



**UNITED STATES  
NUCLEAR REGULATORY COMMISSION**  
REGION II  
245 PEACHTREE CENTER AVE., NE, SUITE 1200  
ATLANTA, GEORGIA 30303-1257

November 4, 2010

EN 46001

Mr. R. P. Cochrane  
Vice-President and General Manager  
Babcock and Wilcox  
Nuclear Operations Group, Inc.  
P. O. Box 785  
Lynchburg, VA 24505-0785

**SUBJECT: NRC INSPECTION REPORT NO. 70-27/2010-003 AND NOTICE OF VIOLATION**

Dear Mr. Cochrane:

On September 30, 2010, the US Nuclear Regulatory Commission (NRC) completed an inspection of the Babcock and Wilcox Nuclear Operations Group facility in Lynchburg, VA. The purpose of the inspections was to determine whether activities authorized under the license were conducted safely and in accordance with NRC requirements. The enclosed integrated inspection report documents the inspection findings, which were discussed on July 14, September 30, and October 5, 2010, with you and other members of your staff.

The inspections consisted of an examination of activities conducted under the license as they relate to safety and compliance with the Commission's rules and regulations and with the conditions of your license. Areas examined during the inspections included: Plant Operations, Radiation Protection, and Facility Support. Within these areas, the inspections consisted of selective examinations of procedures and representative records, interviews with personnel, and observation of activities in progress.

Based on the results of these inspections, the NRC has determined that one Severity Level IV violation of NRC requirements occurred. This violation was evaluated in accordance with the NRC Enforcement Policy included on the NRC's Web site at <http://www.nrc.gov/about-nrc/regulatory/enforcement/enforce-pol.html>.

The violation is cited in the enclosed Notice of Violation (Notice), and the circumstances surrounding it are described in the subject inspection report. The violation is being cited in the Notice because it was self-revealing due to an event.

You are required to respond to this letter and should follow the instructions specified in the enclosed Notice when preparing your response. The guidance from NRC Information Notice 96-28, "Suggested Guidance Relating to Development and Implementation of Corrective Action," is available on the NRC's Web Site and may be helpful. The 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 the NRC's "Rules of Practice," a copy of this letter, its enclosures, and your response, if you choose to provide one, 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, your response should not include any personal privacy, proprietary, or safeguards information so that it can be made available to the Public without redaction.

Should you have any questions concerning this inspection, please contact us.

Sincerely,

*/RA/*

Steven J. Vias, Chief  
Fuel Facility Inspection Branch 1  
Division of Fuel Facility Inspection

Docket No. 70-27  
License No. SNM-42

Enclosures:

1. Notice of Violation
2. NRC Inspection Report 70-27/2010-003

cc w/encls:

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109 Governor Street, Room 730  
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Distribution w/encls: (See page 3)

Distribution w/encls:

- M. Tschlitz, NMSS
- S. Vias, RII
- P. Habighorst, NMSS
- J. Pelchat, RII
- M. Crespo, RII
- P. Silva, NMSS
- M. Baker, NMSS
- K. Ramsey, NMSS

PUBLICLY AVAILABLE   
  NON-PUBLICLY AVAILABLE   
  SENSITIVE   
  NON-SENSITIVE  
 ADAMS:  Yes   
 ACCESSION NUMBER: \_\_\_\_\_   
  SUNSI REVIEW COMPLETE

OFFICE	RII:DFFI	RII:DFFI	RII:DFFI	RII:DFFI	RII:DFFI	HQ:NMSS	
SIGNATURE	<i>Via email 10/26</i>	<i>JP 10/27/10</i>	<i>MC 11/4/10</i>	<i>Via email 10/27</i>	<i>PD 01/29</i>	Via email 10/26	
NAME	SSubosits	JPelchat	MCrespo	Classifier	PGlenn	TMarenchin	
DATE	11/ /2010	11/ /2010	11/ /2010	11/ /2010	11/ /2010	11/ /2010	11/ /2010
E-MAIL COPY?	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO

## NOTICE OF VIOLATION

Babcock & Wilcox Nuclear Operations Group, Inc.  
Lynchburg, Virginia

Docket No. 70-27  
License No. SNM-42

During NRC inspection activities conducted between July 1 and September 30, 2010, a violation of NRC requirements was identified. In accordance with the NRC Enforcement Policy, the violation is listed below:

Safety Condition S-1 of NRC license SNM-42 authorizes the use of nuclear materials in accordance with Chapters 1 through 11 of the License Application submitted on October 24, 2006, and supplements thereto.

License Application, Section 5.1.1, "Protection Against Criticality," requires, in part, that the licensee conduct nuclear criticality safety evaluations to assure that under normal and credible abnormal conditions, all nuclear processes will remain subcritical and maintain an approved margin of subcriticality for safety.

