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Petition for Emergency Enforcement Action
per Chapter 10 Code of Federal Regulation Part 2.206 (10 CFR 2.206)
at Listed U.S. Reactors with Forged Components and Parts Manufactured at
France’s AREVA-Le Creusot Forge and Japan Casting and Forging Corporation

Chapter 10 of the Code of Federal Regulations Part 2.206 (10 CFR 2.206) provides,
*“(a) Any person may file a request to institute a proceeding pursuant to § 2.202 to modify, suspend, or revoke a license, or for any other action as may be proper.”*¹

Beyond Nuclear and the undersigned co-petitioners (“the Petitioners”) request that the U.S. Nuclear Regulatory Commission (NRC) take emergency enforcement action per 10 CFR 2.206 at U.S. reactors that currently rely on potentially defective safety-related components and potentially falsified quality assurance documentation supplied by AREVA-Le Creusot Forge and its subcontractor Japan Casting and Forging Corporation.

The Petitioners provide the expert review of John Large & Associates identifying significant ‘irregularities’ and ‘anomalies’ in both the manufacturing process and quality assurance documentation of large reactor components manufactured by the AREVA Le Creusot Forge for French reactors and reactors in other countries.² The expert review of John Large & Associates establishes that these potentially compromised components make up the reactors’ all-important primary pressure boundary critical to the maintaining a reliable reactor cooling system. The manufacturing defect in forged components was

¹Chapter 10 CFR 2.206, <https://www.nrc.gov/reading-rm/doc-collections/cfr/part002/part002-0206.html>

²“Irregularities and Anomalies Relating to the Forged Components of Le Creusot Forge,” John Large and Associates, September 26, 2016, http://www.largeassociates.com/CZ3233/Note_LargeAndAssociates_EN_26092016.pdf

first identified by material testing carried out on a supernumerary replica of the reactor pressure vessel head for the Flamanville 3 nuclear power station under construction in France. The defect is attributed to a significant increase in excess carbon, or “carbon anomaly,” during the forging process. The defect can cover a large area of the component and run throughout the component’s thickness adversely impacting the fracture toughness and render them vulnerable to abrupt tearing at operational pressure and catastrophic failure via crack propagation and “fast fracture.”³ The Petitioners contend that U.S. reactors with the installed components identified with these manufactured irregularities and anomalies must be considered sufficiently ‘at-risk’ to jeopardize defense-in-depth analysis and the nuclear safety case unless otherwise demonstrated. Because the identified at-risk components potentially include fraudulently produced quality assurance documents, the NRC and U.S. operators cannot solely rely upon document reviews as offering reasonable assurance for public safety.⁴

The Petitioners are requesting emergency enforcement action for at-risk U.S. reactors and potentially affected components identified by AREVA’s confirmatory communication dated December 15, 2016 to the U.S. Nuclear Regulatory Commission.⁵

Those identified at-risk reactors and their potentially affected components are:

Reactor Pressure Vessels:

Prairie Island 1 & 2 (MN)

Replacement Reactor Pressure Vessel Heads:

Arkansas Nuclear One 2 (AR)

Beaver Valley 1 (PA)

³ Ibid, Large Associates, Summary, p. 2 of 49.

http://www.largeassociates.com/CZ3233/Note_LargeAndAssociates_EN_26092016.pdf

⁴ “Probe Points to Nuclear Cover up,” Wall Street Journal, December 14, 2016

⁵ “NRC Request for Information on AREVA Creusot Forgings in U.S. Components and Carbon Segregation Issues,” AREVA letter to NRC, Attachment 1, December 15, 2016, ML17009A278 http://www.beyondnuclear.org/storage/areva-le-creusot/creusot-us_areva_12152016_units.pdf [NOTE: The AREVA document was not publicly available on the Agency-wide Document Access Management System [ADAMS] as of 10:00 AM January 24, 2017. Beyond Nuclear has requested assistance from the NRC Public Document Room to publicly post the document including Attachment 1 on ADAMS.]

