



**Nuclear**

# Browns Ferry Nuclear Plant



Use of AREVA XM Fuel at Browns Ferry  
June 18, 2012

# Agenda

- Overview
- Licensing considerations
- Licensing Amendment Request (LAR) content
- ACE CPR correlation issue
- Schedule
- Additional considerations

# Overview

- TVA desires to transition to ATRIUM-10 XM fuel
  - All three Browns Ferry units
    - Fuel cycle cost benefits
    - XM better suited for potential future EPU operation
    - Smaller batch sizes will reduce dry storage requirements
- XM is an industry proven design
  - Significant European experience
  - One domestic customer utilizing XM
- First targeted XM reloads by unit
  - Unit 2 spring 2015
  - Unit 3 spring 2016
  - Unit 1 fall 2016
- Transition cores will only contain AREVA fuel types
  - Remaining GNF fuel discharged from Unit 1 in 2016
  - No multi vendor core issues to review



# Licensing Considerations

- XM fuel design meets all criteria in ANF-89-98(P)(A) “Generic Mechanical Design Criteria for BWR Fuel Designs”
- NRC completed XM compliance review in November 2010
- XM use approved for Brunswick
  - Identical XM fuel design will be used for Browns Ferry
  - Brunswick is comparable to Browns Ferry
    - Same core lattice geometry
- TVA requesting XM approval for current power level only

# Licensing Considerations

- Application of AREVA methodologies to Browns Ferry
  - Fully reviewed with the three exceptions noted
  - Previous reviews
    - NRC methods audit August 2008
      - Focused largely on application to Browns Ferry
    - Review of unit 1 ATRIUM-10 LAR
      - In depth review of LOCA methods
      - Resulted in modified methodology for Browns Ferry
- Same methodologies as used for ATRIUM-10
  - Three exceptions
    - Addition of RODEX4 for thermal mechanical analyses
    - Addition of ACE correlation for XM fuel CPR monitoring
    - Replacement of SAFLIM2 safety limit methodology with SAFLIM-3D

# LAR Content

- Provide similar reports as the approved Unit 1 ATRIUM-10 LAR
  - Mechanical design report
  - Thermal hydraulic design report
  - Fuel cycle design report
  - Reload safety analysis report
  - LOCA break spectrum report
    - Same modified methodology as outlined in ANP-3015 report
  - BWR licensing methodology compendium
    - Updated for new methods (RODEX4, SAFLIM-3D)
  - RAI compendium
    - Fuel type dependent RAIs from the ATRIUM-10 RAI compendium will be answered in the context of XM
    - Will include RAIs from the Brunswick XM LAR as appropriate



# LAR Content

- Additional LAR information
  - Specific to application of the three new methodologies
    - Equilibrium fuel cycle report (part of RODEX4 application)
    - Rod thermal mechanical report (part of RODEX4 application)
    - SAFLIM-3D application (SLMCPR calculation for lead reload)
    - Plant specific ACE supplement
  - Thermal conductivity issue
    - RODEX2 still used for transient and LOCA analyses
    - LAR will address the resolution agreed upon between AREVA and NRC
- Will use lead Browns Ferry XM reload as the basis for the transition analyses
  - Unit 2 cycle 19

# LAR Content

- LAR will include Technical Specifications changes
- Technical Specification 5.6.5.b will be modified
  - Add new methodology references:
    - BAW-10247PA “Realistic Thermal-Mechanical Fuel Rod Methodology for Boiling Water Reactors” Revision 0, April 2008
    - ANP-10298PA “ACE/ATRIUM 10XM Critical Power Correlation” Revision 0, March 2010
    - ANP-10307PA “AREVA MCPR Safety Limit Methodology for Boiling Water Reactors” Revision 0, June 2011
- Technical Specification 2.1.1.2 (SLMCPR)
  - SLMCPR will be reduced relative to current values
  - LAR will include a new value for unit 2 only
    - Changes for the other two units in separate LARs



# LAR Content

- Technical Specification Bases changes
  - Some TS Bases will require modification
  - References in select Bases will be updated to reflect new methods
    - Bases for SLMCPR and other thermal limits
- No other Technical Specifications changes required

# ACE Correlation Issue

- Current ACE method has an identified deficiency
  - Axial averaging process for K factor
- AREVA has a corrected K factor methodology
  - AREVA has submitted a generic ACE supplement to the NRC
- Issues may arise with review timing
  - Uncertainty over when generic supplement will be approved relative to Browns Ferry XM LAR approval
- Proposed solution
  - Develop Browns Ferry specific ACE supplement and include in XM LAR
  - If generic supplement is approved prior to XM LAR
    - Supplement XM LAR requesting generic ACE supplement be added to Browns Ferry Technical Specifications
  - If XM LAR is approved before the generic ACE supplement
    - Technical Specification reference for ACE will be annotated to reference the SE for the XM LAR

# Schedule

- Transition work underway
  - Will complete in late 2012
- Target date for LAR submittal
  - January 2013
- SER need date
  - February 2014
  - Need date is tied to reload design and fuel fabrication milestones



# Additional Considerations

- TVA developing EPU Licensing path forward
  - Subject of future meeting
- Downstream EPU timing
  - First XM application (unit 2 cycle 19) not targeted for EPU
  - 2016 reloads are potential EPU cycles
    - Unit 3 cycle 18
    - Unit 1 cycle 12
  - Potential for concurrent EPU and XM intro in these two cycles
  - TVA views this as acceptable under the ELTR process
    - Lead XM reload would not be EPU concurrent
- Additional EPU LAR information
  - Information docketed for EPU does not consider XM
    - Only GE14 and ATRIUM-10 considered
  - Will need a future meeting to discuss how to supplement EPU LAR to account for XM fuel



Nuclear

# Discussion