License Application, Section 5.1.1, "Protection Against Criticality," requires, in part, that the licensee establish and maintain nuclear criticality safety Items Relied On For Safety, based on current nuclear criticality safety evaluations

Contrary to the above from June 6, 2005 to June 11, 2010, the licensee failed to conduct a nuclear criticality safety evaluation and establish and maintain nuclear criticality safety Items Relied on for Safety to protect against the accumulation of fissile solution for an unfavorable geometry pass-through glovebox in the high-level trough dissolver system.

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

Pursuant to the provisions of 10 CFR 2.201, Babcock and Wilcox Nuclear Operations Group 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 a copy to the Regional Administrator, Region II, and a copy to the NRC Senior Resident Inspector at your facility, 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 for each violation: (1) the reason for the violation, or, if contested, the basis for disputing the violation or severity level, (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 a Demand for Information may be issued as to why the license should not be modified, suspended, or revoked, or why such other action as may be proper should not be taken. Where good cause is shown, consideration will be given to extending the response time.

Enclosure 1

If you contest this violation or its significance, you should provide a response within 30 days of the date of this inspection report, with the basis for your denial, to the Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington, DC 20555-0001, with copies to the Regional Administrator, Region II, and the Director, Office of Enforcement, United States Nuclear Regulatory Commission, Washington, DC 20555-001, and the NRC Senior Resident Inspector at your facility.

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, classified, 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 2.390(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 4<sup>th</sup> day of November, 2010

U. S. NUCLEAR REGULATORY COMMISSION  
REGION II

Docket No.: 70-27

License No.: SNM-42

Report No.: 70-27/2010-003

Licensee: Babcock and Wilcox

Facility: Nuclear Operations Group

Location: Lynchburg, Virginia

Dates: July 1, 2010 – September 30, 2010

Inspectors: S. Subosits, Senior Resident Inspector  
M. Crespo, Senior Fuel Facilities Inspector  
A. Gooden, Senior Fuel Facilities Inspector  
P. Glenn, Fuel Facilities Inspector  
T. Marenchin, Criticality Safety Inspector  
D. Morey, Senior Criticality Safety Inspector

Approved by: Steven J. Vias, Chief  
Fuel Facility Inspection Branch 1  
Division of Fuel Facility Inspection

Enclosure 2

## **EXECUTIVE SUMMARY**

Babcock and Wilcox  
NRC Integrated Inspection Report 70-27/2010-003  
July 1 – September 30, 2010

This report covers a three month period of inspection by the senior resident inspector, an announced inspection by regional inspectors and an event follow-up inspection by NRC Headquarters inspectors. The NRC's program for overseeing the safe operation of fuel cycle facilities is described in Manual Chapter 2600, "Fuel Cycle Facility Operational Safety and Safeguards Inspection Program," dated January 27, 2010.

Inspections were conducted during normal and off normal shifts in the areas of safety operations, radiological controls, and facility support. The inspectors performed a selective examination of licensee activities by direct observation of safety-significant activities and equipment, tours of the facility, interviews and discussions with licensee personnel, independent verification of safety system status, corrective actions, and a review of facility documentation and records.

### **Safety Operations**

The facility was operated safely in accordance with operating procedures and nuclear criticality safety postings.

### **Radiological Controls**

Radiation work permits were developed and implemented in order to ensure personnel exposure was kept as low as reasonably achievable.

### **Facility Support**

Safety related maintenance, surveillance, and engineering activities were performed in conformance with regulatory requirements, license conditions and commitments, and in accordance with established procedures.

Items Relied On For Safety were available and reliable to perform their function when needed to comply with the performance requirements of 10 CFR 70.61.

Corrective actions were completed according to specified schedules, consistent with risk-significance.

An unresolved item was opened regarding incomplete documentation of periodic reviews of emergency preparedness implementing procedures, as required by the emergency plan.

**Special Topics**

A violation was identified for a failure to analyze and control the accumulation of fissile material in an unsafe geometry glovebox.

**Attachment**

List of persons Contacted  
List of Items Opened, Closed and Discussed  
Inspection Procedures Used  
Documents Reviewed

## **REPORT DETAILS**

### **Summary of Plant Status**

Routine fuel manufacturing operations and maintenance activities were conducted in the fuel processing areas and in the Research Test Reactors and Targets (RTRT) facility. Uranium Recovery (UR) operations were conducted in the UR facility.

The licensee conducted an emergency preparedness drill on September 15, 2010, with full NRC Incident Response Program participation.

On September 21, 2010, NRC Region II representatives presented Babcock & Wilcox Nuclear Operation Group (B&W NOG) senior management with the results of the Licensee Performance Review (LPR) at the City Hall of Lynchburg in a meeting open to the public. Steven J. Vias, Branch Chief, Division of Fuel Facilities Inspection (DFFI); Merritt N. Baker, Senior Project Manager, Office of Nuclear Materials Safety and Safeguards (NMSS); and Stephen G. Subosits, Senior Resident Inspector (SRI), DFFI, attended the meeting.

