

May 13, 2009

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

SUBJECT: INSPECTION REPORT NO. 70-1257/2009-201 AND NOTICE OF VIOLATION

Dear Mr. Perkins:

The U.S. Nuclear Regulatory Commission (NRC) conducted a routine announced criticality safety inspection at your Richland, Washington, facility from April 13-16, 2009. 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 April 16, 2009, during which inspection observations and findings were discussed with your staff.

The inspection, which is described in the enclosure, focused on: (1) the most hazardous activities and plant conditions; (2) the most important controls relied on for safety and their analytical basis; and (3) 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.

Based on the results of this inspection, NRC has determined that one Severity Level IV violation of NRC requirements occurred. The violation was evaluated in accordance with the NRC Enforcement Policy included on the NRC's web site at www.nrc.gov; select **What We Do, Enforcement**, then **Enforcement Policy**. The violation is being cited in the enclosed Notice of Violation (Notice), and the circumstances surrounding it are described in detail in the subject inspection report. The violation is being cited in the Notice because it was identified by NRC during the inspection. The violation is being cited as a Severity Level IV violation, the failure to establish controls on moderation to ensure that k_{eff} will not exceed 0.97 for three accident scenarios.

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

In accordance with 10 CFR 2.390 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 Blake Purnell, of my staff, at (301) 492-3212.

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 70-1257/2009-201

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, Washington Department of Health

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NOTICE OF VIOLATION

AREVA NP, Inc.
Richland, Washington

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

During a U.S. Nuclear Regulatory Commission (NRC) inspection from April 13 through 16, 2009, a violation of NRC requirements was identified. In accordance with the NRC Enforcement Policy, the violation is listed below.

Safety Condition S-1 of Special Nuclear Material License No. 1227 requires that material be used in accordance with the statements, representations, and conditions of Part I of the licensee's application dated October 28, 1996, and supplements thereto.

Section 4.2.7.2 of the license application states: "Critical parameters derived from nuclear criticality safety analyses shall be based upon optimum moderation, unless controls on the amount of moderator are applied, or other controls on moderation are established to ensure that the k_{eff} [calculated neutron multiplication factor] meets the limits in Section 4.2.1."

Section 4.2.1 of the license application requires that k_{eff} not exceed 0.97 for credible abnormal conditions.

Contrary to the above, on and before April 16, 2009, the licensee failed to establish controls on moderation to ensure that k_{eff} will not exceed 0.97 for the following credible abnormal conditions where optimum moderation was not used as the basis for deriving critical parameters:

- Accident sequence 4.3 in E04-NCSA-325, "BLEU Powder Preparation," Version 8.0
- Accident sequence 2.2.7 in E04-NCSA-830, "Dry Conversion Powder Preparation," Version 9.0
- Accident sequence 830-50 in the Integrated Safety Assessment Summary

This is a Severity Level IV Violation (Supplement VI).

Pursuant to the provisions of 10 *Code of Federal Regulations* (10 CFR) 2.201, AREVA NP, Inc., is hereby required to submit a written statement or explanation to the U.S. Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington, D.C. 20555 with copies to the Chief, Technical Support Branch, Division of Fuel Cycle Safety and Safeguards, Office of Nuclear Material Safety and Safeguards, and Regional Administrator, Region II, within 30 days of the date of the letter transmitting this Notice of Violation (Notice). This reply should be clearly marked as a "Reply to a Notice of Violation" and should include: (1) the reason for the violation, or, if contested, the basis for disputing the 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 reply is not received within the time specified

in this Notice, an Order or Demand for Information may be issued as to why the license should not be modified, suspended, or revoked, or why such other actions as may be proper should not be taken. Where good cause is shown, consideration will be given to extending the response time.

If you contest this enforcement action, you should also provide a copy of your response to the Director, Office of Enforcement, U.S. Nuclear Regulatory Commission, Washington, D.C. 20555-0001.

