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U.S. Nuclear Regulatory Commission  
Washington, DC 20555-0001

29 April 2013  
DCS-NRC-000345

Subject: Docket Number 07-03098  
Shaw AREVA MOX Services  
Mixed Oxide Fuel Fabrication Facility  
Part 21 Final Report Notification:  
Thermal Sensitization of Pipe

RE: DCS-NRC-000319, Letter from Shaw AREVA MOX Services to NRC,  
dated July 12, 2012, Part 21 60-Day Interim Report Notification: Thermal  
Sensitization of Pipe

This letter provides information concerning an evaluation completed by Shaw AREVA MOX Services, LLC (MOX Services) regarding sensitized pipe identified by MOX Services in the referenced correspondence. The deviation pertained to the procurement of Type 304L and Type 316L SS pipe where, through independent testing, MOX Services determined that some of the pipe provided failed ASTM A262 tests to detect susceptibility to intergranular attack (IGA). MOX Services has concluded that this is a reportable condition in accordance with the requirements of 10CFR 21.21(d).

If you have any questions, please feel free to contact me at (803) 819-2156 or Dealis Gwyn, Licensing and Nuclear Safety Manager at (803) 819-2780.

Sincerely, *Kelly Trice*

Kelly D. Trice, President and COO

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Enclosure:

Final Report Notification Information per §21.21(d)

cc :

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**Enclosure**

**Final Report Notification Information per §21.21(d)**

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(i) Name and address of the individual or individuals informing the Commission.

Kelly D. Trice  
President and Chief Operating Officer  
Shaw AREVA MOX Services  
Savannah River Site  
P.O. Box 7097  
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(ii) Identification of the facility, the activity, or the basic component supplied for such facility which fails to comply or contains a defect.

The Mixed Oxide Fuel Fabrication Facility is affected by the procurement of Types 304L and 316L SS pipe where some of the delivered pipe contains a defect. An extent of condition was performed based on the initial discovery of a defect in ½" (0.109 MW), Type 304L SS pipe. This investigation determined that eight additional heat/size combinations had similar defects including both 304L and 316L pipe as given below.

- ½" (0.109 MW), Type 304L – 5 heats (41789, 44266, 43599, 40900, 41123)
- ¾" (0.113 MW), Type 304L – 1 heat (42635)
- 1-½" (0.145 MW), Type 304L – 1 heat (41586)
- 4" (0.237 MW), Type 304L – 1 heat (41880)
- ¾" (0.113 MW), Type 316L – 1 heat (44464)

(iii) Identification of the firm constructing the facility or supplying the basic component which fails to comply or contains a defect.

The Type 304L and 316L SS pipe is being supplied to MOX Services as a basic component by CB&I Laurens (formerly BF Shaw).

(iv) Nature of the defect or failure to comply and the safety hazard which is created or could be created by such defect or failure to comply.

Through independent testing, MOX Services has identified nine heats/sizes of 304L and 316L SS pipe supplied by CB&I Laurens (formerly BF Shaw) that fail required ASTM A262 testing and cannot be used in their specified application. Test results provided by CB&I Laurens (formerly BF Shaw) with the pipe indicate that it passes the Practice A test. The pipe was manufactured by Tubacex for CB&I Laurens (formerly BF Shaw), and ASTM A262 Practice A testing was performed by Welding Testing Lab prior to supply of the pipe to MOX Services. Both entities have been qualified by CB&I Laurens (formerly BF Shaw) as approved suppliers.

Testing of these heat/size combinations of material has been performed by an independent test lab contracted by MOX Services with failing results thus indicating that the pipe is susceptible to intergranular corrosion if utilized in an environment with

electrolytic potential (e.g., nitric acid, oxalic acid). The heats/sizes of SS pipe in question are intended for use where these environments exist for many processes.

In total, 124 heat/size combinations of Type 304L SS pipe and 64 heat/size combinations of Type 316L supplied by CB&I Laurens (formerly BF Shaw) were retested to validate original testing results. Eight heats/sizes of Type 304L SS pipe fail both ASTM A262 practice A and C and the one heat/size of Type 316L SS pipe fails ASTM practice A making this pipe unusable for the MOX Project in certain applications.

(v) The date on which the information of such defect or failure to comply was obtained.

The deviation was initially identified in a test report provided by Savannah River National Laboratory on May 14, 2012.

(vi) In the case of a basic component which contains a defect or fails to comply, the number and location of these components in use at, supplied for, being supplied for, or may be supplied for, manufactured, or being manufactured for one or more facilities or activities subject to the regulations in this part.

MOX Services does not possess information as to whether other facilities have been supplied a similar basic component by CB&I Laurens (formerly BF Shaw).

(vii) The corrective action, which has been, is being, or will be taken; the name of the individual or organization responsible for the action; and the length of time that has been or will be taken to complete the action.

Corrective actions are being addressed via MOX Services' corrective action program. The major activities associated with this issue include, tagging and segregation of impacted pipe spools, retesting samples for the affected pipe, generating/dispositioning non-conformance reports for heats of pipe that fail the re-test, and investigating the test protocol at both Welding Testing Lab and the MOX Services independent laboratory. The majority of the samples requiring retest have been retested. Initial nonconformance reports have been generated. Additional nonconformance reports will be generated as retesting is completed and affected heats are mapped to affected pipe spools. Test protocols at both Weld Test Lab and the MOX Services independent laboratory have been observed.

(viii) Any advice related to the defect or failure to comply about the facility, activity, or basic component that has been, is being, or will be given to purchasers or licensees.

The following two excerpts are from ASTM A262 and pertain to the advice offered by MOX services.

- 5.2 The intent is to test a specimen representing as nearly as possible the surface of the material as it will be used in service. Therefore, the preferred sample is a cross section including the surface to be exposed in service. Only such finishing should be performed as is required to remove foreign material and obtain a standard, uniform finish as described in 5.3. For very heavy sections, specimens should be machined to represent the appropriate surface while maintaining reasonable specimen size for convenient testing. Ordinarily, removal of more material than necessary will have little influence on the test results. However, in the special case of surface

carburization (sometimes encountered, for instance, in tubing or castings when lubricants or binders containing carbonaceous materials are employed) it may be possible by heavy grinding or machining to completely remove the carburized surface. Such treatment of test specimens is not permissible, except in tests undertaken to demonstrate such effects.

- 6.2 The etched cross-sectional areas should be thoroughly examined by complete traverse from inside to outside diameters of rods and tubes, from face to face on plates, and across all zones such as weld metal, weld-affected zones, and base plates on specimens containing welds.

Based on these excerpts, MOX Services offers the following advice.

- Sample preparation is an area that should be carefully controlled in regards to detection of piping with ID sensitization. Heavy cleaning or deburring in sections of the sample to be tested is proven to impact test results. Follow up surveillance at both Welding Testing Lab and the MOX Services independent laboratory determined that standard protocol is for samples to be taken from newly cut sections without sanding or deburring.
- Procurement specifications should clearly indicate that micrographs should be done perpendicular to the forming direction, and should be representative of the worst case area of the cross section including the pipe ID when appropriate. In a number of cases represented herein, only the inner portions of the pipe walls were sensitized to the point of ditching in which case a complete traverse of the cross-sectional area is needed to detect the condition. In a follow up survey of both Welding Testing Lab and the MOX Services independent laboratory, ASTM A262 practices were reviewed and it was determined in both cases that testing practices and procedures are in compliance with the ASTM standard including a full traverse of the cross-section.

(ix) In the case of an early site permit, the entities to whom an early site permit was transferred.

This is not an early site permit concern.