June 12, 2009
REL:09:028

U.S. Nuclear Regulatory Commission
Attn: Document Control Desk
Director, Office of Nuclear Material Safety
and Safeguards
11555 Rockville Pike
One White Flint North
Rockville, MD 20852

Gentlemen:

**Subject:** **Reply to a Notice of Violation from NRC Inspection Report 70-1257/2009-201; AREVA NP Inc. License No. SNM-1227**

Ref.: Letter, Patricia A. Silva to Charles Perkins, "NRC Inspection Report No. 70-1257/2009-201 and Notice of Violation," dated May 13, 2009.

Attached is AREVA NP's (AREVA's) response to the violation described in the referenced letter.

If you have questions or require further information, please contact me at 509-375-8409 or C. D. Manning of my staff at 509-375-8237.

Very truly yours,

R. E. Link, Manager
Environmental, Health, Safety, & Licensing

IE07

**AREVA NP INC.**
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**Reply to Notice of Violation**
**NRC Inspection Report 70-1257 / 2009-201; AREVA NP Inc.**

## Violation

The violation as stated in the referenced Notice of Violation (NOV) is as follows:

> Safety Condition S-1 of Special Nuclear Materials License No. SNM-1227 authorizes the use of licensed materials 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."

(Note that accident sequence 830-50 in the Integrated Safety Assessment Summary is accident sequence 3.3.4 in NCSA 830.

> This is a Severity Level IV violation (Supplement VI).

## Position Statement

AREVA acknowledges the violation in that the controls established did not limit the amount of moderator present to less than the amount required in the optimum hypothetical analysis, but not necessarily credible configuration to limit $k_{eff}$ to less than 0.97. However, we take exception to the underlying basis of the violation. All aspects of the Performance Criteria 10 CFR 70.61 were and are met. The Criticality Analysis underlying and supporting the ISA was accurate and complete and the ISA met our approved methodology and process and was formally approved. The difference noted in the violation is an inconsistency between the spillable volume allowed in the process area as defined by the IROFS and the minimum mass of water that can exceed 0.97 as documented in the NCSA. AREVA is taking steps to improve its performance as described in the Actions Taken noted below.

## Background

During the ISA process, AREVA NCS personnel performed sensitivity studies to assist the ISA teams in understanding what plant conditions would result in unacceptable values of $k_{eff}$ (e.g. would exceed 0.97 for credible abnormal conditions). The NCS personnel in conjunction with the other ISA Team members jointly establish the controls needed to assure that accidental nuclear criticality was highly unlikely and that the double contingency requirements were met per the AREVA ISA methodology.

In this case, the qualitative assessment of the ISA Team including the NCS member and peer reviewer was that limiting containers of spillable liquids to a nominal 5-gallon container was a sufficient control and approved as an IROFS. The guidance to the NCS staff and ISA teams using the approved ISA methodology allowed using a qualitative determination that a quantitative limit would be met. That is in this case a volume limit of a nominal 5-gallon container preventing 17 liters of liquid from entering equipment that was inadvertently left open or from entering a spill of uranium oxide powder outside of containment. Thereby meeting the license commitment listed in the violation.

## Analysis of Situation

AREVA's position is that sufficient controls were established to ensure that $k_{eff}$ would not exceed 0.97 for credible abnormal conditions. A discussion of the accident scenarios listed in the NOV follows:

### Accident Sequence 325-25:

The BLEU blender contains > 40 kg $UO_x$. > 18.5 kg of water is brought into the area and is spilled into the blender via an open and unattended access door.

Where the Initiating Event is:

A spill of > 18.5 kg of liquid water or equivalent moderator intentionally brought into the BLEU Blender area that is at an elevation where intrusion into the blender due to an open port is credible. (Includes failure of

This accident sequence specifically credits IROFS 4712 and 1143 as controls that will ensure an acceptable $k_{eff}$.

It is noted that this accident sequence meets the 10CFR70.61 requirement for being "highly unlikely" without crediting IROFS 4712.

Facility design features and controls which are considered applicable to maintaining $k_{eff}$ within acceptable values include the following:

The only working surface above the BLEU blender or blender receiver vessels is a maintenance catwalk that is accessed by a ladder. This catwalk is equipped with a lip about 6 inches high around the perimeter of the catwalk, except at the ladder access location which opens away from the blender, that would prevent any significant amounts of liquid from a 20-liter spill onto the catwalk surface from reaching the top of the blender.