### **A. Safety Operations (88135)**

#### **1. Plant Operations**

##### **a. Inspection Scope and Observations**

The inspectors performed daily tours of production areas, observed a select number of shift turnover meetings and observed a status meeting for the fuel reclamation area during the inspection period. Staffing was adequate for the tasks being performed and the operations staff was alert and generally knowledgeable of the current status of equipment associated with their assigned duties.

The inspectors observed and interviewed operators in the UR and Filler areas to determine if they were familiar with the instrumentation, procedures and safety controls associated with systems they operated, including the items relied on for safety (IROFS).

The inspectors performed periodic tours of the outside facility areas within the protected area. The focus of these tours centered on the evaluation of combustible material storage and fire loading, hazardous chemical storage, adequate storage of compressed gas containers, and potential degradation of plant security features. During these tours, the inspectors also verified that required notices to workers were posted in accordance with 10 CFR 19.11.

The inspectors conducted a walk-down and review of the below listed safety significant system(s) involved with the processing of special nuclear materials (SNMs) to verify that the existing alignment of the system was consistent with the correct alignment and that the IROFS were available and reliable to perform their function when needed to comply with the performance requirements.

- Bay 5A Acid Treatment Area
- High Level Trough Dissolver

To review these systems, the inspectors reviewed Safety Analysis Reports (SAR) 15.5 for the Dissolver System and SAR 15.27 for the Bay 5A Acid Tanks of the Integrated Safety Analysis (ISA) Summary and noted the controls designated as an IROFS. During the walkdowns, the inspectors verified that the IROFS controls for the two systems were properly implemented in the field by reviewing the system configuration, applicable operating procedures and nuclear criticality safety (NCS) postings.

b. Conclusions

No findings of significance were identified.

2. Chemical Process Safety

a. Inspection Scope and Observations

On September 27, 2010, two operators were adding Hydrofluoric (HF) Acid from a drum to a makeup tank using a drum pump. The pump leaked approximately five gallons of HF spilled onto the floor of the Bay 10 Acid Treatment Area. This area does not handle any radioactive materials. The cause of the leak was determined to be a crack in the pump transfer tube which is constructed of material compatible with HF for non-continuous use. Both operators were in full chemical suits and respirators during the evolution and as a result no chemical exposures occurred. The area was cordoned off to prevent inadvertent access and the emergency team was contacted to respond (the emergency operations center (EOC) was not activated). The HF concentration in air was measured at 7 parts per million (ppm) using a Draeger tube. For HF, the Immediately Dangerous to Life and Health level is 30 ppm. The emergency team (E-team) donned full chemical suits and SCBAs, cleaned the majority of the spill with a shop vacuum, and then added soda ash to the residue on the floor to ensure neutralization. The SRI observed the E-team members adding the soda ash to the floor and there were no issues with neutralization.

During their initial response to the event, one of the operators slipped and fell while exiting the tank area. The operator slipped while exiting the area as the chemical suit being worn was a full suit including the feet which do not give good traction. The operator was seen by the site doctor then was taken to the hospital where it was determined he suffered a leg injury. To prevent further falls from the chemical suits, the licensee will be requiring overshoes to be worn over the feet while in chemical suits to give better traction. The licensee created an unusual incident report and corrective action (CA) to review the event and identify corrective actions. As part of their CA, the licensee will review drum pump operability and pump transfer tube material damage in other areas in the plant where HF is added using a drum pump for makeup purposes, including several areas that utilize HF in operations with SNM. The licensee will also review material of construction options for the pump transfer tube to determine if a more suitable material is available.

b. Conclusions

No findings of significance were identified.

### 3. Criticality Safety

#### a. Inspection Scope and Observations

During daily tours of the shop floor area and the controlled areas, the inspectors verified various criticality controls to be in place, that personnel followed NCS postings, and that unfavorable geometry containers were adequately controlled to minimize potential criticality hazards in the UR area. The inspectors sampled a number of criticality-related IROFS for operability and for adequate identification in the field as well as in area operating procedures and NCS postings. The inspectors interviewed operators in the UR and Filler areas and noted that operators were knowledgeable of NCS requirements and the IROFS controls at their workstations.

#### b. Conclusions

No findings of significance were identified.

### 4. Fire Protection

#### a. Inspection Scope and Observations

During daily plant tours, the inspectors verified that transient combustibles were being adequately controlled and minimized and that fire barriers located between fire areas were being properly maintained.

The inspectors conducted a fire safety tour for the waste handling and compactor clean areas. The inspectors walked down accessible portions of each area. The inspectors reviewed the control of transient combustible material and ignition sources, and fire detection and suppression capabilities.

#### b. Conclusions

No findings of significance were identified.

## **B. Radiological Controls**

### 1. Radiation Protection

#### a. Inspection Scope and Observations

During tours of the production areas, the inspectors verified workers complied with radiation protection procedures. The inspectors noted that plant workers properly wore dosimetry, used protective clothing in accordance with posted area requirements or applicable Radiological Work Permits (RWPs), and properly monitored for contamination upon exiting the controlled area. The inspectors monitored the operation of radiation protection instruments at the controlled area exit points and reviewed the calibration due dates of those instruments.

