

February 21, 2017

MEMORANDUM TO: Vonna Ordaz, Acting Director
Office of New Reactors

THRU: Kerri Kavanagh, Chief **/RA/**
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SUBJECT: TRIP REPORT - JOINT MULTI-NATIONAL DESIGN
EVALUATION PROGRAMME VENDOR INSPECTION AT
AREVA NUCLEAR POWER CREUSOT FORGE

From November 28 to December 2, 2016, Thomas Kendzia and Jonathan Ortega-Luciano from NRO, Division of Construction Inspection and Operational Programs, participated in a Multi-national Design Evaluation Programme (MDEP) Vendor Inspection Cooperation Working Group (VICWG) vendor inspection of AREVA Nuclear Power (NP) Creusot Forge (ACF). The inspection was led by the French regulator, the French Nuclear Safety Authority (ASN), and included inspectors from France, United Kingdom, Finland, China, Canada, and the US. The purpose of this MDEP inspection was to obtain more information on the issues identified by ACF.

Enclosure:
NRC International Trip Report

NRC INTERNATIONAL TRIP REPORT

Traveler, Office, Division:

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Subject:

Trip Report – Joint Multinational Design Evaluation Programme (MDEP) Vendor Inspection Cooperation Working Group (VICWG) Inspection at AREVA Nuclear Products (NP) Creusot Forge

Date of Travel and Countries/Organizations Visited:

November 28 – December 2, 2016

Le Creusot, France - AREVA NP Creusot Forge (ACF)

Background:

From November 28 to December 2, 2016 two NRC inspectors participated in a Joint MDEP VICWG inspection at ACF. MDEP VICWG performs multinational vendor inspections at facilities that provide products for the nuclear industry in the member nations. Multinational VICWG inspections are a tool to gain vendor performance insights with efficiencies gained by sharing inspection resources from the participating regulators. MDEP VICWG inspections are based on MDEP's common quality assurance (QA) requirements. The MDEP VICWG common QA requirements and protocol for multinational vendor inspections can be seen at the following links:

- Common QA/QM Criteria for Multinational Vendor Inspection [https://www.oecd-nea.org/mdep/documents/2015-10-20%20TR-VICWG-03%20MDEP%20VICWG%20Technical%20Report%20Common_QAQM_Criteria_Versi](https://www.oecd-nea.org/mdep/documents/2015-10-20%20TR-VICWG-03%20MDEP%20VICWG%20Technical%20Report%20Common_QAQM_Criteria_Version%201_30%20January%202014.pdf)
- MDEP Protocol for Witnessed, Joint, and Multinational Vendor Inspection [https://www.oecd-nea.org/mdep/documents/2015-10-20%20TR-VICWG-01%20MDEP%20VICWG%20Technical%20Report%20Vendor%20Inspection%20Proto](https://www.oecd-nea.org/mdep/documents/2015-10-20%20TR-VICWG-01%20MDEP%20VICWG%20Technical%20Report%20Vendor%20Inspection%20Protocol%20Version%202_20%20March%202014.pdf)

The MDEP VICWG inspection focused on ACF and AREVA NP's oversight of ACF activities and was conducted under ASN direction. ACF and AREVA NP made presentations on ACF's manufacturing processes, quality assurance (QA)/quality management (QM) system, and AREVA NP's oversight of ACF activities. The MDEP VICWG inspectors reviewed ACF documentation, conducted interviews of ACF and AREVA NP personnel, walked down the ACF manufacturing shop, and observed forging operations.

The MDEP VICWG inspection team consisted of 3 ASN inspectors, 2 ONR (Office for Nuclear Regulation, United Kingdom) inspectors, 2 NNSA (National Nuclear Safety Administration, China) inspectors, 2 NRC inspectors, 1 CNSC (Canadian Nuclear Safety Commission, Canada) inspector, and 1 STUK (Radiation and Nuclear Safety Authority, Finland) inspector. The MDEP VICWG inspection team provided a daily debrief to ACF and AREVA NP and exited with ACF and AREVA NP management on December 2, 2016.

