

U.S. NUCLEAR REGULATORY COMMISSION
REGION I

INSPECTION REPORT

Docket No.	07001201
License No.	SNM-1168
Inspection No.	07001201/2011006
Licensee:	AREVA, Inc.
Facility:	Mount Athos Road Facility
Location:	Lynchburg, Virginia
Inspection Dates:	October 25, 2011 (on-site) and January 19, 2012 (exit)
Date Follow-up Information Received:	December 22, 2011
Inspector:	Mark C. Roberts Senior Health Physicist Decommissioning Branch Division of Nuclear Materials Safety
Approved By:	Marc S. Ferdas, Chief Decommissioning Branch Division of Nuclear Materials Safety

EXECUTIVE SUMMARY

AREVA, Inc.
Mount Athos Road Facility
NRC Inspection Report No. 07001201/2011006

A routine announced safety inspection was conducted at the AREVA, Inc. (AREVA) Mount Athos Road (MAR) Facility on October 25, 2011. An in-office review of additional information provided by AREVA continued through January 19, 2012. The inspection was conducted in accordance with NRC Inspection Procedures (IP) 83890 and 88104. The inspection consisted of a review of AREVA's remediation of the areas in the MAR facility where special nuclear material (SNM) was used or stored, including radioactive waste management and transportation and the inventory of SNM. The inspection consisted of observations by the inspector, interviews with AREVA personnel, and a review of procedures, records, and radiological survey and sample results.

AREVA has shipped completed fuel assemblies to customers and any remaining fuel pellets and some contaminated equipment to its existing facility in Richland, Washington. Staff in the AREVA facility has also remediated the locations in the fuel building where U-235 was used or stored. Remediation activities included removal of equipment and decontamination of the Pellet Loading Room (PLR), removal of the ducts and filters and decontamination in the ventilation system mezzanine area, minor decontamination in the fuel assembly storage area, removal of multiple sections of the main waste water line, and shipment of these wastes to a licensed offsite processing facility. Tours of the facility did not identify any remaining amounts of SNM in product storage areas (pellets or completed fuel assemblies had been shipped), waste storage areas (waste shipping containers had been shipped offsite), the waste measurement area (the SNM in the drum standards had been shipped as waste), or in material processing areas (pellet handling and loading equipment had been shipped offsite). The remaining inventory of SNM is limited to residual contamination, primarily in the remaining sections of the waste water line.

Available sample data indicate that the waste water line was internally contaminated, which was not unexpected because the line was used to release waste water containing uranium. Although AREVA is not releasing the fuel building for unrestricted use and will be using these areas for licensed activities under its Commonwealth of Virginia license, the unexcavated areas of the waste water line and soil beneath the line should be specifically considered for evaluation of residual radioactivity from licensed operations when the facility is decommissioned.

Based on the results of this inspection, no violations or safety concerns were identified.

REPORT DETAILS

1.0 Background

The MAR facility in Lynchburg, Virginia was constructed in the late 1960s for the purpose of manufacturing commercial nuclear reactor fuel. These activities involved the use of SNM (enriched uranium) and were licensed under NRC License No. SNM -1168. AREVA conducted pelletizing operations with enriched uranium from 1975 to 1982. After 1982, pellet fabrication was outsourced and activities involving enriched uranium at the MAR facility consisted of fuel rod loading and fuel bundle assembly. In the mid-1980s, the NRC amended AREVA's license to authorize the use of radioactive byproduct material for reactor support services. On March 31, 2009, authorization for use of byproduct material was transferred to the Commonwealth of Virginia when the state became an NRC Agreement State. Use of byproduct material is now authorized by the Virginia Department of Health (Virginia License No. 680-515-1).

In September 2009, AREVA announced that it would be ceasing fuel fabrication operations at the MAR facility and would transfer these activities to an existing facility in Richland, Washington. As of March 31, 2011, AREVA shipped all remaining completed fuel assemblies to authorized customers and shipped any remaining fuel pellets and some of the fuel assembly production equipment to their Richland, Washington facility.