Additionally, the design of the BLEU powder blender and preparation equipment contains the following design features that prevent potential spills from a 20-liter container from entering this equipment even if the maintenance access port is left open:

1. The blender top is about 6.25 inches above the adjacent floor.
2. The maintenance access port is elevated another 6.25 inches above the top of the blender.
3. The maintenance access ports on the rest of the powder preparation equipment are located inside enclosures, oriented, and otherwise shielded to prevent the entry of water from this volume of a spill.

Based on this information, it is concluded that IROFS 4712 remains valid for this accident sequence as it will preclude entry of liquid from a container spill provided the volume of the spill is limited as required by this IROFS. The qualitative assessment by the ISA team, including NCS personnel, that $k_{eff}$ will remain less than 0.97 was a valid assessment. Given the plant configuration it is not credible for 17 liters of water to enter the blender or powder preparation equipment following a spill of all the contents in a 20-liter container (the volume limit imposed in the NCSA/NCSSS)

The only other 10CFR70.61 issue of concern is meeting the double contingency principle.

In addition to the above mentioned control (IROFS 4712), Nuclear Criticality Safety Specification (NCSS) 325 imposes two independent administrative controls that also ensure an acceptable $k_{eff}$ is maintained. These administrative controls are listed as:

18. "The blender and powder receiver vessel shall not be opened for any reason until emptied unless written permission is given by an NCS specialist." This requirement flows down into Standard Operating Procedure SOP- 40533.

19. "An open blender shall not be left unattended." This requirement also flows down into SOP- 40533.

If a moderator challenge exists, the attending operator will take the needed action to prevent liquid moderators from entering the open equipment, empty or not, per the requirements of NCSS Administrative requirement 7 of NCSS-G01 "Any floods/large spills of liquids shall be terminated as soon as possible...". All operators are trained to this NCSS.

Another NCS control that has some bearing on this accident scenario is the generic requirement listed in NCSS-G92 that states, "while in transit, mop and mop wringer buckets shall be kept at least 1 foot from any accumulations of fissile material." This control further decreases the likelihood that a spill from a 20-liter container will result in a volume of concern entering the equipment.

**Accident Sequence 830-25:**

> 18 kg water or equivalent liquid moderator is spilled in the DCF processing area and enters a blender through an open and unattended access door.

Where the Initiating Event is:

Spill of > 18 kg water or equivalent liquid moderator near a blender in the DCF processing area. (Includes failure of Defense 1)

This accident sequence specifically credits IROFS 1114 and 1143 as controls that will ensure an acceptable $k_{eff}$.

It is noted that this accident sequence meets the 10CFR70.61 requirement for being "highly unlikely" without crediting IROFS 1114.
Aspects of the facility design (controls) which are considered applicable to maintaining $k_{eff}$ within acceptable values include the following:

On 5/08/2009 a test was performed to check the adequacy of these aspects of the facility design in preventing significant amounts of liquid accidentally spilled from a 20-liter container from entering a DCF blender. The DCF fourth floor powder prep is above the blender and was selected as the most limiting location for such a spill. The line two blender was selected for this test because it has not had any powder in it for several months.

The following steps were taken:

1. The mass of water to be spilled during the test was measured using a scale to be 10 kg (10 liters)

2. The tare weight of the plastic bucket used to carry the water was 680 grams.

3. A plastic bag was suspended above the maintenance access port above the line two blender (level 3) in such a way that it would conservatively catch any water that could enter the maintenance access port. This particular port was selected because it is most directly below any level four floor opening.

4. The 10-liters of water were carefully poured in the direction of this floor opening in an effort to maximize the amount of water that would enter the floor opening.

5. After the portion of the spilled water that entered level 3 powder prep had finished dripping into the plastic bag suspended above the access port, the plastic bag was removed, placed into the plastic bucket and taken to a scale and weighed.

Results:

The total weight of water and bag used to collect the water was 190 grams.

Conclusion:
If the volume of spilled liquid is doubled, the amount of water that would have hypothetically entered an access port would have been about 380 grams. If one conservatively assumes that this test is non-conservative by a factor of 10 in representing an actual spill, the amount of water that hypothetically would have entered an open blender is still less than 4 kg. Based on this conclusion, a 20 liter

volume limit on a single container of liquid is an adequate control to prevent $k_{eff}$ from exceeding 0.97.

