and administrative requirements in applicable CSAs.

The inspectors noted during their walkdown of the fuel assembly storage racks that the posting for this area specified that, if polyethylene sheathing was used around fuel assemblies, the bottoms must be left open or cut-out windows employed (made of low-grade paper that would degrade if wet), and that polyethylene covers “should” be placed on top of the assemblies. The inspectors verified that all plastic-sheathed assemblies did have both polyethylene covers and either open bottoms or cut-out widows. During the attempt to verify this, however, the licensee’s staff indicated that the statement regarding polyethylene covers was not a “requirement,” since the posting contained the word “should.” The inspectors indicated that the inclusion of optional controls on NCS postings could dilute their effectiveness and lead to lax compliance, and therefore this ambiguous language should not be used. The inspectors also noted that there was a licensee audit finding regarding the adequacy of the wording of NCS postings. The licensee concurred and agreed to place this into its corrective action program. The clarification of wording on NCS postings will be tracked as **IFI 70-1201/2006-202-02**.

c. Conclusions

The licensee agreed to clarify wording on NCS postings. With the exception of the previously identified NCS posting weakness, plant activities were conducted safely and in accordance with applicable postings and CSAs.

5.0 Exit Meeting

The inspectors presented the inspection scope and results to members of the licensee's management and staff during an exit meeting on July 14, 2006. The licensee acknowledged and understood the findings as presented.

SUPPLEMENTAL INFORMATION

1.0 List of Items Opened, Closed, and Discussed

Opened

IFI 70-1201/2006-202-01 Tracks licensee actions to adequately address, in NCS analyses, the scenario of spilling multiple boxes of loose pellets into an unfavorable geometry trash can.

IFI 70-1201/2006-202-02 Tracks licensee actions to clarify wording on NCS postings.

Closed

None

Discussed

None

2.0 Inspection Procedures Used

IP 88015 Headquarters Nuclear Criticality Safety Program

3.0 Key Points of Contact

AREVA NP, Inc.

D. Grandemange	AREVA, MAR Site Manager
C. Holman	AREVA, Manager, Environmental Health and Safety
B. O'Donnell	AREVA, Criticality Safety Engineer

NRC

C. Tripp	Sr. Criticality Safety Reviewer, NRC HQ
N. Jordan	Criticality Safety Inspector, NRC HQ
T. Marenchin	Criticality Safety Inspector, NRC HQ

All attended the exit meeting on July 14, 2006.

Attachment

4.0 List of Acronyms and Abbreviations

ADAMS	Agency-Wide Document Access and Management System
CAAS	criticality accident alarm system
CSA	Criticality Safety Analysis
IFI	inspection follow-up item
IP	inspection procedure
IROFS	item relied on for safety
ISA	Integrated Safety Analysis
k_{eff}	effective neutron multiplication factor
MAR	Mount Athos Road
NCS	nuclear criticality safety
NRC	U.S. Nuclear Regulatory Commission
PCSC	arbitrary designator for accident scenario
SNM	special nuclear material