AREVA's remediation plans consisted of removing as much residual uranium contamination as reasonably achievable in the areas of the MAR facility where activities involving enriched uranium occurred. AREVA elected this approach because these areas were not going to be requested to be released for unrestricted use, but would remain as licensed areas for use with byproduct material in AREVA's Service Equipment Refurbishment Facilities (SERF) projects. AREVA requested and received an amendment to its Commonwealth of Virginia license authorizing the possession of enriched uranium, up to 350 grams of uranium 235 (U-235), as contamination from former fuel manufacturing operations. The NRC regulations in 10 CFR 150.10 and 150.11, in part, exempt Agreement State licensees from the requirement for a specific NRC license for SNM if the quantity possessed is less than or equal to 350 grams of U-235.

In April 2011, NRC inspectors from the Region II and Region I offices performed a final inspection under the NRC's fuel facilities program (NRC Inspection No. 07001201/2011003, dated July 29, 2011), which included a review of AREVA's programs associated with radiation protection, radioactive waste management, effluent control and environmental protection, transportation activities, and emergency preparedness. The inspection included an examination of AREVA's remediation activities to confirm that AREVA no longer possessed fuel pellets or fuel assemblies, and had initiated removal of equipment associated with these activities. A site visit on June 21, 2011 was conducted to collect a series of soil samples from the exterior excavation of the removal of the main waste water line. These samples were shipped to the NRC's analytical contractor, the Oak Ridge Institute for Science and Education (ORISE) for analysis and were also split with AREVA.

2.0 Remediation Performance and SNM Inventory

a. Inspection Scope (IPs 83890 and 88104)

The inspector reviewed AREVA's remediation activities, including waste shipping and disposal, radiological surveys, and sampling and analysis. The inspector also confirmed that the inventory of SNM was less than the amount authorized on the Commonwealth of Virginia radioactive materials license. The inspector held discussions with the AREVA staff on the remediation activities that were conducted where SNM had been used or stored and also toured these areas. The inspector reviewed records relating to the remediation conducted in the Pellet Loading Room (PLR), the ventilation system mezzanine area, the waste water line, and additional areas in the facility where SNM was used or stored.

The inspector reviewed AREVA's calculation method for converting radiation detection measurements taken on a surface (e.g. count per minute readings from the inside surface of a ventilation duct) to a quantity of U-235 in grams. The inspector also noted that the method used appropriate unit conversion factors and used conservative assumptions to come up with a final quantitative value for grams of U-235. These data were subsequently used to estimate the quantity of U-235 contamination in the radioactive waste shipments.

The inspector reviewed available sample analysis data to determine the radiological condition of the waste water line. The NRC ORISE analytical results were compared to the AREVA data for the exterior section of the main waste water line. The inspector also reviewed AREVA's report on the "Decommissioning of Selected Sections of the Former Waste Water Line," dated November 2011, to determine the condition of this line and confirm estimates of residual SNM in the waste water line. The inspector also confirmed the calculations used in this document for determining the residual inventory of SNM in the sections of the waste water line that were not removed.

The inspector reviewed records associated with radioactive waste management and transportation to determine if radioactive waste shipments that were shipped to the offsite processing facility for disposal from the AREVA facility were properly documented and accounted for SNM. The inspector reviewed the radioactive waste shipping records for four shipments. The shipping documents included completed low level waste manifest forms (NRC Forms 540 and 541), emergency response information, in-transit driver instructions, package certificate, radiological surveys, and exclusive use instructions as required by NRC and U.S. Department of Transportation regulations.

The inspector also toured areas where SNM had been previously used and stored, reviewed survey records to determine the residual quantity of SNM, and reviewed the SNM inventory for the MAR facility.

b. Observations and Findings

PLR Remediation Activities - The PLR consisted of multiple discrete areas where boxes of enriched uranium pellets were received, inspected, stored, and then transferred to the

pellet loading area. Pellets were then inserted into zircalloy tubes. Finished tubes were removed from the PLR through an exit port in the wall. Final welding and assembly of fuel bundles were performed in this adjacent area outside the PLR. The PLR ventilation system maintained the areas under a negative pressure for contamination control. The ventilation system fans and filter banks were located on a mezzanine above the PLR. The PLR also contained a change area for workers along with sinks and shower facilities. Drain lines from these systems fed into the main waste water line that ran down the central corridor of the building.