North Anna 1 & 2 (VA)

Surry 1 (VA)

Steam Generators:

Beaver Valley 1 (PA)

Comanche Peak 1 (TX)

V.C. Summer (SC)

Farley 1 & 2 (AL)

South Texas 1 & 2 (TX)

Sequoyah 1 (TN)

Watts Bar 1 (TN)

Reactor Steam Pressurizers:

Millstone 2 (CT)

Saint Lucie 1 (FL)

Therefore, the Petitioners request that the NRC initiate the following federal emergency enforcement actions for the identified at-risk U.S. reactors and components;

1) suspend power operations of U.S. nuclear power plants relying upon Le Creusot Forge components and Le Creusot subcontractors pending both full inspection (including Non-Destructive Examination by ultrasonic testing) and material testing (including Destructive Examination, where possible, involving the analysis of “test ring” samples taken from the surplus edges of the at-risk components). With the finding of carbon anomalies (“carbon segregation” or “carbon macrosegregation”) in excess of the design-basis specifications for at-risk component parts:

A) replace the degraded at-risk component(s) with quality certified components or;

B) for those at-risk degraded components that a licensee seeks to allow to remain in-service, the licensee shall make application through the License Amendment Request

process to demonstrate that a revised design-basis is achievable and will not render the in-service component unacceptably vulnerable to fast fracture failure at any time, and in any credible service condition, throughout the current license of the power reactor.

The emergency enforcement action request for suspension of operations pending component examination and material testing is justified given that AREVA has provided the NRC with documentation dated December 7, 2016 indicating that AREVA has notified its U.S. customers of “*the identification of an issue related to fabrication record anomalies at Creusot Forge. This information is provided pursuant to the requirements of 10 CFR 21 to submit an Interim Report on issues for which the evaluation will not be completed within 60 days of discovery.*”⁶ The AREVA Part 21 notification identifies June 30, 2017 as the completion date for the Part 21 evaluation of these Le Creusot components supplied to its US reactor customers.

The referenced Chapter 10 Code of Federal Regulation Part 21 “Reporting of Defects and Noncompliances” states that when any supplier of components to a US nuclear facility “*obtains information reasonably indicating: (a) That the facility, activity or basic component supplied to such facility or activity fails to comply with the Atomic Energy Act of 1954, as amended, or any applicable rule, regulation, order, or license of the Commission relating to substantial safety hazards or (b) that the facility, activity, or basic component supplied to such facility or activity contains defects, which could create a substantial safety hazard, to immediately notify the Commission of such failure to comply or such defect, unless he has actual knowledge that the Commission has been adequately informed of such defect or failure to comply.*”⁷ [Emphasis added].

AREVA’s Part 21 notification substantiates that the Petitioners requested emergency enforcement actions for examination and material testing are therefore reasonable and in the interest of public health and safety.

⁶ “Interim Report of an Evaluation of a Deviation Pursuant to 10 CFR 21.21(a)(2),” AREVA, December 7, 2016, ML15344A120, http://www.beyondnuclear.org/storage/areva-le-creusot/creusot-us_aveva_12072016_part21-interim-rpt_ML16344A120.pdf

⁷ “Reporting of Defects and Noncompliances,” Chapter 10 Code of Federal Regulation Part 21, Purpose [10CFR21(1)(b)] <https://www.nrc.gov/reading-rm/doc-collections/cfr/part021/part021-0001.html>

The Petitioners further request,

2) should the NRC decline the Petitioners' request for the immediate suspension of reactor operations pending inspections and material testing of at-risk components, the NRC alternatively modify the operating licenses to require the affected operators to perform the requested emergency enforcement actions at the next scheduled outage;

The Petitioners further request of the NRC,

3) given that the agency is reliant upon its licensees to oversee their own quality control, the agency "take other action as may be proper" by issuing a letter to **all U.S. light water reactor operators** pursuant to 10 CFR 50.54(f) requiring licensees to provide the NRC with information under oath and affirmation specifically as to how U.S. operators are reliably monitoring contractors and subcontractors for the potential carbon segmentation anomaly in the supply chain and the reliability of the quality assurance certification of those components.

The Petitioners request that the industry responses to the requested 50.54(f) letters then be publicly released into the NRC Agency-wide Document Access and Management System (ADAMS).

The Petitioners assert that it is impossible to guarantee the reliability and quality of reactor components if the content of quality control and quality assurance document cannot be verified and trusted. Therefore, properly conducted, controlled and enforced quality assurance with verifiable documentation is vital to confidence in the safety of the components in nuclear reactors. Reliable performance during routine reactor operations and in response to accident conditions depends upon such verifiable documentation.

The issuance of the requested NRC letters per 10 CFR 50.54(f) in the United States is a logical outcome of the level of increased scrutiny of nuclear regulators underway in France, Switzerland, Finland and elsewhere currently investigating the potential for counterfeit, substandard and fraudulent components in their respective reactor fleets.