The inspectors reviewed two RWPs concerning work activities for the UR controlled areas. The RWPs contained were posted for employees' review and observation. Workers utilizing the RWP areas signed onto the RWP, verifying their knowledge of the entry requirements.

b. Conclusions

No findings of significance were identified.

**C. Facility Support**

1. Maintenance/Surveillance

a. Inspection Scope and Observations

The inspectors reviewed test data to verify that the systems, structures, and components involved in the tests satisfied the requirements described in the ISAs and applicable licensee procedures, and that the tests demonstrated that the Safety Systems and Components were capable of performing their intended safety functions. The inspectors reviewed the licensee's implementation of maintenance activities to verify that the licensee conducted the activities in a safe and deliberate manner. The inspectors observed new and experienced maintenance personnel performing preventive maintenance activities. The inspectors noted that the maintenance personnel adequately consulted operations personnel regarding the status of equipment prior to conducting the tests. The inspectors also noted that the maintenance personnel properly referenced the procedures for the preventive maintenance activities. The inspectors observed the calibrations of several of the lower explosive limit detectors, which were designated as IROFS, in the UR area.

The inspectors reviewed the IROFS verifications for the modifications in the recovery area involving the new organic system. The change request identified that the only IROFS affected by the modification was the spacing requirements for new columns being installed. The inspectors evaluated the dimension validations conducted by the maintenance personnel and discussed how the information was going to be used by nuclear criticality safety to determine criticality modeling parameters. No issues were noted.

The inspectors verified that the licensee was adequately identifying and tracking IROFS failures by reviewing the records for failures in 2010. The licensee's documentation of failures adequately described the failures and properly identified corrective actions to prevent recurrence. In addition, the licensee properly evaluated any necessary reporting requirements for the failures. No issues were noted.

The inspectors reviewed the 2010 monthly testing records for the criticality alarm system. Also, the inspectors reviewed the 2010 maintenance records that indicated when compensatory measures were in place for the criticality alarm system. No issues were noted from reviews of these records.

The inspectors reviewed the work instructions and results for five surveillances to verify that the IROFS involved in these surveillance tests satisfied the requirements described in the applicable portions of the ISA and that the tests demonstrated that the IROFS were capable of performing their intended safety functions.

b. Conclusions

No findings of significance were identified.

2. Emergency Preparedness

a. Inspection Scope and Observations

The inspectors reviewed changes to the Emergency Plan (EP) to assess the impacts on the effectiveness of the emergency preparedness program. Plan changes were submitted by letter in accordance with 10 CFR 70.32(i). The most recent changes were incorporated as Revision 22 to the EP and were transmitted to NRC by letter dated July 23, 2010. The inspectors reviewed the EP changes and concluded that with one exception, the changes were primarily updates and administrative in nature. The one exception involved a complete revision to Section 5.2.4 of the EP which discussed the various postulated accidents involving radioactive material for both B&W NOG and the Lynchburg Technology Center. The revision resulted from the licensee's change in dose assessment software. The calculations previously were performed using RASCAL version 3.0. The current methodology was based on the computer code Hotspot, version 2.06, which incorporates the International Commission on Radiological Protection 68 dose coefficient factors. The formal technical review of the EP changes by NRC staff had not been completed at the time of the inspection and will be provided via separate correspondence. During the review of EP changes, the inspectors noted and discussed with the licensee administrative errors such as typographical errors and inconsistencies between the Plan and ISA associated with building design criteria. In response to the inspectors' observations, the licensee assigned commitment tracking system (CTS) number 33401 to correct the administrative errors and CTS number 33402 to correct the inconsistencies in the Plan and ISA by July 31, 2010, and December 31, 2010, respectively. However, the Plan changes did not reduce the effectiveness of the emergency preparedness program. There were no site or facility changes that affected the EP and the licensee's emergency call list was both current and maintained.

During the inspection, the inspectors reviewed a representative sample of the licensee's emergency preparedness implementing procedures (EPIPs). The inspectors determined that the procedures were adequate for implementing the EP in that they provided guidance for identification, assessment, notification, recovery, and restoration during an emergency situation. The licensee is required, per the EP and procedure, to conduct a review of the EPIPs on an annual basis and to retain records of those reviews for a minimum of two years. However, during the inspection the licensee was unable to provide documentation that all of the required annual reviews of EPIPs had been completed. In response to this issue the licensee opened CTS number 33403. The issue will be tracked as an unresolved item (URI) 70-27/2010-003-01 and it will be followed up on during an upcoming inspection.

The inspectors conducted tours of the facility focusing on key emergency preparedness areas such as the Emergency Operations Center (EOC) and onsite fire station. During the tours the inspectors verified that current copies of the EP and EIPs were readily available to the Emergency Organization and were located in the appropriate locations. The licensee's pre-fire plan was also reviewed and determined to be current.