The inspector determined that components in the PLR that could be readily disassembled, including the storage shelves, inspection tables, roller conveyors, and ventilation ducts, were removed from the PLR and shipped for offsite disposal as radioactive waste. The shower and sink facilities were also removed and discarded as radioactive waste. The paint on the walls and the floor tiles were removed and discarded as radioactive waste. The inspector noted that areas on the floor and walls were scabbled to remove fixed contamination. The floor in the vicinity of the shower drains and the lower walls, where they joined the floor, was extensively scabbled to remove fixed contamination.

The inspector reviewed radiological surveys for these areas and noted that removable alpha and beta contamination in all areas were less than detectable. Fixed beta-gamma contamination measurements were all less than 1000 disintegrations per minute per 100 square centimeters (dpm/100 cm²), (AREVA's beta-gamma criterion for defining a contaminated area). Two locations on the floor of the PLR indicated fixed alpha contamination greater than 500 dpm/100 cm², (AREVA's alpha criterion for defining a contaminated area); however, these areas were not remediated further because the PLR will remain a radiologically controlled area and is not being designated as a clean area. Radiation Protection staff indicated that the surveys associated with the remediation activities would be classified as decommissioning records and would be required to be retained until the facility is decommissioned.

Ventilation Systems Remediation Activities – Ventilation systems that service the fuel building and systems that previously serviced the PLR are located in a mezzanine area directly above the PLR. The inspector determined that most of the system components that serviced the PLR, including ventilation ducts, pre-filters, and High Efficiency Particulate Air (HEPA) filters, have been removed from the mezzanine and disposed as radioactive waste. The inspector noted that radiological surveys for residual contamination did not identify any readings substantially different than the background count rate.

Waste Water Line Remediation Activities – The waste water line was a polypropylene pipe that ran nearly the length of the fuel building. The line carried low-activity waste water from sinks, showers, and drains to two 1000-gallon retention-dilution tanks outside the north end of the building. During operations, water in the tanks was sampled, diluted if necessary to meet radioactive release criteria, and discharged to the wet weather stream, which flowed eventually to the James River. The line was located approximately three feet below the concrete floor of the building and was buried as far as ten feet below the ground surface after exiting the building. The line was actively used when

pelletizing operations were conducted at the facility. When these activities were ceased, the line was flushed with water. Portions of the line continued to be used for release of industrial water that contributed to the flushing of the line. The line was taken out of service in 1987. The contaminated waste water from the PLR was sent to an evaporator on the PLR mezzanine. Water was evaporated and solids collected in trays and disposed as radioactive waste.

In 1986, 1989, and 1994, sections of the waste water line were replaced or removed. The 1986 replacement of a section of the line was initiated because of an apparent subsidence below the line and notable groundwater in-leakage to the line. Piping leading from the retention-dilution tanks to the wet weather stream and the tanks were removed in the late 1990s and survey data provided to the NRC. The area was released for unrestricted use from AREVA's license by the NRC in 1999. Because this data have been previously reviewed by NRC, it was not examined as part of this inspection.

During previous site visits, the inspector examined the areas where portions of the waste water line had been removed and reviewed available survey data. It is important to note that because AREVA is not releasing the facility for unrestricted use, there was no cleanup criteria established nor statistical testing established to demonstrate that areas could meet any residual activity levels. Discussions with the AREVA staff indicated that AREVA had a project remediation goal (decision level) of 30 pCi/g for residual total uranium. Total uranium is the sum of the three principal radionuclides of uranium; uranium 234 (U-234), U-235, and uranium 238 (U-238). The 30 pCi/g decision level represents a conservative value that is not based on any radiation dose to individuals. AREVA would have to request and be approved for an actual dose-based cleanup criteria in a decommissioning plan when the facility is actually decommissioned.

In 2009, an exterior section of the waste water line from the gas cylinder storage pad to the retention tank was removed. The second retention tank was also removed. The inspector noted that low level alpha and beta contamination were measured on the pipe and the tank and these materials were disposed as radioactive waste. Soil samples from the area were consistent with background concentrations of radioactive materials. In early 2011, feeder sections of the waste water line leading from the metrology laboratory and from the PLR were excavated. The inspector noted that low level radioactive contamination was identified in some of these sections and all excavated pipe was shipped as radioactive waste. An AREVA representative indicated that the piping that was removed did not exhibit any apparent leaks. Data from soil samples from beneath these drain line sections were consistent with background levels of radioactive material.

