



Millstone Power Station Unit 2

Upgrade to AREVA Standard CE14 HTP Fuel Assembly

Pre-Submittal Teleconference for Realistic Large Break LOCA License Amendment Request

May 3, 2016

Agenda

- 1) Background Information: MPS2 Fuel Product Upgrade**
- 2) Background Information: LAR for LBLOCA Analysis**
- 3) Schedule for LBLOCA LAR**
- 4) Scope and Content of LAR and Licensing Report**
- 5) Future Dominion/NRC interactions**

Background on MPS2 Fuel Product Upgrade

- **Long-term MPS2 project with NRC kickoff meeting in **July 2013** (ADAMS ML13207A259)**
- **Implementation in Cycle 25 (**Spring 2017**)**
- **AREVA Standard CE14 HTP Fuel Assembly upgrades to the current MPS2 fuel product:**
 - M5[®] cladding
 - Advanced fuel rod geometry
 - Zircaloy-4 MONOBLOC[™] guide tubes
- **M5[®] cladding is a safety improvement and will be credited for 10 CFR 50.46c compliance in the future**

Background on LAR for LBLOCA Analysis

- July 17, 2013** **Fuel Upgrade project kickoff meeting with NRC**
- **Current LBLOCA evaluation model in EMF-2087(P)(A) is not applicable to the upgrade fuel with M5[®] clad**
 - **Identified need for evaluation model in EMF-2103, Rev. 3, which was later submitted in September 2013**
- June 22, 2015** **Pre-Submittal teleconference for LARs with LOCA analyses supporting the Fuel Upgrade (ML15198A343)**
- **LBLOCA LAR submittal planned for September 2015 consistent with expected availability of NRC draft SE for EMF-2103, Rev. 3 by July 2015**
- June 2015** **AREVA incorporated changes from NRC review of**
- April 2016** **EMF-2103, Rev. 3 into MPS2 analysis and documents**

Schedule for LBLOCA LAR

| | |
|-----------------------|--|
| April 14, 2016 | Draft SE for EMF-2103(P), Rev. 3 is available to reference to meet NRC LIC-109 |
| May 3, 2016 | Pre-submittal teleconference to get NRC feedback on LAR |
| May 31, 2016 | MPS2 LBLOCA LAR to be submitted |
| Ongoing | Dominion will respond promptly to NRC requests for information to support timely review and will be open to an audit of the technical details of the RLBLOCA analysis |
| Dec. 1, 2016 | Requested approval date for LAR (Since July 2013, Dominion has stated that approval by October 2016 would avoid impact on MPS2 Cycle 25 reload documentation) |
| Spring 2017 | MPS2 has committed to introduce the AREVA Standard CE14 HTP fuel with M5[®] cladding |

Scope of the LAR

- Adds EMF-2103(P)(A) to TS 6.9.1.8.b, “Core Operating Limits Report”, which lists the analytical methods to determine the core operating limits
- EMF-2103(P)(A) will be used to establish the COLR limits for the AREVA Standard CE14 HTP fuel product for:
 - TS 3.1.3.6 Regulating CEA Insertion Limits
 - TS 3.2.1 Linear Heat Rate
 - TS 3.2.3 Total Unrodded Integrated Radial Peaking Factor – F_{r}^T
- LAR includes AREVA Licensing Report (Proprietary and Non-Proprietary versions) with an affidavit for withholding
- AREVA Licensing Report will be completed after this meeting, so that NRC feedback regarding LAR content can be incorporated

Scope of the LAR

- MPS2 analysis complies with the NRC draft SE dated **April 14, 2016** for EMF-2103(P), Rev. 3
 - No deviations from the submitted method as modified by RAI responses
- LAR will include documentation for how each Limitation from the draft SE has been addressed in the MPS2 application
- Licensing Report includes content to address recent NRC questions on applications of realistic LBLOCA evaluation models
 - Example: Appendix with sampled parameter input values and key results for the case set