The inspectors reviewed the licensee's conduct of quarterly emergency preparedness drills involving the emergency response organization (ERO) and the emergency management organization (EMO). During their review of several drill packages from 2009 and 2010, the inspectors determined that quarterly drills were conducted that exercised the emergency plan and both the emergency management and response organizations. The inspectors verified that drill critiques were conducted and issues identified during the critiques were captured via the corrective actions or commitment tracking system. The inspectors also verified that the licensee conducted timely accountability drills and periodically tested emergency communication equipment.

On September 15, 2010, an emergency drill was conducted which involved full participation with the NRC Incident Response Program. NRC Region II and Headquarters Incident Response Teams and the NRC SRI at B&W NOG participated in the exercise from the Incident Response Centers and the B&W NOG EOC, respectively. The inspectors observed performance by the licensee at the incident scene, the on-scene command post, and the EOC although it was not an NRC-evaluated exercise. The drill scenario postulated significant accident conditions for a protracted period to allow full implementation of various response activities by licensee and NRC drill participants.

For the areas observed, the licensee's performance in responding to the postulated accident was considered successful. The simulated accident conditions were promptly classified in accordance with the "Initial Emergency Assessment Flow Chart," and as conditions changed following an aircraft crash on site, a Site Area Emergency was declared. Access control to the plant perimeter area was established in a timely manner. Following the Site Area Emergency declaration, appropriate protective action recommendations were made in a timely manner. Following the drill, the inspectors discussed their observations with the licensee regarding the performance of response teams in performing life-saving, search and rescue; and in providing environmental sample results.

The inspectors reviewed the licensee's agreement letters for local offsite assistance and noted that the agreements were being maintained as agreed and were current. The licensee offered facility familiarization tours and conducting safety training for offsite support agencies on an annual basis. The inspectors interviewed representatives from Concord Fire Department and Concord Rescue Squad regarding their interaction, support of, and relationship with the licensee. From those interviews the inspectors verified that the licensee engaged the appropriate local offsite support agencies and provided adequate training.

During the inspection, the inspectors examined the adequacy and reliability of emergency equipment as required by the EP and EIPs. Specifically, the inspectors walked down various storage locations containing emergency response equipment and radiological survey equipment and verified that the equipment was present, calibrated, and operational, as applicable.

The inspectors reviewed biannual audits related to the emergency preparedness program. The inspectors interviewed an auditor and reviewed audit reports for 2010 and noted that the audits covered the following topics as required by the EP:

- plans and procedures;
- facilities and equipment; and,
- training, drills, and exercises.

Deficiencies found during the audit were issued a corrective action number and tracked through the corrective action system. Additionally the inspectors noted that the audit team performs a follow-up surveillance to validate that the deficiencies were resolved and closed out in the corrective action system.

b. Conclusions

An unresolved item was opened regarding incomplete documentation of periodic reviews of emergency preparedness implementing procedures, as required by the emergency plan. No findings of significance were identified.

3. Management Organization and Controls

a. Inspection Scope and Observations

The inspectors reviewed a sample of 12 corrective actions in the licensee's Preventive/Corrective Action System to ensure that items with impacts on safety were identified, investigated as necessary and tracked to closure. The inspectors verified that issues affecting safety were properly identified, and reviewed for apparent causes, and that corrective actions to prevent recurrence were identified and tracked to completion.

The inspectors reviewed the adequacy and implementation of the facility's configuration-control program. The inspectors reviewed two safety evaluation request packages, attended one change control board meeting, and interviewed personnel responsible for the proposed changes. The inspectors noted that each safety discipline and security were represented at the meeting and provided details of their requirements for implementation of the changes for the safety evaluation requests under review.

b. Conclusions

No findings of significance were identified.

