



Department of Energy

Washington, DC 20585

April 19, 2016

Ms. Carol A. Johnson
President and Chief Executive Officer
Savannah River Nuclear Solutions, LLC
203 Laurens Street SW
Aiken, South Carolina 29801

NCO-2016-01

Dear Ms. Johnson:

The Office of Enterprise Assessments' Office of Enforcement completed its review of the facts and circumstances associated with the potential nuclear criticality noncompliances that occurred in the H-Area at the Savannah River Site (SRS) related to the loss of tank agitation and item spacing. Savannah River Nuclear Solutions, LLC (SRNS) documented these events in the Department of Energy's (DOE) Noncompliance Tracking System under reports NTS-SRSO--SRNS-HBLINE-2015-0002 and NTS-SRSO-SRNS-HBLINE-2015-0003, dated May 14, 2015, and October 1, 2015, respectively.

On September 8, 2015, SRNS discovered that a group of three operators and a first-line manager stored three samples of plutonium in containers that were not evaluated for storage. The placement of plutonium in unauthorized containers and the inability to maintain proper material spacing were deviations from nuclear criticality safety (NCS) procedural steps required for the safe performance of repackaging operations. The event occurred at the Office of Environmental Management's HB-Line facility, Phase III, at SRS and resulted in the violation of an NCS limit and a technical safety requirement (TSR). However, one documented control remained in place to prevent an inadvertent criticality. The samples were scheduled to be transported from H-Area to the Savannah River National Laboratory for flowsheet development. Subsequently, SRNS proactively paused operations for all nonessential nuclear and non-nuclear activities due to this breakdown in procedural compliance, along with several other incidents in preceding months, including the loss of agitation in Tank NT-51 that occurred on January 7, 2015, at the HB-Line facility, Phase II, that resulted in the loss of all documented NCS controls and a TSR violation. Subsequently, in a separate occurrence on January 20, 2016, SRNS discovered an error in a sample analysis performed by F/H analytical laboratories used to measure plutonium concentration to support an NCS control.



These issues were determined to be of low safety significance based on actual consequences and material configurations, but could have resulted in more significant safety consequences if left uncorrected, because they involved violation of an NCS limit and a TSR. SRNS's actions since the event, however, as well as its senior management's attention, focus, and transparency, have been extensive and appropriate. Consequently, the Office of Enforcement has confidence that SRNS's corrective actions will prevent future recurrence of similar events.

In accordance with 10 C.F.R. § 820.23, *Consent Order*, the Office of Enforcement has elected to resolve any potential noncompliances with requirements enforceable under 10 C.F.R. Part 820, *Procedural Rules for DOE Nuclear Activities*, through execution of a Consent Order. In deciding to enter into this Consent Order, DOE placed considerable weight on SRNS's post-event actions including: (1) a thorough and self-critical event investigation and causal analysis, (2) timely and conservative reporting to the Savannah River Operations Office and the Office of Enforcement, (3) prompt compensatory actions, (4) comprehensive corrective actions, and (5) senior management's commitment to facility safety, recurrence prevention, and continuous improvement.

DOE reserves the right to re-open this investigation if DOE later becomes aware that SRNS provided any false or materially inaccurate information. Further, if there is a recurrence of nuclear safety deficiencies similar to those identified in this Consent Order, or a failure to complete all action items prescribed in the Consent Order (or other related actions that SRNS subsequently determines to be necessary) to prevent recurrence of the identified issues, then the Office of Enforcement may pursue additional enforcement activity. The Office of Enforcement, the Office of Environmental Management, and the Savannah River Operations Office will continue to closely monitor SRNS's implementation of DOE nuclear safety requirements until the issues associated with this Consent Order are fully resolved.

Enclosed please find two signed copies of the Consent Order. Please sign both, keep one for your records, and return the other copy to the Office of Enforcement within 1 week from the date of receipt. Please follow all instructions specified in the enclosure. By signing this Consent Order, you agree to comply with all of the terms, including payment of the monetary remedy, specified in section IV of the Consent Order and in the manner prescribed therein.

Should you have any questions, please contact me at (301) 903-7707, or your staff may contact Mr. Jon Thompson, Director, Office of Nuclear Safety Enforcement, at (301) 903-1134.

