

April 22, 2010

Mr. Charles Perkins, Site Manager  
AREVA NP, Inc.  
2101 Horn Rapids Road  
Richland, WA 99352-5102

SUBJECT: INSPECTION REPORT NO. 70-1257/2010-201

Dear Mr. Perkins:

The U.S. Nuclear Regulatory Commission (NRC) conducted a routine announced criticality safety inspection at your Richland, Washington, facility March 22-25, 2010. 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 March 25, 2010, during which inspection observations and findings were discussed with your staff.

The inspection, which is described in the enclosure, focused on the most hazardous activities and plant conditions; the most important controls relied on for safety and their analytical basis; and the principal management measures for ensuring controls are available and reliable to perform their functions relied on for safety. The inspection consisted of analytical basis review, selective review of related procedures and records, examinations of relevant nuclear criticality safety (NCS)-related equipment, interviews with NCS engineers and plant personnel, and facility walkdowns to observe plant conditions and activities related to safety basis assumptions and related NCS controls. Throughout this inspection, observations were discussed with your managers and staff.

In accordance with Title 10 of the *Code of Federal Regulations* 2.390 of NRC's "Rules of Practice," a copy of this letter and the enclosure will be 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 Thomas Marenchin, of my staff, at (301) 492-3209.

Sincerely,

**/RA/**

Patricia A. Silva, Chief  
Technical Support Branch  
Division of Fuel Cycle Safety  
and Safeguards  
Office of Nuclear Material Safety  
and Safeguards

Docket No.: 70-1257  
License No.: SNM-1227

Enclosure: Inspection Report 70-1257/2010-201

cc w/enclosures: L. J. Maas, AREVA NP  
C. D. Manning, AREVA NP  
R. E. Link, AREVA NP

cc w/o enclosures: Mr. Gary Robertson, Director  
Washington Department of Health

C. Perkins

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

Docket No.: 70-1257

License No.: SNM-1227

Report No.: 70-1257/2010-201

Licensee: AREVA NP, Inc.

Location: Richland, WA

Inspection Dates: March 22-25, 2010

Inspectors: Thomas Marenchin, Criticality Safety Inspector

Approved by: Patricia A. Silva, Chief  
Technical Support Branch  
Division of Fuel Cycle Safety  
and Safeguards  
Office of Nuclear Material Safety  
and Safeguards

Enclosure

## EXECUTIVE SUMMARY

**AREVA Nuclear Power, Inc.  
U.S. Nuclear Regulatory Commission  
Inspection Report No. 70-1257/201-201**

### Introduction

Staff of the U.S. Nuclear Regulatory Commission (NRC) performed a routine and announced nuclear criticality safety (NCS) inspection of the AREVA Nuclear Power Inc. (AREVA NP) facility in Richland, Washington March 22-25, 2010. The inspection included an on-site review of the licensee's NCS program; NCS analyses; plant operations; NCS inspections, audits and investigations; and open item follow-up. The inspection focused on risk-significant fissile material processing activities in the uranium hexafluoride (UF<sub>6</sub>) cylinder receiving pad, the Dry Conversion Facility (DCF), the Uranium Dioxide (UO<sub>2</sub>) Building including scrap recovery processes, the blended low-enriched uranium (BLEU) facility, rod and bundle fabrication shops, the incinerator, Engineering Laboratory Operations (ELO), the BLEU powder storage area, outside powder storage warehouses, the Product Development and Test Facility, the Analytical Services Laboratory, and the wastewater facility.

### Results

- No safety concerns were identified regarding the licensee's NCS program.
- No safety concerns were noted regarding NCS audits.
- No safety concerns were identified during a review of recent licensee investigation of internal events.
- No safety concerns were identified during a review of the licensees' criticality alarm system.
- No safety concerns were noted during walkdowns of plant operations.

## REPORT DETAILS

### 1.0 Plant Status

The licensee manufactures light water reactor fuel at its Richland Washington facility. During the inspection the licensee was conducting routine dry conversion, powder preparation, pelletizing and bundle fabrication operations. The licensee was also performing routine scrap recycle and waste management operations.