In June 2011, the last exterior section of the main waste water line was removed. The line was removed from outside the north end of the fuel building up to the gas cylinder storage pad. The inside of the pipe exhibited elevated radiation levels in sludge samples removed from the pipe. The pipe was cut into segments for disposal as radioactive waste. AREVA collected 11 soil samples at joint areas beneath the pipe. The inspector determined that these samples would be considered as biased samples because they were not collected in a random pattern for applying a statistical test. The NRC requested that five of the samples be split for analysis by the NRC's contractor ORISE.

The AREVA samples were analyzed for both gross alpha and gross beta activity. The NRC requested that the samples be analyzed for gross alpha and gross beta activity and also analyzed by gamma spectrometry so that specific nuclides could be identified. The ORISE data report is publically available in the NRC's Agencywide Documents and Management Access System (ADAMS) (ADAMS Accession No. ML12045A506). The NRC samples 1, 2, 3, 4, and 5 correspond to AREVA samples 1, 6, 8, 10, and 11 respectively. The higher numbered samples were located closest to the building.

The inspector noted that all of AREVA's gross alpha and gross beta measurements for the 11 soil samples were below their decision level of 30 pCi/g. The sample results from location 11 and location 8 were elevated compared to the rest of the samples they collected. Overall, NRC's results were similar to that of AREVA's. Specifically, NRC's data were also elevated for the same two locations. The inspector also noted that some of NRC's results were greater than AREVA's remediation decision level. Although these data do not numerically agree, (this may be due to different sample aliquots being analyzed, even though the samples came from the same location), the results do indicate that these areas may need to be evaluated further when the facility is decommissioned.

Radiological Surveys in the Remainder of the Fuel Plant – AREVA conducted routine radiological surveys in the fuel bundle welding and assembly area adjacent to the PLR and in the radioactive waste measurement area. Special surveys were conducted with large area beta-gamma radiation detector probes and alpha radiation detectors in the areas where pelletizing operations were previously conducted and where fuel assemblies were stored and prepared for shipment. The inspector determined that the equipment in the fuel bundle welding and assembly area has been removed and the equipment was either shipped as radioactive waste or shipped to the AREVA facility in Richland, Washington. The equipment in the radioactive waste measurement area has been dismantled and stored for eventual re-use. The U-235 drum standards have been shipped as radioactive waste and the SNM inventory updated to reflect disposal of this material. The inspector noted that radiological survey results in these two areas meet AREVA's criteria for clean areas. Surveys in the former pelletizing operations and the fuel bundle storage areas were initially performed with the large area beta-gamma radiation detector probes to identify areas for follow-up measurements with alpha detectors. The surveys identified fixed contamination in a floor seam near the pit in the SERF-1 area. This area was remediated and follow-up surveys confirmed the fixed contamination was successfully removed.

Radioactive Waste Management and Transportation Activities – Wastes from the remediation activities included contaminated equipment, ventilation ducts and filters, soil, concrete rubble and sections of the waste water line. The wastes were placed in drums or larger containers and then into larger seavan containers for shipment to an offsite waste processor in Tennessee. The content descriptions in AREVA Shipment 11-039 included the quantity of U-235 from the drum reference standards that were used to calibrate the waste drum monitoring equipment. The inspector also confirmed that these drum standards were no longer present in the area where radioactive waste drums were monitored. AREVA accounted for the quantity of U-235 shipped as waste in its current SNM inventory.