Sincerely,



Steven C. Simonson

Director

Office of Enforcement

Office of Enterprise Assessments

Enclosure: Consent Order (NCO-2016-01)

cc: Jack Craig, DOE-SR
Robert Martini, SRNS

In the matter of) Report No. (s) NTS-SRSO-SRNS-HBLINE-2015-0002
)) NTS-SRSO-SRNS-HBLINE-2015-0003
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Savannah River Nuclear)
Solutions, LLC)
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) Consent Order NCO-2016-01

CONSENT ORDER INCORPORATING AGREEMENT BETWEEN THE U.S.
DEPARTMENT OF ENERGY AND SAVANNAH RIVER NUCLEAR SOLUTIONS, LLC

I

Savannah River Nuclear Solutions, LLC (SRNS) is responsible for the management and operation of the Department of Energy (DOE) Savannah River Site (SRS). SRNS is the prime contractor under Contract No. DE-AC09-08SR22470 (Contract) entered into with the DOE Savannah River Operations Office.

II

On September 8, 2015, SRNS discovered that a group of three operators and a first-line manager had placed three samples of plutonium in containers that were not authorized for storage. The placement of plutonium in unauthorized containers and the inability to maintain proper material spacing were deviations from nuclear criticality safety (NCS) procedural steps required for the safe performance of repackaging operations. The issue occurred in the Phase III area of the HB-Line facility at SRS, where the current mission is to repackage plutonium material for dissolution in the H-Canyon dissolver.

The first step in Phase III area repackaging operations is to receive material in shipping containers. Inside each shipping container is a stainless steel outer can that contains two smaller stainless steel inner cans containing plutonium. Once received, the shipping container is opened and the outer can is removed and placed in a cart for transport to the process room. In the process room, the outer can is opened and the two inner cans are removed. The inner cans are then placed in the Phase III glovebox and opened. Since stainless steel does not readily dissolve in the H-Canyon dissolver, the plutonium from the inner cans must be repackaged and transferred into dissolvable carbon steel cans.

Prior to the event, a temporary immediate procedure change was made for this stage of the process. This work process change allowed small samples of plutonium from the inner cans to be placed into small sample cans for transport to Savannah River National Laboratory (SRNL) in support of flowsheet development.

Once repackaging is complete, cans are removed from the Phase III glovebox and placed into a primary containment vessel (PCV) cart for storage and eventual transport to either H-Canyon (dissolvable cans) or SRNL (sample cans). As described and analyzed in the HB-Line nuclear criticality safety evaluation (NCSE), the PCV cart provides the spacing required to prevent interaction between plutonium materials.

On September 3, 2015, contrary to the NCSE requirement for adequate spacing and without proper authorization, three sample cans were placed into five-gallon pails instead of a PCV. An SRNS fact-finding meeting held shortly after the event determined that the placement of sample cans into the five-gallon pails resulted from failure to follow procedures. The storage and movement of these sample cans in unauthorized containers resulted in the loss of one of the two documented NCS controls credited in the double contingency analysis (DCA). The second documented NCS control for the DCA, limiting the mass of plutonium, was maintained. Therefore, at no time was the facility in danger of a nuclear criticality event. The loss of required spacing in this event was also a violation of both a criticality safety limit (CSL) and a technical safety requirement (TSR). Subsequent to this event, SRNS proactively paused operations for all nonessential nuclear and non-nuclear activities. SRNS has since lifted the pause, entered deliberate operations, and resumed normal operations for most activities site wide.

SRNS's root cause analysis for this event determined that the major causes were: a willful procedure violation; an unwillingness to call a time out; less than adequate conduct of operations; and issues in management performance and engagement. The root cause analysis also noted other contributing causes, including: deficiencies in the pre-job briefing; issues in planning, scheduling, and staffing; unclear roles, authorities, and accountabilities; and inadequate procedure validation, review, and approval of the immediate procedure changes.

An earlier event involving criticality safety occurred on January 7, 2015, in the Phase II area of the HB-Line facility. In this event, there was a loss of agitation in Tank NT-51 and six other HB-Line facility tanks after loss of power in H-Area. SRNS stopped aqueous nuclear material processing and subsequently suspended all HB-Line nuclear material movement and operations, due to the loss-of-agitation condition discovered on February 13, 2015, when it was determined that two NCS controls, required to be performed by HB-Line and required to be in place to protect H-Canyon Tank 9.6, were violated. The event resulted in the loss of all documented NCS controls for a particular nuclear criticality accident scenario, as well as a TSR violation. However, this event was of low safety significance based on material configurations.