### 2.0 Nuclear Criticality Safety Program (IP 88015 & 88016)

#### a. Inspection Scope

The inspector reviewed the licensee's NCS program and analyses. The inspector evaluated the adequacy of the program and analyses to assure the safety of fissile material operations. The inspector interviewed licensee managers and engineers in the safety and production departments, operations engineers, and selected operators. The inspector reviewed selected NCS-related items relied on for safety (IROFS) to determine that performance requirements have been met for selected accident sequences. During walkdowns, the inspectors evaluated the effectiveness of IROFS to assure adequate subcritical margin for normal and credible abnormal conditions. The inspector reviewed selected aspects of the following documents:

- CSA [criticality safety analysis]-607, 590, "AREVA Site General Arrangement," Revision 15, dated August 2009
- CSA-611, 670, "Solid Waste Uranium Recovery [SWUR] P&ID," Revision 7, dated August 2009
- CSA-613, 388, "SWUR Hydraulic Ram Feeder and Door Arrangement," Revision 2, dated August 2009
- E04-NCSA-080, "Line 2 Uranium Recovery," Revision 5, dated February 18, 2010
- E04-NCSA [nuclear criticality safety analysis]-100, "Line 2 Process Off-Gas System," Revision 2, dated February 18, 2010
- E04-NCSA-120, "UNH Reprocessing," Revision 10, dated December 8, 2009
- E04-NCSA-130, "Conversion of UO<sub>2</sub> Pellets to U<sub>3</sub>O<sub>8</sub> Powder," Revision 6, dated September 1, 2009
- E04-NCSA-135, "BLEU Scrap Recover," Revision 9, dated February 18, 2010
- E04-NCSA-150, "Miscellaneous Uranium recovery System," Revision 7, dated February 18, 2009
- E04-NCSA-163, "Industrial Waste Water treatment Facilities," Revision 14, dated January 22, 2010
- E04-NCSA-180, "ELO Gad Scrap Uranium Recovery," Revision 6, dated October 16, 2009
- E04-NCSA-325, "BLEU Powder Preparation," Revision 11, dated February 18, 2010
- E04-NCSA-350, "Powder Drum Warehouse (I3A)," Revision 5, dated September 1, 2009
- E04-NCSA-771, "Warehouse #2," Revision 9, dated September 1, 2009
- E04-NCSA-777, "Planar Array Storage of SNM in Sea-Land Containers and Warehouse," Revision 8, dated September 1, 2009
- E04-NCSA-830, "Dry Conversion Power Preparation," Revision 12, dated February 18, 2010

- E04-NCSA-960, "HVAC Exhaust Systems," Revision 10, dated October 15, 2009
- E04-NCSS-G01, "NCS Guide Rules and Generic Program Requirements," Revision 7, dated August 20, 2009
- Engineering Change Notice [ECN] 8300, "Backflow Assembly Flood Hazard Fixes," dated April 6, 2009
- ECN 8430, "SWUR Feed Ram Trough Modifications," dated October 23, 2009
- EMF-607,508-8430, "SWUR Waste Conveyor Arrangement," Revision 2, dated March 13, 1995
- EMF-609, 889M, "SWUR Ram Chamber Collection Trough," Revision 0, dated June 1995

b. Observations and Findings

The inspectors reviewed NCS approvals, NCS evaluations, and supporting calculations for new, changed, and other selected operations. Within the selected aspects reviewed, the inspectors determined that the analyses were performed by qualified NCS engineers, that independent reviews of the evaluations were completed by qualified NCS engineers, and that the analyses provided for sub-criticality of the systems and operations. The inspectors observed that the analyses contained appropriate limits on controlled parameters for each credible accident sequence leading to inadvertent criticality. NCSA and supporting calculations demonstrated adequate identification and control of NCS hazards to assure operations within subcritical limits.

c. Conclusions

No safety concerns were identified regarding the licensee NCS program.