Because your response will be made available electronically for public inspection in the NRC Public Document Room, or from the NRC's document system (ADAMS), accessible from the NRC web site at <http://www.nrc.gov/reading-rm/adams.html>, to the extent possible, it should not include any personal privacy, proprietary, or safeguards information so that it can be made available to the public without redaction. If personal privacy or proprietary information is necessary to provide an acceptable response, then please provide a bracketed copy of your response that identifies the information that should be protected and a redacted copy of your response that deletes such information. If you request withholding of such material, you must specifically identify the portions of your response that you seek to have withheld, and provide in detail the bases for your claim of withholding (e.g., explain why the disclosure of information will create an unwarranted invasion of personal privacy or provide the information required by 10 CFR 2.790(b) to support a request for withholding confidential commercial or financial information). If safeguards information is necessary to provide an acceptable response, please provide the level of protection described in 10 CFR 73.21.

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

Dated this 13th day of May 2009

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

Docket No.: 70-1257

License No.: SNM-1227

Report No.: 70-1257/2009-201

Licensee: AREVA NP, Inc.

Location: Richland, WA

Inspection Dates: April 13-16, 2009

Inspectors: Blake Purnell, Criticality Safety Inspector, Headquarters

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

EXECUTIVE SUMMARY

**AREVA Nuclear Power, Inc.
U.S. Nuclear Regulatory Commission
Inspection Report No. 70-1257/2009-201**

Introduction

Staff of the U.S. Nuclear Regulatory Commission performed a routine and announced nuclear criticality safety (NCS) inspection of the AREVA Nuclear Power Inc. (AREVA NP) facility in Richland, Washington from April 13-16, 2009. The inspection included an on-site review of the licensee's NCS program; NCS analyses; plant operations; NCS inspections, audits and investigations; criticality accident alarm system; and open item follow-up. The inspection focused on risk-significant fissile material processing activities in the uranium hexafluoride (UF₆) cylinder receiving pad, the Dry Conversion Facility (DCF), the Ammonium Diuranate (ADU) Conversion area, the Uranium Dioxide (UO₂) Building including scrap recovery processes, the blended low-enriched uranium (BLEU) facility, rod and bundle fabrication shops, the incinerator, Engineering Laboratory Operations (ELO), and the BLEU powder storage area.

Results

- A Severity Level IV violation was identified regarding the failure to establish moderator controls to ensure k_{eff} will not exceed 0.97 for the large powder blenders and for large powder spills
- A weakness was identified regarding inconsistent items relied on for safety descriptions in safety and implementation documents for the dry conversion facility.
- No safety concerns were noted regarding NCS audits.
- No safety concerns were identified regarding licensee's review of NCS infractions.
- No safety concerns were identified regarding the criticality accident 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 Nuclear Criticality Safety Analyses (NCSAs) and specification Nuclear Criticality Safety Standards (NCSSs) to determine that criticality safety of risk-significant operations was assured through adequate controls with sufficient safety margin. The inspector interviewed NCS staff regarding these evaluations. The inspector reviewed selected aspects of the following documents:

- E04-06-004, "Preparation and Review of Nuclear Criticality Safety Documents," Version 4.0, Feb. 5, 2009
- E04-06-005, "Review of Nuclear Criticality Safety Implementing Documents," Version 3.0
- E04-05-01, "Nuclear Criticality Safety Standards," Version 8.0, Mar. 13, 2009
- E04-NCSA-135, "BLEU Scrap Recovery," Version 6.0, Mar. 23, 2009
- E04-NCSA-210, "ELO Drain System," Version 4.0, Jan. 30, 2009
- E04-NCSA-323, "BLEU Powder Receipt and Download," Version 9.0
- E04-NCSA-325, "BLEU Powder Preparation," Version 8.0
- E04-NCSA-355, "BLEU Powder Storage," Version 9.0, Jan. 15, 2009
- E04-NCSA-328, "DCF Scrap Download Hood Operations," Jan. 27, 2009
- E04-NCSA-600, "Specialty Fuels Powder Preparation," Version 10.0, Dec. 18, 2008
- E04-NCSA-820, "Dry Conversion Powder Production Process," Version 4.0, Jan. 28, 2009
- E04-NCSA-830, "Dry Conversion Powder Preparation,," Version 9.0, Jan. 15, 2009
- E04-NCSA-G4.1, "Equivalent Moisture Content of Additives," Feb. 17, 2009
- E04-NCSS-135, "BLEU Scrap Recovery," Version 4.0, May 6, 2008
- E04-NCSS-800, "General Dry Conversion Facility Requirements," Version 3.0, Aug. 31, 2007
- E04-NCSS-G92, "Moderator Control," Version 3.0, Nov. 5, 2008