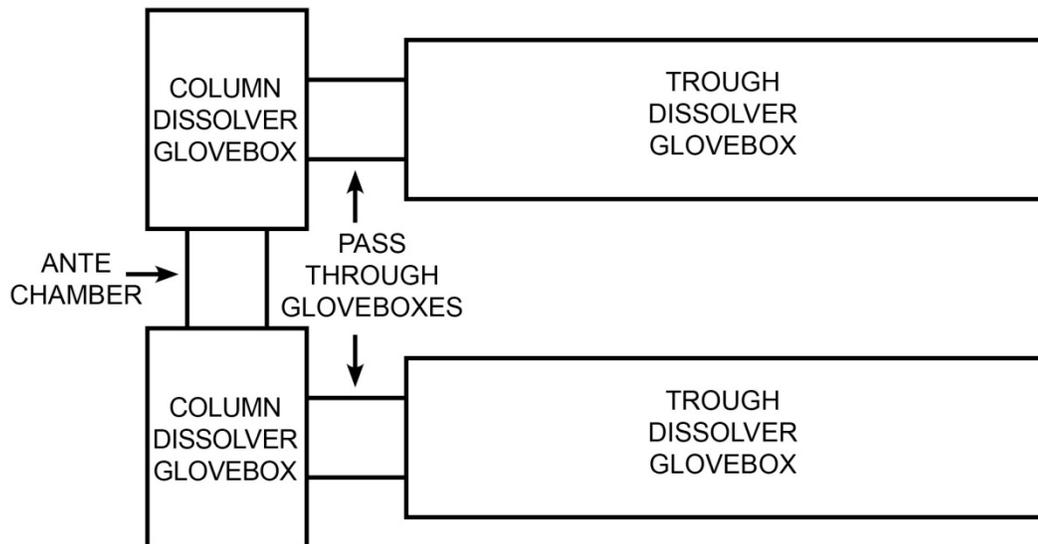
## D. Special Topics

### 1. Follow-up on Events

#### a. Inspection Scope and Observations

The inspectors reviewed event notification (EN) #46001 involving the discovery of fissile solution in a glovebox in the high-level dissolver enclosure in the UR area. The inspectors interviewed operators, process engineers, NCS engineers, and managers to determine the significance of the event. The inspectors performed walkdowns of the high-level dissolver enclosure with UR operators and their supervisor. The inspectors also reviewed selected aspects of a number of supporting NCS documents.

The licensee dissolves high-enriched uranium in two trough dissolvers in the uranium recovery area. The trough dissolvers are part of a large enclosure consisting of six gloveboxes and an ante-chamber. The enclosure arrangement (shown in Figure 1) consists of two column dissolver gloveboxes, two trough dissolver gloveboxes, two pass-through gloveboxes each connecting a column dissolver glovebox with a trough dissolver glovebox and an ante-chamber connecting the two column dissolver gloveboxes. The column dissolver and trough dissolver gloveboxes have multiple drains but the pass-through gloveboxes did not have drains.



**Figure 1 – High-Level Dissolver Enclosure Top View**

Following glovebox flushing operations on June 11, 2010, UR area operators observed approximately one-liter of solution at the bottom of one of the pass-through gloveboxes in the high-level dissolver enclosure. The concentration of the solution was determined to be 26 grams U-235/liter. After the event the licensee cleaned both pass-through gloveboxes to remove any residual material that was in the pass-through gloveboxes. The licensee measurements indicated that a total of 111.65 grams of solid U-235 was

removed. The licensee determined that presence of fissile solution in the pass-through glovebox represented an unanalyzed condition that failed to meet the performance requirements of 10 CFR 70.61 for NCS.

Following clean out of the residual material in the pass-through gloveboxes, the licensee shut down the system and initiated a corrective action (CA201001322) to investigate the event. The investigation determined that fumes from dissolution of uranium in the trough dissolver entered the pass-through glovebox over time and adhered to the inner walls. Also, aqueous solution entered the pass-through glovebox from the trough dissolver through the hatchway during trough dissolver cleaning operations between dissolution batches when the water hose is directed at the hatchway. This resulted in fissile solution in the bottom of the pass-through glovebox where it was difficult to see due to the enclosure configuration and lighting. The licensee investigation did not identify fume penetration into the ventilation system.

The inspectors reviewed the criticality safety analysis for the process and interviewed the responsible criticality engineer. The original analysis for the process did not anticipate or analyze for the presence of solution or material being left in the pass-through glovebox. The inspectors determined that the 26 grams U-235/liter solution that was found in the pass-through glovebox was below the license limit of 573 grams of U-235 for a fully reflective system ( $k$ -effective = 0.95). The solution was more than a minor safety concern because the licensee had failed to analyze the accident sequence and therefore the licensee had failed to establish IROFS to prevent a nuclear criticality accident in the pass-through glovebox.

The inspectors determined that operators halted the operation when the solution was discovered thus demonstrating the effectiveness of procedural requirements and operator training. The inspectors also noted that the only other potential source of additional solution were the trough dissolvers themselves and that criticality controls, including drains, on that system prevented the rapid addition of more fissile solution into the pass-through glovebox.

License Application Section 5.1.1 states, in part, that the licensee is committed to conducting NCS evaluations to assure that under normal and credible abnormal conditions, all nuclear processes will remain subcritical and maintain an approved margin of subcriticality for safety. Under Section 5.1.1, the licensee is also committed to establishing and maintaining NCS IROFS, based on current NCS evaluations. The failure to conduct an NCS evaluation and establish and maintain NCS IROFS against the accumulation of fissile solution in the unsafe geometry pass-through glovebox is Violation (VIO) 70-27/2010-003-02.

b. Conclusions

A violation was identified concerning the failure to analyze and control the accumulation of fissile material in an unsafe geometry glovebox.

## 2. Follow-up on Previously Identified Issues

### a. Inspector Follow-up Item 70-27/2010-001-01: Potential Extent of Condition Review for Inaccuracies in Fire Safety-Related ISA Accident Scenarios

The licensee had identified inconsistencies with accident scenario HUAL3-1. When the inspectors were informed of the errors in the ISA, the inspectors questioned the licensee with regard to the need for a potential extent of condition review concerning the accuracy of related scenarios. Subsequently, the licensee performed a review of the SAR documents related to fire scenarios to identify other potential inaccuracies (documented in Industrial Health and Safety Technical Work Record HS-2010-121). The extent of condition review identified several other minor inaccuracies and typographical errors. The licensee opened corrective action CA201001640 to address the inaccuracies in the SAR. The inspectors evaluated the inaccuracies identified and determined the licensee was appropriately addressing the issues. This item is considered closed.