Based on this information, it is concluded that IROFS 1114 remains valid for preventing entry of a significant amount of liquid into open equipment.

Therefore the only other 10CFR70.61 issue of concern is meeting the double contingency principle; the aforementioned regulation allows crediting of non-IROFS controls.

In addition to this control, IROFS 1114, NCSS 830 imposes two independent administrative controls. These controls also ensure an acceptable $k_{eff}$. These administrative controls are listed as:

11. "Open Blender and Powder Receiver Requirement: The blender and powder receiver vessels shall not be opened for any reason until emptied unless written permission is given by the Criticality Safety Specialist" This requirement flows down into SOP- 40305 and SOP-40308.

12. "An open blender shall not be left unattended." This requirement also flows down into SOP- 40305 and SOP-40308.

The attending operator will take the needed action to prevent liquid moderators from entering the open equipment, empty or not, per the requirements of NCSS Administrative requirement 7 of NCSS-G01, to which all operators are trained "Any floods/large spills of liquids shall be terminated as soon as possible..."

Another NCS control that has some bearing on this accident scenario is the generic requirement listed in NCSS-G92 that states, "while in transit, mop and mop wringer buckets shall be kept at least 1 foot from any accumulations of fissile material." This control further decreases the likelihood that a spill from a 20-liter container will result in a volume of concern entering the equipment.

**Accident Sequence 830-50 (Example cited in NOV2009-201-01):**

> 38 kg $UO_x$ spills outside of a DCF powder preparation process enclosure and is subsequently moderated by water or other hydrogenous liquids brought into the DCF.

Where the Initiating Event is:

Spill of > 38 kg $UO_x$ outside of a DCF powder preparation system process enclosure.

Although not clearly stated, the initiating event is failure of IROFS 1144: "Moderation/mass control by equipment integrity. Both the process equipment and the process enclosure will prevent any significant (kg quantity) spill of $UO_x$ powder."

After this IROFS is lost, this accident sequence credits IROFS 1114 and 104 as controls that will ensure an acceptable $k_{eff}$.

IROFS 104 will ensure an acceptable $k_{eff}$. This IROFS requires operators to "...promptly spread out (to 3.6 inches deep or less) and/or clean up any significant (kg quantity) spill of SNM... ", and to not "...transfer SNM if a flood is present."

It is noted that this accident sequence meets the 10CFR70.61 requirement for being "highly unlikely" without crediting IROFS 1114.

If IROFS 1114 is not credited, the 10CFR70.61 requirement to provide double contingency protection is still met.

**Conclusion**

AREVA has met and continues to meet the 10CFR 70.61 and the license conditions specified in Special Nuclear Materials License No. SNM-1227.

**Corrective Actions Taken**

A number of actions were taken in direct response to this plant condition, as follows:

- A formal Justification for Continued Operation (JCO) was prepared which included the following compensatory actions;
    - Appropriate areas of the facility were posted with a Nuclear Criticality Safety Posting that prohibits more than three gallons of spillable liquid in the applicable areas of the plant.
    - A briefing was held with the appropriate personnel to ensure that they understood this restriction.
- The condition was entered into AREVA's corrective action program.
- AREVA commissioned an Apparent Cause Analysis (ACA) to evaluate the cause of this plant condition.

Actions to Avoid Further Violations

The following additional actions are expected to prevent a repeat of this condition:

1. Conduct remedial training with the NCSA/ISA staff and reminded them of the level of documentation that is expected to be included in NCSA / ISA documents.
2. Revise the NCS work practice on the preparation and review of Nuclear Criticality Safety Documents to provide adequate instructions to the NCS staff .
3. Update the accident sequences associated with IROFS 1114 and 4712 and ensure that sufficient clarity and supporting information is included so that AREVA has reasonable assurance that a qualified person independent from the ISA team and technical review process can reach the same conclusion as the ISA Team members, the NCSA author, and technical reviewers.

The corrective action 1 listed above is complete and actions 2 and 3 are expected to be completed by August 31, 2009.

Date of Full Compliance

AREVA is in full compliance with the subject license requirements.