



**babcock & wilcox nuclear operations group**

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September 14, 2012  
12-100

U.S. Nuclear Regulatory Commission  
ATTN: Document Control Desk  
Washington, DC 20555-0001

References: 1. License No. SNM-42, Docket 70-27  
2. Letter dated August 15, 2012, Thomas G. Hiltz (NRC) to R.P Cochrane (B&W), NRC Inspection Report No.70-027/2012-204 and Notice of Violations

Subject: Reply to a Notice of Violations in Inspection Report No. 70-027/2012-204

Dear Sir or Madam:

Pursuant to the provisions of 10 CFR 2.201, Babcock & Wilcox Nuclear Operations Group, Inc. ("B&W NOG"), Lynchburg facility, is providing this written statement of explanation to the U.S. Nuclear Regulatory Commission ("NRC") in reply to the Notice of Violations that was received by letter dated August 15, 2012 (Reference 2). B&W NOG's reply is provided in the enclosure.

If there are any questions in this regard, please contact Tony England at 434-522-6405.

Sincerely,

Joel Burch  
General Manager  
Babcock & Wilcox Nuclear Operations Group Inc., Lynchburg

Enclosure

cc: NRC, Chief, Technical Support Branch, Division of Fuel Cycle Safety and Safeguards,  
Office of Nuclear Material Safety and Safeguards.  
NRC, Region II, Regional Administrator  
NRC, Resident Inspector

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**ENCLOSURE**

**REPLY TO NOTICE OF VIOLATION****Violation: 70-0027/2012-204-02**

Per the Notice of Violation dated August 15<sup>th</sup>, 2012:

During a Nuclear Regulatory Commission (NRC) inspection from July 16 -19, 2012, a violation of NRC requirements was identified. In accordance with the NRC Enforcement Policy, the violation is listed below:

Title 10 of the Code of Federal Regulations (10 CFR) 70.72(a) states, in part, that the licensee shall establish a configuration management system, that "must assure the following are addressed prior to implementing any change:...(2) Impact of the change on safety and health... (6) The impacts or modifications to the integrated safety analysis, integrated safety analysis summary, or other safety program information, developed in accordance with § 70.62."

Safety Condition No. S-1 of Special Nuclear Material (SNM) License No. 42 requires that material be used in accordance with the statements, representations, and conditions in the license application dated June 29, 2007, and supplements thereto.

Section 11.1.3 of the License Applications states in part, that "Modifications or additions to the facilities, processes, and equipment, used for handling, processing, or storing licensed material, shall be evaluated and approved following an approved procedure before the change is made and the ISA is modified. Examples of changes that require evaluation and approval include: ...A change that adds, alters, or removes IROFS."

Contrary to the above, on December 9, 2009, the licensee failed to evaluate a change to equipment used to store licensed material that altered and effectively removed an item relied on for safety (IROFS). Specifically, during the nuclear criticality safety change review for the new, larger, 'bread pans' in the Met Lab the licensee failed to identify that the change would result in exceeding the volume limit for the Met Lab Fuel Storage Cabinets. The NCS review approved the change without an NCS evaluation; as a result, the facility change was not included in the ISA Summary annual update.

**Reason For Violation:**

Metallurgical samples at B&W's NOG-L facility are contained in "bread pans". The bread pans are used to transport and store the samples. Each bread pan is limited to 350 grams <sup>235</sup>U as a Routine Operating Limit. The bread pans are stored in one of two Met Lab Fuel Storage Cabinets. Each cabinet consists of 24 storage locations in a 6-high x 4-wide array. There is no moderation restriction in a bread pan storage location. Between storage locations, moderating materials are permitted as necessary. The volume of the bread pan is an Item Relied on For Safety (IROFS) when stored in the cabinets; the pans are limited to a maximum of 2.5 liters.

On July 10, 2012, a NCS engineer identified during a routine quarterly audit that the bread pans in the storage cabinets exceeded the 2.5 liter volume limit. At the time of discovery, other IROFS were available to ensure the risk of a criticality remained highly unlikely:

- Operator control of mass (the  $^{235}\text{U}$  mass in each bread pan did not exceed the 350 gram limit), and
- Operator control of moderation (no excess moderation was present between storage locations).

However, given the larger volume bread pans (~ 5.68 liters), a worst case moderation upset was initially evaluated with a  $k_{\text{eff}}$  of 0.9964, which exceeded the Safety Limit of 0.95 in NRC License SNM-42. The condition was reported to the NRC on July 11, under the requirements of 10 CFR 70, Appendix A (b)(1) as an unanalyzed condition.