b. Observations and Findings

The inspector reviewed NCSAs and NCSSs for new, changed, and other selected operations. During this review the inspector identified two concerns which are described below. Based upon the scope of this review, the inspector determined that the analyses were performed and reviewed by qualified NCS engineers. Aside from the concerns described below, the inspector observed that analyses contained appropriate limits on controlled parameters for each credible criticality accident sequence.

Control of Moderator Using 5-Gallon Containers

While reviewing the NCSAs for the dry conversion and BLEU powder preparation areas, the inspectors noted that IROFS 1114 and 4712, respectively, limited the nominal volume of containers with spillable liquids (e.g., water) to 5 gallons. The inspector determined that the licensee's nominal 5 gallon container actually allowed containers as large as 20 liters in the facility. The inspector noted that a number of accident sequences in these areas were initiated by spills of less than 20 liters of water. For some of these sequences, either IROFS 1114 or 4712 was listed as a control to prevent the accident. The inspector determined that these IROFS could not actually prevent a liquid spill of less than 20 liters from occurring.

The inspectors noted that some criticality accident sequences which listed either IROFS 1114 or 4712 were protected by only one other IROFS. These sequences included criticality due to spilling water into large powder blenders and criticality due to spilling water onto a large powder spill. Examples of these sequences include:

- Accident sequence 4.3 in NCSA-325 is initiated by a spill of more than 18.43 kg of water (approximately 18.5 liters) which ends up in the large BLEU powder blender.
- Accident sequence 2.2.7 in NCSA-830 is initiated by a spill of more than 18 kg of water (approximately 18 liters) which ends up in the large dry conversion powder blender.
- Integrated Safety Analysis (ISA) sequence 830-50 is initiated by a spill of more than 38 kg of uranium oxide powder outside of an enclosure that is subsequently moderated.

The inspector asked the NCS staff how the amount of moderator needed for the initiating events were determined. The inspector was provided with documented results from computer calculations with UO_2 powder, which were summarized in Tables 12, 13, 14, 41, and 42 of NCSA-325. In each of these cases small amounts of moderator are allowed in the powder. The inspector noted that when computer calculations are used the license requires that controls limit k_{eff} to no more than 0.97.

The first set of calculations consisted of a small sphere of UO_2 saturated with water surrounded by a large bulk UO_2 powder sphere (89 cm radius) and full water reflection. The results showed that with 0.5 wt% water in the bulk powder and 18.43 kg of water in the saturated region the calculated neutron multiplication factor (k_{eff}) is 1.0. Similarly, 1.0 wt% water in the bulk powder and 17.04 kg of water in the saturated region also resulted in a k_{eff} of 1.0. The inspectors noted that under normal conditions up to 0.5 wt% water plus additional moderating additives is allowed in the powder. Thus, the inspector determined that an appropriate limit on additional moderators, based upon this model, would be less than 17.04 kg (17 liters) of water.

The second set of calculations consisted of a UO_2 powder sphere saturated with water and surrounded by full water reflection. The calculations showed that near optimal density of UO_2 powder, about 17.5 liters of water was required to mix with the powder to reach a k_{eff} of 0.97. This occurred with about 72.3 kg of UO_2 powder. The inspector determined that an appropriate limit on additional moderators, based upon this model, would be less than 17.5 liters of water.