Under NRC regulations 10 CFR 50.54(f) provides, “*The licensee shall at any time before expiration of the license, upon request of the Commission, submit, as specified in § 50.4, written statements, signed under oath or affirmation, to enable the Commission to determine whether or not the license should be modified, suspended, or revoked. Except for information sought to verify licensee compliance with the current licensing basis for that facility, the NRC must prepare the reason or reasons for each information request prior to issuance to ensure that the burden to be imposed on respondents is justified in view of the potential safety significance of the issue to be addressed in the requested information. Each such justification provided for an evaluation performed by the NRC staff must be approved by the Executive Director for Operations or his or her designee prior to issuance of the request.*”⁸

Additional Background

In late-2014, AREVA contacted the French nuclear safety regulator, Autorité de Sûreté Nucléaire (ASN), regarding test results it had conducted on steel material equivalent to two components (the upper and lower vessel head) manufactured at le Creusot Forge already incorporated into the Flamanville 3 European Pressurized Reactor under construction in France.

The test findings revealed that the material characteristics for “fracture toughness” did not correspond to the reactor’s design-basis specification. A small but significantly excessive amount of carbon content across a large zone and throughout the thickness of the component had weakened the components resistance to rapid tearing and cracking under operational pressure. This “carbon anomaly” rendered the large component susceptible to potential “abrupt and catastrophic failure” due to the “fast fracture.”⁹ The loss of fracture toughness and the operational vulnerability are a public safety concern for nuclear power plants that must have the highest confidence value for “break

⁸ Condition of licenses, US NRC, 10 CFR 50.54(f) <https://www.law.cornell.edu/cfr/text/10/50.54>

⁹ Ibid, Large & Associates, Summary, p. 2 of 49,

http://www.greenpeace.org/france/PageFiles/266171/Note_LargeAndAssociates_EN_26092016.pdf

preclusion.”¹⁰ The discovery prompted further testing and quality assurance of components manufactured at the Le Creusot Forge. The additional testing and analysis led ASN to disclose that not only was the Flamanville Unit 3’s reactor pressure vessel affected but that similar excess carbon-induced defects and irregularities had originated from the AREVA’s main heavy forging works Le Creusot Forge and were presently installed in a number of French operational NPPs in other Creusot-sourced components.

The ongoing investigation and analysis to date has led to the discovery of a significant number of these “irregularities” leading to a series of regulator-requested reactor inspections and material testing of the at-risk components in France and other European countries for

The Petitioners’ are requesting the Emergency Enforcement Action in response to this widening international controversy involving potentially defective reactor components where excessive levels of carbon can make them become more brittle and subject to sudden fracture or rapid tearing under sustained high operational pressure. The Petitioners understand that almost all carbon macrosegregation is undesirable particularly for the large ingots used to manufacture the large components in the nuclear industry.

This reactor safety and operability concern is exacerbated by ongoing investigations into forged, falsified, or incomplete quality control reports allegedly produced by the Le Creusot Forge.¹¹ The Wall Street Journal reports, “*Areva executives said that Le Creusot stopped falsifying documents in 2012, when oversight of quality control was removed from an internal office at the factory to a different Areva factory in Saint-Marcel, France. French regulators said they are investigating that claim.*”¹² At the very least, this admission raises questions regarding the quality assurance of Le Creusot Forge components supplied and installed in U.S. reactors up to 2012.

¹⁰ Ibid, Large & Associates, p. 28 of 49, referencing “*break preclusion*” assuring that the “*fundamental and overriding ‘design-basis’ is that the equipment will never catastrophically fail under all credible circumstances. In other words, the primary coolant circuit is assumed to remain intact and wholesome in all reasonably foreseeable normal operating and abnormal fault situations.*”

¹¹ “France’s Nuclear Storm: Many Power Plants Down Due to Quality Concerns,” Power Magazine, November 1, 2016, <http://www.powermag.com/frances-nuclear-storm-many-power-plants-down-due-to-quality-concerns/>

¹² “Probe Points to Nuclear Coverup,” Wall Street Journal, December 14, 2016, B4.