Storage operations were immediately suspended and a safe shutdown condition was determined. The  $^{235}\text{U}$  mass was redistributed in the bread pans in the storage cabinets to establish a safe shutdown mode. The storage cabinets were secured and posted as out of service. In this shutdown mode, fuel could only be removed from the cabinets under direct supervision by NCS. Under no circumstances was fuel allowed to be added to the storage cabinets.

A conservative approach was initially taken in evaluating the event in order to ensure compliance within the specified reporting time period established in the regulations. The configuration was later reanalyzed using another approach approved in NRC License SNM-42 to account for neutron interaction. The calculated  $k_{\text{eff}}$  using this approach was 0.9308, which was less than the Safety limit of 0.95. The event notification was subsequently corrected and the report withdrawn on August 3, 2012.

A formal investigation was performed during July, 2012, to determine the root causes and recommend corrective actions to prevent recurrence. The investigation identified an error in human performance as the root cause. The review of the change in configuration by the originators and the evaluators was not recognized as exceeding the volume limit for the bread pan. The review did not identify the change as requiring a Safety Evaluation Request (SER), which would have triggered a detailed analysis of the new configuration, including establishing limits and controls to demonstrate adequate subcriticality, as well as updating the safety basis as appropriate. The failure during the change process to analyze the new configuration and update the safety documentation before approving the change was determined to be the reason for the violation.

### **Corrective Steps Which Have Been Taken and the Results Achieved:**

Met Lab Storage Cabinet operations were immediately suspended. The  $^{235}\text{U}$  mass in the storage cabinets was redistributed to achieve a loading of less than 250 g per bread pan to establish a safe shutdown mode. The storage cabinets were secured and posted as out of service. In this shutdown mode, fuel could only be removed from the cabinets under direct supervision by NCS. Under no circumstances was fuel allowed to be added to the storage cabinets. These actions re-established compliance with the performance requirements of 10 CFR 70.61.

Completed on: July 11, 2012

The specifics of the event were reviewed with the change originator and the NCS evaluators relative to the use of containers to store uranium bearing materials and their relationship to moderating materials (other than solutions). This action reduced the likelihood of recurrence of a similar error in human performance.

Completed on: July 12, 2012

An extent of condition review was completed to ensure other areas where the bread pans are used or stored met the performance requirements of 10 CFR 70.61. The results of the review found no other instances of non-compliance. The safety basis for other areas of use or storage does not credit the pan volume as an IROFS. This step provided assurance that the same condition did not exist elsewhere in the facility.

Completed on: July 18, 2012

**Corrective Steps That Will Be Taken To Avoid Further Violations:**

Revise NCS training for new hires regarding the use of containers outside of the Uranium Recovery area to store uranium bearing materials and their relationship to moderating materials (other than solutions).

To be completed by: October 31, 2012

Implement improvements to Quality Work Instruction (QWI) 5.1.12, "Change Management" to clarify that a SER is required for physical changes affecting IROFS safety functionality, unless otherwise approved by Safety management.

To be completed by: November 30, 2012

Complete an NCS evaluation of the Met Lab Fuel Storage Cabinets to return the storage operation to service. Determine revised limits and additional IROFS as necessary to meet the performance requirements of 10 CFR 70.61.

To be completed by: December 31, 2012

Complete an extent of cause review to ensure the root cause of this event has not impacted other plant operations. Review other in-house designed containers intended to store uranium bearing materials to ensure the design intention properly regarded the ability of the container to hold moderating materials other than solutions.

To be completed by: December 31, 2012

**Date When Full Compliance Will Be Achieved:**

Full compliance will be achieved by December 31, 2012.

**Violation: 70-0027/2012-204-04**

Per the Notice of Violation dated August 15, 2012:

During a Nuclear Regulatory Commission (NRC) inspection from July 16 -19, 2012, a violation of NRC requirements was identified. In accordance with the NRC Enforcement Policy, the violation is listed below:

Safety Condition No. S-1 of Special Nuclear Material (SNM) License No. 42 requires that material be used in accordance with the statements, representations, and conditions in the license application dated June 29, 2007, and supplements thereto.

Title 10 CFR 70.61 (e) states: "Each engineered or administrative control or control system necessary to comply with paragraphs (b), (c), or (d) of this section shall be designated as an item relied on for safety. The safety program, established and maintained pursuant to § 70.62 of this subpart, shall ensure that each item relied on for safety will be available and reliable to perform its intended function when needed and in the context of the performance requirements of this section."