**3.0 Nuclear Criticality Safety Inspections, Audits, and Investigations (IP 88015)**

a. Inspection Scope

The inspector reviewed the licensee's internal audit procedures, records of previously completed audits of fissile material operations, and records of NCS infractions. The inspector reviewed selected aspects of the following documents:

- E04-07-200907, "NCS Audit/Inspection Report – July 2009," Revision 1, dated August 18, 2009
- E04-07-200908, "NCS Audit/Inspection Report – August 2009," Revision 1, dated September 28, 2009
- E04-07-200909, "NCS Audit/Inspection Report – September 2009," Revision 1, dated October 21, 2009
- E04-07-200910, "NCS Audit/Inspection Report – October 2009," Revision 1, dated December 1, 2009
- E04-07-200911, "NCS Audit/Inspection Report – November 2009," Revision 1, dated December 19, 2009
- E04-07-200912, "NCS Audit/Inspection Report – December 2009," Revision 1, dated January 21, 2010

b. Observations and Findings

The inspector found that NCS audits were conducted according to procedural requirements. The inspector noted that NCS audits were focused on determining that plant operations requirements conform to those listed in the applicable NCS specification documents.

The inspector observed that the documentation of NCS infractions contained in the monthly NCS audit reports included infractions that had been observed over the audited month. NCS infractions from previous months that had corrective actions that were not completed are no longer tracked in the NCS audit report. The licensee now tracks their corrective actions for NCS infractions found during audits using WebCAP.

c. Conclusions

No safety concerns were noted regarding NCS audits.

**4.0 Nuclear Criticality Safety Event Review and Follow-up (IP 88015)**

a. Inspection Scope

The inspector reviewed the licensee's response to internally-reported events. The inspector reviewed the progress of investigations and interviewed licensee staff regarding immediate and long-term corrective actions. The inspector reviewed selected aspects of the following documents:

- Condition Report [CR] 2009-6424, dated September 27, 2009
- CR 2009-6461, dated September 29, 2009
- CR 2009-6524, dated September 30, 2009
- CR 2009-6736, dated October 9, 2009
- CR 2009-6788, dated October 11, 2009
- CR 2009-6868, dated October 14, 2009
- CR 2009-7323, dated October 29, 2009
- CR 2009-8244, dated December 10, 2009
- CR 2009-8461, dated December 18, 2009
- CR 2010-0030, dated January 3, 2010
- CR 2010-0219, dated January 11, 2010
- CR 2010-0238, dated January 12, 2010
- CR 2010-0866, dated February 9, 2010
- CR 2010-1017, dated February 16, 2010
- CR 2010-1034, dated February 16, 2010

b. Observations and Findings

The inspector reviewed selected licensee internally-reported events. The inspector observed that internal events were investigated in accordance with written procedures and appropriate corrective actions were assigned. The inspector had no safety concerns regarding the licensee's reporting, investigation, and correction of internal NCS related events.

c. Conclusions

No safety concerns were identified during a review of recent licensee investigation of internal events.

**5.0 Criticality Alarm Systems (IP 88017)**

a. Inspection Scope

The inspector reviewed documentation of criticality accident alarm detector coverage, interviewed engineering and maintenance staff, and performed facility walkdowns to determine the adequacy of the licensee criticality alarm system. The inspector reviewed selected aspects of the following documents:

- NSA-TR-04-03, "Criticality Accident Alarm System Coverage Analysis for FANP-Richland," Revision 0, dated June 9, 2004
- "A Users Manual for the SNP Criticality Detection and Alarm System," Revision 1, dated August 1992

b. Observations and Findings

The inspector verified that the licensee's placement of criticality accident alarm detectors has been established in accordance with the criteria described in the license and Title 10 of the *Code of Federal Regulations* 70.24. The inspector reviewed criticality accident alarm system placement calculations to determine the adequacy of models, assumptions and results, and visually inspected detector configuration.

c. Conclusions

No safety concerns were identified during a review of the licensees' criticality alarm system.

