



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