### b. Violation 70-27/2009-004-01: Failure to Comply with Change Management Procedure for Scrubber System Piping Modification in SFF

The licensee had implemented an extent of condition review to assess if recent change requests had properly identified the IROFS that would potentially be affected. The inspectors interviewed the personnel that conducted the assessment and determined that it used an insufficient sample size to conclude that the corrective action that had been implemented were effective. This observation was passed along to the licensee, who acknowledged the deficiency and stated that the sample size would be increased to provide an adequate effectiveness review. Also, the inspectors evaluated the corrective actions involving the modifications of Quality Work Instructions (QWIs) 9.1.7 and 9.1.21. These QWIs were modified to provide additional guidance in identifying IROFS potentially affected by maintenance work to the individuals responsible for generating change requests. The inspectors evaluated the modifications and noted that adequate instructions and descriptions had been included to assist in the identification of IROFS. The inspectors reviewed the training records for the modified QWIs and noted no issues. This item will remain open to evaluate the licensee's actions to address the deficiency in the extent of condition review.

### c. Violation 70-27/2009-006-01: Failure to Declare an Alert in Accordance with Appendix G of the Emergency Plan

The violation involved the failure to declare an Alert on July 15, 2009, in response to the accumulation of cutting fluid containing unknown quantities of U-235 in an unfavorable geometry band saw cutting fluid reservoir. The inspectors reviewed the licensee's corrective actions that were presented to NRC during a pre-decisional enforcement conference held on November 6, 2009. The corrective actions included revising the reportability procedure, revising the event classification flow chart, providing Emergency Director (ED) training on the lessons learned from the event, and incorporating the lessons learned from the event into the annual emergency management organization training. The inspectors reviewed the current and previous version of QWI 14.1.10 "Safety Evaluation of Unusual Incidents" which details the requirements and responsibilities necessary for ensuring that unusual incidents are evaluated and the required notifications are made. Revision 12 to QWI 14.1.10 included as a requirement

“Consider Activation of the Emergency Operations Center in Accordance with EPR-02-01 and Appendix G of the Emergency Plan.” The current and previous versions of the event classification flow chart “Initial Emergency Assessment Flow Chart” used by the licensee for emergency classification were reviewed. The inspectors determined that when Revisions 23 (dated August 6, 2009), and 24 (dated June 15, 2010), were compared to the revision in effect at the time of the Alert incident, the decision matrix involving the classification of criticality events had been revised to consolidate criticality events including degraded IROFS. The ED position specific training was reviewed and verified as including the lessons learned 2009 regarding the correct event classification. All personnel assigned as the ED was trained following the event and no issues were identified involving training. Based on actions taken and the results from walkthroughs with individuals assigned as alternate EDs, this item is considered closed.

#### **E. Exit Meeting Summary**

On July 14, September 30, and October 5, 2010, the inspectors presented the inspection results to R. Cochrane and other members of his staff. The inspectors confirmed that proprietary information was examined and discussed but not included in the report.

## ATTACHMENT

### 1. LIST OF PERSONS CONTACTED

J. Burch, Manager, Operations  
R. Cochrane, Vice-President and General Manager  
B. Cole, Manager, Licensing & Safety Analysis  
K. Conway, Manager, Radiation Protection  
D. Faidley, Manager, Nuclear Criticality Safety  
M. Hicks, Manager, Security  
D. Miller, Manager, Uranium Recovery Operations  
D. Spangler, Manager, Nuclear Safety and Licensing  
B. Stratton, Supervisor, Radiation Protection  
D. Ward, Manager, Environment, Safety, Health and Safeguards  
C. Yates, Manager, Uranium Processing Operations  
B. Dilling, Emergency Preparedness Officer  
J. Calvert, Unit Manager, Industrial Health and Safety

Other licensee employees contacted included engineers, technicians, production staff, security, and office personnel.

### 2. LIST OF ITEMS OPENED, CLOSED AND DISCUSSED

<u>Item Number</u>	<u>Status</u>	<u>Description</u>
70-27/2010-001-01	Closed	IFI - Potential Extent of Condition Review for Inaccuracies in Fire Safety-Related ISA Accident Scenarios. (Paragraph D.2.a)
70-27/2009-004-01	Discussed/Open	VIO - Failure to Comply with Change Management Procedure for Scrubber System Piping Modification in SFF. (Paragraph D.2.b)
70-27/2009-006-01	Closed	VIO - Failure to Declare an Alert in Accordance with Appendix G of the EP. (Paragraph D.2.c)
70-27/2010-003-01	Open	URI – Documentation of Conduct of Periodic Review of Emergency Preparedness Procedures. (Paragraph C.2.a)
70-27/2010-003-02	Open	VIO - Failure to Conduct an NCS Evaluation and Establish and Maintain NCS IROFS for an Unfavorable Geometry Pass-through Glovebox. (Paragraph D.1.a)