The lack of quality control documentation prompted France's ASN to initiate a series of extended reactor shutdowns and oversee Non-Destructive Examination (NDE) inspections and material testing of at-risk components at twenty (20) of France's Pressurized Water Reactors. The examination and material testing continued into January 2017.¹³ ASN stated that potentially more than half of France's 58 reactor units are potentially affected by investigations into AREVA's supply of steel reactor components forged at Le Creusot Forge that are contaminated with excessive levels of carbon making them vulnerable to cracking and fast fracture.¹⁴ The ASN investigations reveal that after AREVA checked the records of Le Creusot, they identified anomalies associated with initially 400 large components manufactured at the forge since the plant opened in 1965. Inspectors from the U.S., China and four other nations are investigating the AREVA-Le Creusot Forge in central France for a cover-up of quality control violations dating back decades.¹⁵ The Petitioners assert that the inspection need to include more than just a paper review. Most recently, nuclear regulators in Finland have initiated an inquiry into the Olkiluoto nuclear power station under construction for Le Creusot components.¹⁶ Reuters News Service reported that a French court has opened an investigation into suspected falsified reports necessary to confirm the quality assurance of components and parts manufactured by the AREVA-Le Creusot Forge.¹⁷

Switzerland's Federal Nuclear Safety Inspectorate are requiring the operators of the Goesgen nuclear power stations to inspect and verify compatibility of the units' material specifications of forged parts for their steam generators and report back to the nuclear safety agency. The restart of Beznau-1 has been pushed back to March 31, 2017 rather than the end of December 2016 as was previously scheduled, to allow more time to

¹³ Ibid, Power Magazine

¹⁴ "French watchdog deepens probes into Areva nuclear parts," Financial Times, January 3, 2017 <https://www.ft.com/content/2baf6270-c36a-11e6-81c2-f57d90f6741a>

¹⁵ "Coverup at French Nuclear Supplier Sparks Global Review," The Wall Street Journal, December 13, 2016, <http://www.wsj.com/articles/problems-at-nuclear-components-supplier-spark-global-reviews-1481625005>

¹⁶ "Finland opens inquiry in Olkiluoto nuclear plant as the Areva scandal unfolds," New Europe Online, December 20, 2016, <https://www.neweurope.eu/article/finland-opens-inquiry-olkiluoto-nuclear-plant-areva-scandal-unfolds/>

¹⁷ "French court probes forged documents case at Areva nuclear foundry," Reuters News Service, December 23, 2016, <http://in.reuters.com/article/france-nuclear-areva-court-idINL5N1E34XV>

complete testing of steam generator materials.¹⁸

Similarly, active investigations of Le Creusot components installed at Finland's Lovissa and Olkiluto nuclear power plants continue under the increased oversight of the Finnish Radiation & Nuclear Safety Authority (STUK) said in a January 5, 2017 statement. Martti Vilpas, head of STUK's manufacturing technology section, said in a statement that STUK seeks to assure that the AREVA Le Creusot at-risk components must meet their design-basis specifications and "*not leave room for even the slightest doubt.*"¹⁹

The Petitioners contend that the U.S. NRC cannot conservatively rely upon reviewing other international regulatory agencies inspections and material testing of at-risk components in foreign reactor in France, Switzerland and Finland to reasonably assure the operational integrity and safe operation of US reactors. Given the number of affected reactors, the U.S. NRC has an obligation and the mandate to actively protect the public health and safety by actively participating in an enhanced inspection and materials testing program at the reactors identified in AREVA's notification to the agency under 10 CFR 21 for "Reporting of Defects and Noncompliances" relating to the potentially "substantial safety hazards."

Therefore, the Petitioners' request that the NRC similarly 1) initiate both Non-Destructive Examination (NDE) inspections and testing of surplus material as is occurring and ongoing in affected foreign reactors to remove reasonable doubt about at-risk Le Creusot components installed in US reactors; 2) should NRC decline the Petitioners' request for suspension of the operating licenses to conduct examinations and material testing alternatively NRC should require the requested enforcement action at the next scheduled outage, and; 3) issue letters to all US reactor operators requesting responses under 10 CFR 50.54(f) for how U.S. operators are reliably monitoring contractors and subcontractors for the carbon segmentation anomaly in the component supply chain and the reliability of the quality assurance certification.

¹⁸ "Restart of Axpo's Beznau-1 postponed to March (2017) for further materials testing," Platts Inside NRC, December 26, 2016, p. 9

¹⁹ "Finland plants still checking Le Creusot components," Platts Inside NRC, January 9, 2017, p. 6

Respectfully submitted on behalf of the listed co-petitioners,

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