Contents of the Licensing Report

- 8 Tables of **Inputs** and **Results**
 - 1) **RLBLOCA Analysis - Plant Parameter Values and Ranges**
 - 2) **Statistical Distribution Used for Process Parameters**
 - 3) **Passive Heat Sinks and Material Properties in Containment Geometry**
 - 4) **Compliance with 10 CFR 50.46(b) (see next slide)**
 - 5) **Summary of Major Parameters for the Demonstration Case**
 - 6) **Calculated Event Times for the Demonstration Case**
 - 7) **Heat Transfer Parameters for the Demonstration Case**
 - 8) **Fuel Rod Rupture Ranges of Parameters**

Contents of the Licensing Report

- Results Summary**

| UTL for 95/95 Simultaneous Coverage | | |
|---|------------------|-------------|
| Parameter | Value | Case Number |
| PCT, °F | 1615 | 123 |
| MLO, % | 2.01 | 174 |
| CWO, % | 0.025 | 96 |
| Characteristics of Case Setting the PCT UTL | | |
| PCT, °F | 1615 | |
| PCT Rod Type | Fresh 4% Gad Rod | |
| Time of PCT, s | 7.44 | |
| Elevation within Core, ft | 9.36 | |
| Local Maximum Oxidation, % | 1.98 | |
| Total Core-Wide Oxidation, % | 0.006 | |
| PCT Rod Rupture Time, s | No rod rupture | |
| Rod Rupture Elevation within Core, ft | No rod rupture | |

- GDC-35 requirements will be covered (proprietary content)**

Contents of the Licensing Report

- **Scatter Plots**
 - **Operational Parameters (inputs)**
 - **PCT versus PCT Time**
 - **PCT versus Break Size**
 - **Maximum Local Oxidation versus PCT**
 - **Total Core-Wide Oxidation versus PCT**
- **Figure - *Beginning of Core Recovery Time using MPR CCFL Correlation***

Contents of the Licensing Report

- **12 Plots from Demonstration Case**
 - 1) **Peak Clad Temperature (independent of elevation)**
 - 2) **Break Flow**
 - 3) **Core Inlet Mass Flux**
 - 4) **Core Outlet Mass Flux**
 - 5) **Void Fraction at RCS Pumps**
 - 6) **ECCS Flows (Includes SIT and SI)**
 - 7) **Upper Plenum Pressure**
 - 8) **Collapsed Liquid Level in the Downcomer**
 - 9) **Collapsed Liquid Level in the Lower Plenum**
 - 10) **Collapsed Liquid Level in the Core**
 - 11) **Containment and Loop Pressures**
 - 12) **Pressure Difference between Upper Plenum and Downcomer**

Future Dominion/NRC Interactions

- Implementation of the fuel product upgrade at MPS2 for Cycle 25 in **Spring 2017** relies on the RLBLOCA LAR
- LAR will be submitted by **May 31, 2016** with a reference to the **April 14, 2016** draft SE for EMF-2103, Rev. 3
- LAR will request approval by **December 1, 2016**
- Dominion is open to an NRC audit for efficient sharing of details of the RLBLOCA application not included in the LAR

Acronym List

| | |
|----------------|---|
| CEA | Control Element Assembly |
| CFR | Code of Federal Regulations |
| COLR | Core Operating Limits Report |
| CWO | Core Wide Oxidation |
| ECCS | Emergency Core Cooling System |
| HTP | High Thermal Performance |
| LAR | License Amendment Request |
| LBLOCA | Large Break Loss of Coolant Accident |
| LOCA | Loss of Coolant Accident |
| MLO | Maximum Local Oxidation |
| MPS2 | Millstone Power Station, Unit 2 |
| NRC | Nuclear Regulatory Commission |
| PCT | Peak Cladding Temperature |
| RLBLOCA | Realistic Large Break Loss of Coolant Accident |
| SE | Safety Evaluation |
| SI | Safety Injection |
| SIT | Safety Injection Tank |
| TS | Technical Specifications |
| UTL | Upper Tolerance Limit |