### 3. INSPECTION PROCEDURES USED

IP 88135 Resident Inspection Program for Category I Fuel Cycle Facilities  
 IP 88025 Maintenance and Surveillance of Safety Controls  
 IP 88050 Emergency Preparedness

### 4. DOCUMENTS REVIEWED

<u>Number</u>	<u>Title</u>
CA2010000006	Corrective Action 201000006
CA2010000187	Corrective Action 201000187
CA2010000349	Corrective Action 201000349
CA2010000438	Corrective Action 201000438
CA2010000610	Corrective Action 201000610
CA2010000784	Corrective Action 201000784
CA2010000787	Corrective Action 201000787
CA2010000794	Corrective Action 201000794
CA2010001244	Corrective Action 201001244
CA2010001280	Corrective Action 201001280
CA2010001322	Corrective Action 201001322
CA2010001687	Corrective Action 201001687
CA2010001820	Corrective Action 201001820
OP-0021001	Operating Procedure for Pickling (U)
QWI 5.1.12	Quality Work Instruction for "Change Management", Rev. 21
QWI 14.1.10	Quality Work Instruction for "Safety Evaluation of Unusual Incidents", Revisions 11 and 12
QWI 17.1.2	Quality Work Instruction for "Internal Quality Audits", Rev. 15
QWI 2.2.1	Quality Work Instruction for "Preparation of Quality System Procedures, Instructions, and Other Documents", Rev. 14
EPR-01-05	"Emergency Response to James River", Rev. 3
EPR-01-12	"Emergency Evacuation Plan", Rev. 7
EPR-02-04	"Notification of Off-site Agencies During an Emergency", Rev. 30
EPR-03-07	"Response to Severe Weather", Rev. 12
EPR-03-11	"HazMat Incident Control & Mitigation", Rev. 5
EPR-03-20	"Hazardous Materials Remediation", Rev. 6
EPR-04-01	"Emergency Termination & Plant Recovery", Rev. 10
EPR-06-02	"Mt. Athos Site Emergency Plan Distribution", Rev.11
EPR-06-03	"Emergency Management Training", Rev.10
EPR-06-04	"Emergency Drills", Rev.14
EPR-06-05	"Inspection of Emergency Operations Center", Rev. 21
EPR-06-06	"Annual Emergency Plan Review", Rev. 6
EPR-06-07	"Plant Evacuation Drills", Rev. 4
EPR-06-08	"Emergency Response Training", Rev. 7
SAR 15.5	Safety Analysis Report - Classified
SAR 15.27	Safety Analysis Report – Classified
RWP 10-0035	Radiological Work Permit for Uranium Recovery General Maintenance
RWP 10-0063	Radiological Work Permit for Maintenance Activity in Specialty Fuels Facility

CR- 1034169-00 Change Request EPR-02-03 REV 8; EPR-03-07 REV 13 (U),  
 SER 10-014 Safety Evaluation Request 10-014  
 ISA Table 15.5.4.1.1 "Trough Dissolver Equipment," May 25, 2010  
 OP-1018680 "Recovery High Level Dissolution," Revision 18, undated  
 NCS-2004-284, "Nuclear Criticality Safety Analysis Supporting Phase 2 of SER  
 04-012," December 7, 2004  
 NCS-2005-139 "Nuclear Criticality Safety Analysis Supporting Revised Phased of  
 SER 04-012," June 6, 2005  
 NCS-2010-135 "Mass Limits Specific to Accumulation of Uranium Bearing  
 Solution in the High-Level Dissolver Enclosure," July 1, 2010  
 NCS-2010-125 Safety Concern Analysis for "Solution Accumulation in High-Level  
 Dissolver Pass-Through Glove Box," June 11, 2010  
 Posting 15-05-009, NCS Posting for "Trough Dissolver Enclosure," undated

2010 Annual Position Specific Emergency Management Training Presentation  
 2010 Topic Specific ERO Training Presentations  
 Emergency Preparedness Committee Meeting Minutes - February 2010  
 Emergency Preparedness Committee Meeting Minutes - August 2010  
 2010 EMO and ERO Staffing Rosters  
 2010 EMO Drill Participation Roster  
 2010 EMO and ERO Training Records  
 2009 and 2010 Quarterly Drill Packets  
 Local Offsite Assistance Agreement Letters  
 Emergency Preparedness Inventory Records  
 Initial Emergency Assessment Flow Chart, Rev. 24  
 B&W NOG Emergency Plan, Rev. 21  
 B&W NOG Emergency Plan, Revision 22  
 2010 Internal Audit Summary Report - 1<sup>st</sup> Quarter  
 2010 Internal Audit Summary Report - 2<sup>nd</sup> Quarter  
 2010 Internal Audit Summary Report - 3<sup>rd</sup> Quarter  
 2010 Annual Emergency Preparedness Refresher Training Presentation