The third set of calculations consisted of a UO_2 powder hemisphere saturated with water, resting on a concrete floor, and surrounded by full water reflection. The calculations showed that near optimal density of UO_2 powder, about 18.75 liters of water was required to mix with the powder to reach a k_{eff} of 0.97. This occurred with about 77.4 kg of UO_2 powder. The inspector determined that an appropriate limit on additional moderators, based upon this model, would be less than 18.75 liters of water.

Based upon this information, the inspector determined that IROFS 1114 and 4712 cannot ensure that k_{eff} does not exceed 0.97 for the accident sequences listed above. The inspector observed that the largest containers of spillable liquids appeared to be mop buckets. The inspector did not observe any mop buckets near the large blenders or any that were filled anywhere near their full capacity. The inspector determined that the risk significance of the noncompliance was low. The failure to establish moderator controls which ensure k_{eff} will not exceed 0.97 for the large powder blenders and for large powder spills will be tracked as **VIO 70-1257/2009-201-01**.

Implementation of IROFS

While reviewing the controls on moderator for the dry conversion process, the inspector noted a discrepancy between the descriptions of IROFS 1114 in the safety documentation and the implementing documents. These discrepancies are underlined below:

- IROFS 1114 as described in NCSA-830: "The total volume of spillable liquid in the Dry Conversion processing area is administratively limited to ≤ 5 gallons."
- IROFS 1114 as described in the ISA Summary: "The total volume of spillable liquid in the subject facility is administratively limited to no more than 5 gallons."
- Specified requirement provided to the Engineering and Operations Division [NCSS-800] for implementation: (A-2) No more than two containers of liquid with a volume between 1 and 20 liters are permitted in the UF_6 Vaporization, Powder Production, and Powder Preparation process areas; and (A-3) unlimited liquid bearing containers with a volume less than 1 liter are permitted.

The inspector noted that in the analysis section of NCSA-830, it was assumed that two containers of spillable liquid were allowed in the dry conversion processing areas. The inspector did not have a concern over the number of containers permitted by NCSS-800. However, controls must be implemented as described in the safety analysis and the ISA Summary. Correction of the inconsistent dry conversion process moderator control descriptions in the safety and implementation documents will be tracked as **IFI 70-1257/2009-201-02**.

c. Conclusions

A Severity Level IV violation was identified regarding the failure to establish moderator controls to ensure k_{eff} will not exceed 0.97 for the large powder blenders and for large powder spills.

A weakness was identified regarding inconsistent IROFS descriptions in safety and implementation documents for the dry conversion facility.

No other 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 licensee 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:

- E04-06-002, "Routine NCS Audits," Version 2.0, June 17, 2008
- E04-07-200812, "NCS Audit/Inspection Report," Dec. 2008
- E04-07-200901, "NCS Audit/Inspection Report," Jan. 2009
- E04-07-200902, "NCS Audit/Inspection Report," Feb. 2009

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. The inspector also observed that the licensee was analyzing for trends over time of infractions and IROFS failures.

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 NCS infractions that have occurred since December 1, 2008. The inspector reviewed the progress of investigations and interviewed the licensee's staff regarding immediate and long-term corrective actions.

b. Observations and Findings

The inspector reviewed selected NCS infractions that have occurred since December 1, 2008 and the associated condition reports. The inspector observed that internal events were investigated in accordance with written procedures and appropriate corrective actions were assigned. The inspector determined that the licensee adequately evaluated whether or not these events were reportable to the NRC. The inspector had no safety concerns regarding licensee reporting, investigation, and correction of internal NCS related events.

Conclusions

No safety concerns were identified regarding licensee's review of NCS infractions.