**6.0 Plant Activities (IP 88015)**

a. Inspection Scope

The inspector 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 interviewed operators, NCS engineers, and process engineers both before and during walkdowns. The inspectors reviewed selected aspects of the following documents:

- E04-NCSA-120, "UNH Reprocessing," Revision 10, dated December 8, 2009
- E04-NCSA-130, "Conversion of UO<sub>2</sub> Pellets to U<sub>3</sub>O<sub>8</sub> Powder," Revision 6, dated September 1, 2009

b. Observations and Findings

The inspector performed walkdowns of the UF<sub>6</sub> cylinder receiving pad, the DCF, the UO<sub>2</sub> Building including scrap recovery processes, the BLEU facility, rod and bundle fabrication shops, the incinerator, ELO, the BLEU powder storage area, outside powder storage warehouses, the Product Development and Test Facility, the Analytical Services Laboratory, and the wastewater facility. The inspector noted that observed operations were performed in accordance with written procedures.

c. Conclusions

No safety concerns were noted during walkdowns of plant operations.

**7.0 Open Items**

**VIO 70-1257/2009-201-01**

This item concerned the failure to establish moderator controls which ensure that  $k_{eff}$  will not exceed 0.97 for large powder blenders and large powder spills. During a previous inspection, the inspectors identified accident sequences initiated by the intrusion of 18.43 kilograms (approximately 18.5 liters) of water into process equipment. To control these accident sequences, the licensee implemented IROFS consisting of prohibitions on containers larger than a nominal five gallons (approximately 20 liters). The inspectors determined that these IROFS could not actually prevent a liquid spill of less than 20 liters from occurring. In its response to the notice of violation dated June 12, 2009, the licensee summarized corrective actions taken and committed to additional actions to prevent recurrence. The licensee stated that these corrective actions would be completed by August 31, 2009.

The inspector concluded that the licensee had completed its corrective actions as indicated in its June 12, 2009, letter. Based on the temporary restriction to less than 3 gallons and the physical configuration of the equipment, the inspector concluded that powder operations were currently safe with regard to hazards posed by spillable liquids. This item is closed.

**IFI 70-1257/2009-202-01**

This item concerned the revision of accident sequences for moderator intrusion into the moderation control areas of Room 101A. During a previous inspection, the inspectors identified that accident sequence 7.2 in E04-NCSA-120, Version 9.0, "UNH Reprocessing," dated May 28, 2009, established an initiating event frequency index for having a flood or spray from liquid lines of -1. IROFS consisting of neutron absorbing inserts, mass controls on drums without inserts, and integrity of the drum, produced a combined likelihood index of -9. Although the five events listed above all had different causes, the inspectors indicated that the frequency of leaks into the moderation control area of Room 101A greatly exceeded that assumed in the NCSA. The licensee stated that it was currently in the process of reviewing E04-NCSA-120 as part of its five-year update, and had not determined how it would handle the affected accident sequence. The licensee stated that the initiating event in sequence 7.2 makes reference to a "large" leak or spill, although what constitutes a "large" leak or spill is not defined. The inspector

reviewed the licensee's checklist for conducting ISA meetings, which specifies reviewing condition reports and other operational information to ensure that assumptions in the NCSA remain valid. The licensee showed the inspector another sequence that was already slated for revision in the draft currently in progress, in which the initiating event frequency was to be increased based on operational experience. The licensee indicated that the current initiating event frequency for sequence 7.2 appeared non-conservative given recent events, and that it would also likely be reduced.

During this inspection the inspector reviewed a revision to E04-NCSA-120 and determined that the licensee had updated the accident sequence. The licensee added information to give more detail on what a flood or spray from liquid lines was. This additional information stated that a small flood or spray in Room 101A of less than one inch was determined to happen a few times a year but it would take more than two feet of water on the floor to cause a criticality. This additional information to clarify what a flood or spray was addressed the concerns that the previous inspectors had. This item is closed.