Residual Inventory of SNM - The primary locations for SNM product storage were the PLR and the fuel assembly storage and shipping area. The inspector did not observe any uranium fuel pellets or completed fuel assemblies in these areas. Remediation wastes were shipped to an offsite processing facility. These wastes included the quantity of U-235 in the drum standards. AREVA estimated that the remaining onsite inventory of U-235 is 0.5 grams, and is in the form of residual contamination in the remaining sections of the waste water line. The inspector noted that this estimate is well below the limit for U-235 in AREVA's Commonwealth of Virginia license.

c. Conclusions

AREVA has shipped completed fuel assemblies to customers and any remaining fuel pellets and some contaminated equipment to its existing facility in Richland, Washington. Staff in the AREVA facility has also remediated the locations in the fuel building where U-235 was used or stored. Remediation activities included removal of equipment and decontamination of the PLR, removal of the ducts and filters and decontamination in the ventilation system mezzanine area, minor decontamination in the fuel assembly storage area, removal of multiple sections of the main waste water line, and shipment of these wastes to a licensed offsite processing facility. Tours of the facility did not identify any remaining amounts of SNM in product storage areas (pellets or completed fuel assemblies had been shipped), waste storage areas (waste shipping containers had been shipped offsite), the waste measurement area (the SNM in the drum standards had been shipped as waste), or in material processing areas (pellet handling and loading equipment had been shipped offsite). The remaining inventory of SNM is limited to residual contamination, primarily in the remaining sections of the waste water line.

Available sample data indicate that the waste water line was internally contaminated, which was not unexpected because the line was used to release waste water containing uranium. Although AREVA is not releasing the fuel building for unrestricted use and will be using these areas for licensed activities under its Commonwealth of Virginia license, the unexcavated areas of the waste water line and soil beneath the line should be specifically considered for evaluation of residual radioactivity from licensed operations when the facility is decommissioned.

Based on the results of this inspection, no violations or safety concerns were identified.

3.0 Exit Meeting Summary

On January 19, 2012, the inspector presented the inspection results to Michelle Moore, Plant Manager, and other members of the AREVA staff. Ms. Moore acknowledged the inspection findings.

SUPPLEMENTAL INFORMATION

PARTIAL LIST OF PERSONS CONTACTED

Licensee

T. Allsep, Manager, Support Services
*T. Blanks, Manager, Nuclear Safety
*M. Moore, Site Manager
T. Osborne, Radiation Protection
G. Powers, Safeguards
*W. Sharkey, Manager, Environmental, Health, Safety & Licensing

Nuclear Regulatory Commission

*D. Hanks, Sr. International Safeguards Analyst, NMSS
*M. Thomas, Senior Fuel Facility Inspector, Region II
*R. Thompson, Project Manager, NMSS

Virginia Department of Health

**C. Coleman, Radiation Safety Specialist
*M. Welling, Assistant Director, Radioactive Materials

*Present for January 19, 2012 telephone exit meeting
**Accompanied NRC inspector during October 25, 2011 site visit

PARTIAL LIST OF DOCUMENTS REVIEWED

Commonwealth of Virginia, Department of Health, Areva NP, Inc., Radioactive Materials License No. 680-515-1, Amendment No. 3, July 28, 2011
Areva Inc., Mount Athos Road Facility, Decommissioning of Selected Sections of the Former Waste Water Line, November 2011 (ADAMS Accession No. ML120050029)
Oak Ridge Institute for Science and Education, Letter Report, Analytical Results for Five Soil Samples Associated with the Areva Site in Lynchburg, Virginia, July 28, 2011 (ADAMS Accession No. ML12045A506)
Miscellaneous radiation survey results for the Pellet Loading Room, mezzanine ventilation systems, and areas in the remainder of the plant
MAR EHS&L Procedure SL-1220 – Surface Contamination
Miscellaneous low-level waste shipment records

ITEMS OPEN, CLOSED, AND DISCUSSED

Opened, Closed and Discussed – None

LIST OF ACRONYMS USED

ADAMS	Agencywide Documents and Management Access System
CFR	Code of Federal Regulations
dpm/100 cm ²	disintegrations per minute per 100 square centimeters
IP	Inspection Procedure
MAR	Mount Athos Road (facility)
NRC	Nuclear Regulatory Commission
ORISE	Oak Ridge Institute for Science and Education
pCi/g	picoCuries per gram
PLR	Pellet Loading Room
SERF	Service Equipment Refurbishment Facilities
SNM	Special Nuclear Material
U-234	Uranium 234
U-235	Uranium 235
U-238	Uranium 238