5.0 Criticality Accident Alarm Systems (IP 88017)

a. Inspection Scope

The inspector reviewed documents and interviewed the licensee's staff regarding a recent event which impacted the criticality accident alarm system (CAAS). The inspector reviewed selected aspects of the following documents:

- Condition Report No. 2009-1285
- E12-01-007, Justification for Continuing Operation, February 26, 2009

b. Observations and Findings

The inspector reviewed a condition report describing an event where several howlers for the CAAS were inoperable from February 26 to March 1, 2009. On February 26, 2009, a howler was moved and incorrectly rewired. On March 1 the system was tested, which triggered a short circuit that took out several howlers. The inspector noted that on February 26, 2009, the licensee had authorized its personnel, using a Justification for Continuing Operating (JCO), to postpone testing of the modified system until the regularly scheduled test on March 1, 2009. The JCO indicated that the public address (PA) system would broadcast howlers activated anywhere in the facility and would serve as a compensatory measure. The licensee had measurements which indicated that the PA would be audible in the affected areas. The inspector determined that adequate compensatory measures were in place to justify continued operation during the four days the CAAS howlers were unavailable.

c. Conclusions

No safety concerns were identified regarding the criticality accident 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 inspector interviewed the operators, NCS engineers, and process engineers both before and during walkdowns.

b. Observations and Findings

The inspector performed walkdowns of the UF₆ cylinder receiving pad, the DCF, the ADU conversion area, the UO₂ Building including scrap recovery processes, the BLEU facility, rod and bundle fabrication shops, the incinerator, ELO, and the BLEU powder storage area. The inspector also toured the uranium extraction process area which is under construction. 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.

8.0 Open Item Review

IFI 70-1257/2008-203-01

This item tracks the licensee's implementation of unfavorable geometry containers in the ELO facility. On a previous inspection an inspector observed that large plastic bags were in the ELO facility, and questioned why unfavorable geometry containers were not controlled in ELO like they are in other parts of the facility. During this inspection, the inspector noted that the licensee had an analysis which demonstrated that it was not credible for a critical solution to collect in an unfavorable geometry container in the ELO facility. This item is closed.

IFI 70-1257/2008-203-01

This item tracks the use of checkered tape on the floor to mark the BLEU container powder transfer area as a moderator controlled area. On a previous inspection, an inspector noted that there was checkered tape dividing the BLEU transfer room from an adjacent room. The inspector noted that it was unclear as to which room was intended to be a moderator controlled area. On this inspection, the inspector observed that signs with arrows were posted on the wall to indicate which area was moderator controlled. This item is closed.

8.0 Exit Meeting

The inspector communicated the inspection scope and results to members of AREVA April 16, 2009. Licensee management acknowledged and understood the findings as presented.

SUPPLEMENTARY INFORMATION

1.0 List of Items Opened, Closed, and Discussed

Items Opened

VIO 70-1257/2009-201-01 Tracks the failure to implement moderator controls on spillable liquids to ensure that k_{eff} does not exceed 0.97 for large quantities of uranium oxide powder.

IFI 70-1257/2009-201-02 Tracks the correction of the inconsistent dry conversion process moderator control descriptions in the safety and implementation documents.

Items Closed

IFI 70-1257/2008-203-01 Tracks implementation of non-favorable geometry controls in the ELO facility.

IFI 70-1257/2008-203-02 Tracks correction of moderation controlled area boundaries in the BLEU powder handling area.

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

3.0 Key Points of Contact

AREVA NP, Inc. - Richland

C. Manning	Manager, NCS
W. Doane	NCS Team Leader
L. Maas	Manager, Regulatory Compliance
R. Link	Manager, Environmental, Health, Safety, and Licensing
K. Kulesza	NCS Engineer
C. Kahambwe	NCS Engineer
T. Watkins	Maintenance

NRC

B. Purnell	Criticality Safety Inspector
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All attended the exit meeting on April 16, 2009.

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
DCF	Dry Conversion Facility
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
U ₃ O ₈	uranium oxide
UF ₆	uranium hexafluoride
UNH	uranyl nitrate hexahydrate
UO ₂	uranium dioxide