#### **VIO 70-1257/2009-202-02**

This item concerns the failure to observe limits regarding the presence of prohibited unfavorable geometry containers in Room 102A. During a previous inspection, the inspectors observed that the door to Room 102A contained a criticality safety posting stating that "unfavorable geometry containers are not allowed in this room/area." The inspectors reviewed the licensee glossary of terms and determined that the licensee had defined unfavorable geometry items as those that would retain fissile material that exceeds the following: a 3.6-inch depth, a 5.5-gallon volume, or a 7.7-inch diameter. The inspectors also noted that the licensee had defined an open container as any items which could hold liquid in the event of an accident or process upset. An example of an open container is described as "Plastic bag left in the open position."

The licensee investigated and determined that the bags had been placed in the room by operators to allow a dismantled pump to decay briefly before being removed from the contaminated area. The licensee noted that the presence of the bags in Room 102A was an NCS infraction. The inspectors noted that posting NCSP-G01-007 prohibiting unfavorable geometry containers in Room 102A is a procedural requirement intended to implement IROFS 3503 in that area.

During this inspection, the inspector observed that the licensee had removed the bags from Room 102A and had discussed the violation with the operators, supervision and management in the conversion area. The licensee completed corrective actions to prevent reoccurrence of the violation. This item is closed.

### **8.0 Exit Meeting**

The inspector communicated the inspection scope and results to members of AREVA NP March 25, 2010. Licensee management acknowledged and understood the findings as presented.

## SUPPLEMENTARY INFORMATION

### 1.0 List of Items Opened, Closed, and Discussed

#### Items Opened

None

#### Items Closed

- VIO 70-1257/2009-201-01 Tracks the failure to implement moderator controls on spill able liquids to ensure that keff does not exceed 0.97 for large quantities of uranium oxide powder.
- IFI 70-1257/2009-202-01 Tracks revision of accident sequences for moderator intrusion into the moderation control areas of Room 101A.
- VIO 70-1257/2009-202-02 Failure to observe limits regarding the presence of prohibited unfavorable geometry containers in Room 102A.

#### Items Discussed

None

### 2.0 Inspection Procedures Used

- IP 88015 Nuclear Criticality Safety (NCS) Program  
IP 88016 NCS Evaluations and Analyses  
IP 88017 Criticality Alarm Systems  
IP 88070 Permanent Plant Modifications

### 3.0 Key Points of Contact

#### **AREVA NP, Inc. - Richland**

- \*B. Doane NCS Engineer  
\*V. Gallacher Chemical Manager  
\*C Kahambwe NCS Engineer  
\*R. Kimura Manger, Project & Plant Engineering  
\*K. Kulesza NCS Engineer  
\*R. Link Manager, Environmental, Health, Safety, and Licensing  
\*L. Maas Manager, Licensing and Compliance  
C. Manning Manager, NCS  
\*T. Tate Manager, Safety, Security, and Emergency Preparedness  
\*J. Veysey Technical Support & Maintance Manager  
\*L. Schinnell Manager, Ceramics/Labs  
\*C. Perkins Site Manager

## **NRC**

C. Cramer                      Fuel Facility Inspector  
T. Marenchin                Criticality Safety Inspector

\* Attended the exit meeting on March 25, 2010.

### **4.0    List of Acronyms and Abbreviations**

ADAMS	Agency-Wide Document Access and Management System
ADU	ammonium diuranate
AREVA NP	AREVA Nuclear Power, Inc. (current company name)
BLEU	blended low-enriched uranium
CR	Condition Report
CSA	criticality safety analysis
DCF	Dry Conversion Facility
ECN	Engineering Change Notice
ELO	Engineering Laboratory Operations
IP	inspection procedure
IROFS	item relied on for safety
NCS	nuclear criticality safety
NCSA	nuclear criticality safety analysis
NCSS	nuclear criticality safety specification
NRC	Nuclear Regulatory Commission
PM	preventive maintenance
U <sub>3</sub> O <sub>8</sub>	uranium oxide
UF <sub>6</sub>	uranium hexafluoride
UNH	uranyl nitrate hexahydrate
UO <sub>2</sub>	uranium dioxide
SWUR	Solid Waste Uranium Recovery