An SRNS investigation of this incident revealed that after the loss of power on January 7, 2015, the Tank NT-51 agitator drive went to the "stopped" position. On resumption of HB-Line operations, plant personnel did not recognize that the agitator drive remained in that position and did not automatically restart. Three noncompliant tank transfers resulted from the lack of agitation in Tank NT-51. SRNS NCS engineering also examined the safety significance of the situation and determined that safe conditions existed in the two tanks due to geometrically favorable conditions in Tank NT-51 and the material configuration in H-Canyon Tank 9.6, which was safe from a criticality safety perspective and did not require any compensatory measures. At no time were any of the three applicable CSLs, or the more conservative criticality safety

operating limits, exceeded or challenged. In addition, controls were present in the H-Canyon DCA for neutron poison, acidity, and solids, and several additional conservatisms were present in the analyses.

In a later occurrence on January 20, 2016, SRNS discovered an error in a sample analysis performed by F/H analytical laboratories. The sample analysis was used to measure plutonium concentration in solution to support an NCS control prior to transferring tank contents from HB-Line to H-Canyon. No operational or safety limits were exceeded and no criticality controls were violated as a result of this error. The error was in the conservative direction, resulting in a lower than expected plutonium concentration due to increased dilution by SRNS prior to initiating the tank transfer. The cause of this occurrence was determined to be a data input error by a technician. The subsequent investigation found procedural deficiencies and weaknesses in the data integrity review, the assessment process, and the common mode failure analyses. Once the error was identified, SRNS instituted a stop of all fissile material transfers dependent on lab sample analyses at the affected facilities.

SRNS voluntarily reported potential noncompliances associated with these events into the DOE Noncompliance Tracking System (NTS) in reports NTS-SRSO--SRNS-HBLINE-2015-0002, *Loss of Tank NT-51 Agitation Results in Criticality Control and TSR Violations*, and NTS-SRSO-SRNS-HBLINE-2015-0003, *HB-Line Phase III TSR/NCSE Violation*.

The Office of Enforcement had not initiated an investigation prior to SRNS's request for settlement dated December 11, 2015. However, the Office of Enforcement had visited SRS on August 25 and 26, 2015, and conducted initial data gathering activities to evaluate whether to initiate a formal investigation. During this period of preliminary information gathering and analysis, the Office of Enforcement identified several potential noncompliances with DOE nuclear safety requirements.

In the December 11, 2015, letter to the Office of Enforcement, SRNS requested to enter the settlement process based on a consistent history of noncompliance reporting, self-identification and reporting of these NCS issues, a comprehensive investigation and extent-of-condition review, open and transparent communication, and initiation of robust corrective actions to prevent recurrence.

III

Pursuant to 10 C.F.R. § 820.23, at any time during enforcement proceedings, DOE may resolve any or all outstanding issues with a Consent Order if the settlement is consistent with the objectives of the Atomic Energy Act of 1954, as amended, and DOE nuclear safety requirements enforceable under 10 C.F.R. Part 820, *Procedural Rules for the DOE Nuclear Activities*.

To resolve potential noncompliances with DOE nuclear safety requirements and in consideration of SRNS's comprehensive and appropriate investigation, causal analyses, and associated corrective actions taken since the submission of the NTS reports referenced above, DOE has elected to enter into settlement. DOE and SRNS have reached agreement to resolve this matter through execution of this Consent Order.

IV

Accordingly, the terms of this Consent Order are as follows:

In consideration of the mutual agreements set forth in this section, the sufficiency and adequacy of which are acknowledged by DOE and SRNS (hereinafter the "Parties"), the following terms represent agreement by the authorized representatives of the Parties to resolve by settlement the potential noncompliances at SRS, in lieu of an enforcement action that DOE may issue pursuant to 10 C.F.R. § 820.24.

