North Anna

Westinghouse RFA-2 Fuel Transition

July 14, 2010

Objectives

1) **Discuss Dominion's Licensing Approach for Transitioning to the Westinghouse RFA-2 Fuel Product at North Anna**

2) **Provide Dominion's Schedule of Submittals Required to Support the North Anna Fuel Transition**

3) **Discuss NRC Resources for November 2011 BELOCA Approval**

Fuel Product Description

- **Westinghouse Robust Fuel Assembly 2 (RFA-2)**
  - Removable Top Nozzle
  - 0.374 inch OD Fuel Rod with Optimized ZIRLO Cladding
  - Zirconium Diboride (ZrB_2) Integrated Fuel Burnable Absorbers (IFBA)
  - Reduced Rod Bow Inconel Top Grid
  - Intermediate Flow Mixing Grids (3)
  - Inconel Protective Grid
  - Oxide Coated Cladding on Bottom Six Inches
  - Debris Filter Bottom Nozzle

Licensing Approach

- **Fuel Criteria Evaluation Process (FCEP) – WCAP-12488-A**
  - NSD-NRC-96-4694
  - NSD-NRC-97-5189
  - NSD-NRC-98-5618
  - NSD-NRC-98-5796
  - LTR-NRC-01-44
  - LTR-NRC-02-55 – Applicability of WRB-2M DNB correlation to 17x17 RFA-2 fuel with or without IFM grids

Licensing Approach

- **Required NRC Submittals**
  1. Optimized ZIRLO – fuel cladding material
  2. VIPRE-D WRB-2M DNB Correlation Implementation
  3. BELOCA Methodology (WCAP-16009-P-A)

Schedule / Milestones

- **Transition is Approximately 50% Complete**
- **North Anna RFA-2 Implementation**
  - N1C23 Spring 2012
  - N2C23 Spring 2013
- **Optimized ZIRLO Submittal**
  - Currently with the NRC (Dominion Letter No. 10-205, May 6, 2010)
  - Requested NRC Approval May 2011

Schedule / Milestones

- **VIPRE-D WRB-2M Correlation**
  - Submit to NRC — July 22, 2010
  - Requested NRC Approval — July 2011
- **BELOCA Analysis**
  - Submit to NRC — November 2, 2010
  - Requested NRC Approval — November 2011
  - Working with Vendor to Improve Submittal Schedule

BELOCA Analysis

- **License Amendment Request (LAR) adds ASTRUM methodology to T.S. 5.6.5 (COLR)**
  - ASTRUM methodology used for Best-Estimate LBLOCA analysis of RFA-2 fuel
  - T.S. change adds ASTRUM analytical methodology topical report WCAP-16009-P-A to T.S. 5.6.5.b in support of core limits
    - Heat Flux Hot Channel Factor ($F_Q(Z)$)
    - Nuclear Enthalpy Rise Hot Channel Factor ($F^N_{\Delta H}$)
  - Analysis description comparable to Surry submittal
    - Dominion letter 06-936 dated 11/16/06
    - NRC Safety Evaluation Report dated 9/6/07

BELOCA Analysis

- **Approved BELOCA Methodology**
  - WCAP-16009-P-A with one exception
  - 9 node downcomer model
    - 3 axial nodes/radial segment aligned to each RCS loop
  - Improved resolution of downcomer boiling phenomenon
  - Multi-node model in ASTRUM approved by NRC for D.C. Cook (12 nodes for 4 RCS loops)
- **Format of North Anna T.S. COLR reference like D.C. Cook (ADAMS ML082670351)**

BELOCA Analysis

- **Unit-Specific Analyses**
  - Unit 1 – Upflow baffle/barrel configuration
  - Unit 2 – Downflow baffle/barrel configuration
  - Unit-specific models used for Realistic Large Break LOCA analysis of AREVA Advanced Mark-BW fuel (UFSAR Section 15.4.1)
- **Same peaking factors as AREVA LBLOCA analysis in UFSAR Section 15.4.1**
  - $F_Q(Z) = 2.32$
  - $F^N_{\Delta H} = 1.65$

Questions?