Title 10 CFR 70.62 (d) states, in part: "Each applicant or licensee shall establish management measures to ensure compliance with the performance requirements of § 70.62... The management measures shall ensure that engineered and administrative controls and control systems that are identified as items relied on for safety pursuant to § 70.62 (e) of this subpart are designed, implemented, and maintained, as necessary, to ensure they are available and reliable to perform their functions when needed to comply with the performance requirements of § 70.62 of this subpart."

Title 10 of 70.4 states, in part: "Management measures mean the functions performed by the licensee, generally on a continuing basis, that are applied to items relied on for safety, to ensure the items are available and reliable to perform their functions when needed. Management measures included configuration management."

Contrary to the above, as of July 19, 2012, the licensee failed to maintain IROFS as established in the ISA. Specifically, items relied on for safety consisting of doubly-encased pipes in the Pharmacy and Shipping and Receiving areas were not implemented as stated in criticality safety evaluations and the ISA Summary.

**Reason For Violation:**

During the nuclear criticality safety (NCS) inspection conducted from February 27 through March 1, 2012 (Inspection Report No. 70-027/2012-202), the NRC inspectors observed that the safety basis for the Pharmacy area of fuel operations (SAR 15.32) listed the building design as a control for moderation for the Fuel Transport Cart. The moderation control was established by Quality Work Instruction (QWI) 4.1.5, "Design Criteria for NRC Licensed Activities, which states "areas under moderation control should provide that all water and steam lines are either left out by design, disconnected and plugged, double-cased, or shielded."

The building design was credited as an IROFS for the Fuel Transport Cart in 2008. Sufficient IROFS were already in place at the time to meet the performance criteria of 10 CFR 70.61. The

building design was added to the safety basis with the intention of increased defense in depth. However, the control was not verified by a Nuclear Safety Release. An incorrect assumption was made that because the building design had not changed since its construction, verification was not necessary. This assumption was an error in human performance. URI 70-027/2012-202-01 was generated to track this item.

During the NCS inspection conducted from July 16 - 19, 2012 (Inspection Report No. 70-027/2012-204), the URI was assessed by the inspectors. The inspectors' review of the Pharmacy area inspection conducted by NOG-L identified that some water lines were not in fact doubly encased. In addition, an extent of condition review performed by NOG-L found piping in the Shipping and Receiving Area (SAR 15.30) that was also not doubly-encased. Double encasing of piping is recommended (but not required) by QWI 4.1.5. It is not needed as an IROFS to meet the performance requirements of 10 CFR 70.61 in either area. However, SAR 15.30 specifically calls out doubly-encased piping as part of the IROFS description. Failure to implement and maintain this IROFS as part of the building design configuration was determined to be a violation.

### **Corrective Steps Which Have Been Taken and the Results Achieved:**

The weakness in the safety basis for the Fuel Transport Cart was reviewed within the NCS organization relative to the establishment of IROFS, development of related requirements, and subsequent verification. The root cause of this event was an error in human performance. This action limited the extent of cause and reduced the likelihood of recurrence of a similar condition in the future.

Completed on: March 6, 2012

An extent of condition review of the safety basis of other areas was performed to determine if the building design was credited as a control for moderation and not adequately verified. The review found one additional instance in which the verification of the building design as a control for moderation needed improvement. The specific equipment identified was the Shipping and Receiving Area Worktables.

Completed on: April 30, 2012

The scenarios associated with the Fuel Transport Cart were re-evaluated to determine if it was necessary to retain the building design as an IROFS for moderation control to meet the performance requirements of 10 CFR 70.61. Crediting the building design as an IROFS was not required to meet the performance requirements. The building design was removed from the SAR as an IROFS for the Cart.

Completed on: May 31, 2012

The building design of the Filler Area was reviewed to verify its compliance with the requirements for a moderation controlled area contained in QWI 4.1.5, "Design Criteria for NRC Licensed Activities". The design was found to be in compliance with the requirements of the QWI.

Completed on: June 14, 2012

The scenarios associated with the Shipping and Receiving Area Worktables were re-evaluated to determine if it was necessary to retain the building design as an IROFS for moderation

control to meet the performance requirements of 10 CFR 70.61. Crediting the building design as an IROFS was not required to meet the performance requirements. The building design was removed from the SAR as an IROFS for the Worktables.

Completed on: July 30, 2012

**Corrective Steps That Will Be Taken To Avoid Further Violations:**

All corrective steps have been completed.

**Date When Full Compliance Will Be Achieved:**

Full compliance was achieved on July 30, 2012.