Summary of MDEP Inspection as it Relates to US Licensees:

During the inspection, the MDEP VICWG inspection team was made aware that AREVA NP identified 400 "marked" files in the thousands of record files of forgings delivered worldwide. The "marked" files contained documentation that was different from the final documentation included with the forging (<http://us.arevablog.com/2017/01/10/creusot-forge-understanding-the-manufacturing-documentation-quality-audit-and-the-list-of-u-s-reactors>). Each forging has files that document all the test results and fabrication steps along with other documents associated with the forging process. Of the 400 "marked" files, four of them were related to forgings that were in components sold to US licensees. All of these forgings are associated with the reactor coolant pressure boundary and are safety-related.

The "marked" files affecting US licensees were associated with forgings used in replacement steam generators at Beaver Valley Unit 1, replacement reactor vessel head (RVH) for ANO Unit 2, replacement pressurizer at Millstone Unit 2, and replacement steam generators at VC Summer Unit 1. All of the discrepancies from the final documentation were subsequently dispositioned as acceptable by AREVA NP. The NRC inspectors noted that AREVA NP had sent letters in March 2016 to notify the purchasers of the above forgings.

The NRC inspectors reviewed copies of six discrepancy notices in the "marked" files associated with US licensees. The NRC inspectors evaluated the AREVA NP's technical justification to ensure there were no potential safety concerns and that any applicable American Society of Mechanical Engineers (ASME) Code specifications were met.

The first discrepancy notice was for the ANO 2 RVH that was identified as not meeting the material specification. Specifically, the aluminum and nickel content was below the material specification. The NRC inspectors noted that the final mechanical tests and austenitic grain size were within the material specification requirements. Therefore, AREVA NP's evaluation determined there was no safety significance to the aluminum and nickel content being below the material specification. The NRC inspectors determined that AREVA NP's evaluation had a

technical basis and was reasonable. The NRC inspectors noted that while the aluminum and nickel did not meet ACF's material specification, it did meet the American Society of Mechanical Engineers (ASME) material specification.

The second and third discrepancy notices were for the Millstone 2 upper and lower pressurizer shells. In both cases, ACF had performed a third austenitization (i.e., heat treatment) that was not allowed by the ACF's procedure. AREVA NP's evaluation determined there was no safety significance since mechanical tests performed after the third heat treatment had acceptable results and the ASME specification does not limit the number of austenitizations. The NRC inspectors determined that AREVA NP's evaluations had a technical basis and were reasonable based on the acceptable mechanical test results and not exceeding ASME specifications for austenitizations.

The three remaining discrepancy notices were for three different shell forgings for the VC Summer 1 steam generators. One of these discrepancies was for performing a gauging operation (i.e., forging shell into a round shape) at a temperature higher than specified, and two discrepancies for performing a gauging operation at lower than specified temperatures. In all cases, heat treatment was done for stress relief and the final mechanical tests showed acceptable results and AREVA NP determined there was no safety significance. The NRC inspectors determined that AREVA NP's evaluations had a technical basis and were reasonable based on the performance of stress relieving after the gauging operations and acceptable mechanical test results.

Conclusions:

The MDEP VICWG inspection team exited with ACF and AREVA NP management on December 2, 2016. ASN issued a publicly available letter (<http://www.french-nuclear-safety.fr/Information/News-releases>) documenting the inspection on February 1, 2017.

The NRC inspectors reviewed the discrepancy notices in the "marked" files associated with ANO Unit 2, Millstone Unit 2, and VC Summer Unit 1. The NRC inspectors concluded that the AREVA NP's evaluations had a technical basis and were reasonable based on the test results and continuing to meet applicable ASME Code requirements.

Since the inspection, AREVA NP has submitted an interim Part 21 report (Agencywide Document Access and Management System (ADAMS) number ML16344A120) and has provided a list of components supplied to US licensees which contain ACF forgings (ADAMS number ML17009A275). Not all of the components supplied to US licensees had marked files associated with them, and not all are being evaluated as part of the interim Part 21 report. AREVA NP continues to review all the ACF files to identify any additional documentation anomalies. The NRC will continue to work with ASN on the resolution of issues at ACF.