1. SRNS shall fully complete and implement all corrective actions previously committed to in its corrective action plans (CAPs) 2015-CTS-001892 and 2015-CTS-010106 and entered into NTS. Corrective actions shall be completed within 12 months of the Effective Date of this Consent Order as defined in item 4 below. SRNS shall ensure that its planned CAP commitments address the following areas:
 - a. Within 6 months of the completion of the CAPs identified in item 1 above, SRNS shall arrange for an independent party (outside of SRNS) to conduct its planned effectiveness review(s) of all NTS corrective actions and any additional corrective actions in 2015-CTS-001892 or 2015-CTS-010106 specifically identified to prevent recurrence.
 - b. SRNS shall provide the results of its effectiveness review(s), from item 1a above, to the Office of Enforcement, the Office of Environmental Management, and the Savannah River Operations Office within 18 months of the Effective Date of this Consent Order as defined in item 4 below.
 - c. Within 24 months of the Effective Date of this Consent Order, SRNS shall conduct an independent (outside of SRNS and its associated parent companies) assessment of its Nuclear Criticality Safety Program, including H-Area and the F/H analytical laboratories. The assessment will be performed by an independent group of assessors that is mutually agreeable to the Parties. The assessment will include, at a minimum: a review of
 - i) common mode failure analyses as they relate to Nuclear Criticality Safety Evaluations,
 - ii) organizational and facility interfaces as they relate to NCS program implementation,
 - iii) NCS control selection and implementation, iv) the laboratory analysis process as it relates to NCS controls, v) the NCS assessment process, vi) NCS training and qualification, and vii) NCS staffing. Assessment areas v, vi, and vii may be reviewed through the use of any previously conducted evaluations, if the independent group determines that those evaluations effectively reviewed these areas. The results of the assessment will be provided to the Office of Enforcement, the Savannah River Operations Office, and the Office of Environmental Management within 27 months of the Effective Date, along with a corrective action plan. The corrective action plan will address any findings identified in the assessment. Corrective actions shall be completed to the satisfaction of the Savannah River Operations Office.

2. SRNS shall pay the amount of \$175,000, reflecting an agreed-upon monetary remedy in lieu of the issuance of an enforcement action with the proposed imposition of a civil penalty pursuant to 10 C.F.R. § 820.24.
3. SRNS agrees to return a signed copy of this Consent Order, within one week from the date of receipt, to the address provided in item 5 below.
4. The Effective Date of this Consent Order shall be the date upon which SRNS signs this Consent Order.
5. SRNS shall remit the monetary remedy of \$175,000 by check, draft, or money order payable to the Treasurer of the United States (Account Number 891099) within 30 calendar days after the Effective Date of this Consent Order. Payment shall be sent by overnight carrier to:

Director, Office of Enforcement
Attention: Office of the Docketing Clerk, EA-10
U.S. Department of Energy
19901 Germantown Road
Germantown, MD 20874-1290

6. This Consent Order shall constitute a full and final settlement of the potential noncompliances identified in the referenced NTS reports, subject to the following:
 - (a) SRNS's payment of the monetary remedy in accordance with item 5 above; and
 - (b) SRNS's completion of all actions set forth in item 1 above to the satisfaction of DOE.
7. Neither the monetary remedy nor any costs, as defined in the Federal Acquisition Regulation, 48 C.F.R. § 31.205-47, incurred by, for, or on behalf of SRNS relating to coordination and cooperation with DOE concerning the investigation of matters covered by this Consent Order shall be considered allowable costs under the Contract. However, costs incurred by, for, or on behalf of SRNS relating to the development and implementation of corrective actions, including costs associated with the effectiveness review required under item 1 above, may be considered allowable costs under the Contract.
8. This Consent Order does not preclude DOE from re-opening the investigation or issuing an enforcement action under 10 C.F.R. § 820.24 with respect to a potential noncompliance if:
 - (a) after the Effective Date (as defined in item 4 above), DOE becomes aware of any false or materially inaccurate facts or information provided by SRNS; (b) there is a recurrence of nuclear safety deficiencies similar to those identified above; or (c) SRNS fails to complete all actions identified in item 1 above in a timely and effective manner to prevent recurrence of the identified issues.
9. Any modification to this Consent Order requires the written consent of both Parties.
10. SRNS waives any and all rights to appeal or otherwise seek judicial or administrative review of the terms of this Consent Order. DOE retains the right to judicially enforce the provisions of this Consent Order by all available legal means.

11. This Consent Order is issued pursuant to DOE's authority under Section 234A of the Atomic Energy Act of 1954, as amended (42 U.S.C. § 2282a) and the implementing provisions of 10 C.F.R. Part 820 governing enforcement of DOE nuclear safety requirements.
12. Pursuant to 10 C.F.R. § 820.23(d), this Consent Order shall become a Final Order 30 calendar days after the signed copy, referenced in item 3 above, is filed by the Office of Enforcement's Office of the Docketing Clerk unless the Secretary of Energy files a rejection of the Consent Order or a modified Consent Order.

On behalf of my respective organization, I hereby agree to and accept the terms of the foregoing Consent Order.

FOR U.S. Department of Energy

FOR Savannah River Nuclear Solutions, LLC

 Date 4/19/2016

Steven C. Simonson
Director
Office of Enforcement
Office of Enterprise Assessments

 Date 4/22/16

Carol A. Johnson
President and Chief Executive Officer
Savannah River Nuclear Solutions, LLC