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TMI Mark-B-HTP Implementation License Amendment Request Meeting

April 30, 2007

ENCLOSURE 2

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Purpose of Meeting

- Review License Amendment Request (LAR) Technical Specification (TS) changes supporting implementation of Mark-B-HTP Fuel Design in Cycle 17 reload (Fall 2007) - LAR # 335 submitted March 22, 2007

- Discuss LAR scope and content, and clarify any initial questions to minimize need for NRC requests for additional information

- Identify any additional information needed for LAR

Agenda

- TMI Unit 1 Presentation
  - Mark-B-HTP Implementation
  - Benefits of Mark-B-HTP Fuel Design
  - Methods Review
  - Scope of License Amendment Request
  - Proposed Technical Specification Changes
  - VLPT Setpoint
  - Questions & Feedback

TMI-1 Mark-B-HTP Implementation

- First reload batch of Mark-B-HTP will be loaded in Fall 2007
  - Original plans to introduce the HTP design in 2009 were accelerated due to TMI fuel defect in Fall 2006
  - TMI will be the 4th B&W reactor to introduce HTP design
    - CR-3, Davis-Besse, and ANO-1 are currently operating mixed Mark-B-HTP/Mark-B cores
    - TMI transition is similar to other B&W transitions previously analyzed by AREVA
    - NRC has reviewed similar submittals for B&W plant applications
  - HTP design uses the same M5 material and same fuel rod as current Mark-B12 design

TMI-1 Mark-B-HTP Implementation (cont.)

- Mixed core transition requires change to TMI-1 Technical Specifications
  - Mark-B-HTP grid design has higher pressure drop than resident Mark-B12 fuel resulting in mixed core T-H penalties
  - Core safety limits and Variable Low Pressure Trip setpoint revised based on mixed core DNB analysis
  - TS Amendment requested by October 15, 2007 to support TMI-1 Cycle 17 startup date

TMI-1 Mark-B-HTP Implementation (cont.)

- Introduction of the Mark-B-HTP fuel design at TMI-1 is being processed as a design change via the Exelon configuration control process
  - Areas not requiring changes to Technical Specifications and not requiring NRC review will be addressed under the 10 CFR 50.59 process
  - Mixed-core LOCA analyses have been performed for TMI-1 Cycle 17
    - Cycle 17 analysis justified the same LOCA kW/ft limits used for the resident Mk-B12 fuel. Peak clad temperatures (PCT) previously calculated for the resident Mk-B12 fuel bound Mk-B-HTP fuel PCT results calculated using NRC-approved hot pin methodology contained in BAW-10164P-A
    - Mixed-core and full core Mark-B-HTP LOCA analyses will be performed that specifically consider EOTSG replacement for Cycle 18
  - Non-LOCA safety analyses are being addressed in the design change package
    - The Mark-B-HTP fuel design has been shown to have a negligible effect on the overall system response
    - The present TMI-1 UFSAR DNB evaluation for the control rod ejection accident will be shown to bound the TMI-1 core with the implementation of the Mark-B-HTP fuel design
    - Cycle-specific evaluation of the loss of flow transients will be performed as described in BAW-10179P-A (Section 6.5) using the BHTP CHF correlation

Major Benefits of Mark-B-HTP Design

- Mark-B-HTP design will significantly increase margin to grid-to-rod fretting failures
  - TMI-1 experienced what appears to be a grid-fretting failure in Fall 2006
  - Extensive in-reactor experience has demonstrated superior HTP fretting resistance
  - Supports TMI-1 drive towards goal of Zero Fuel Defects
- Welded cage expected to reduce fuel assembly twist/bow
  - Lateral stiffness more than twice that of Mk-B12 floating grid design
  - Lower drag forces on control rod insertion and increased margin to Incomplete Rod Insertion
  - Straighter assembly expected to decrease risk of grid damage during core loading/off-loading

Methods Review

- AREVA's NRC-approved Reload Topical BAW-10179P-A, Rev. 6 will be used to develop revised TS safety limits and setpoints
  - BAW-10179 Rev. 6 includes:
    - BAW-10187P-A, Statistical Core Design methodology (same methodology used for current TMI Mark-B DNBR design limits)
    - BAW-10156-A, LYNXT (same core T-H methodology used for current TMI core safety limits)
    - BAW-10241P-A, Rev. 0 and Rev. 1, BHTP DNB correlation applied with LYNXT (required for use with Mark-B-HTP fuel design)
    - BAW-10192P-A, BWNT LOCA EM and BAW-10164P-A, RELAP5/MOD2-B&W (same methodologies used for current TMI-1 LOCA analyses, with BHTP correlation added)
  - Core safety limits and VLPT setpoint are developed using the same methodology as the current TMI-1 limits/setpoint that were last revised in 2003 (Amendment #247)

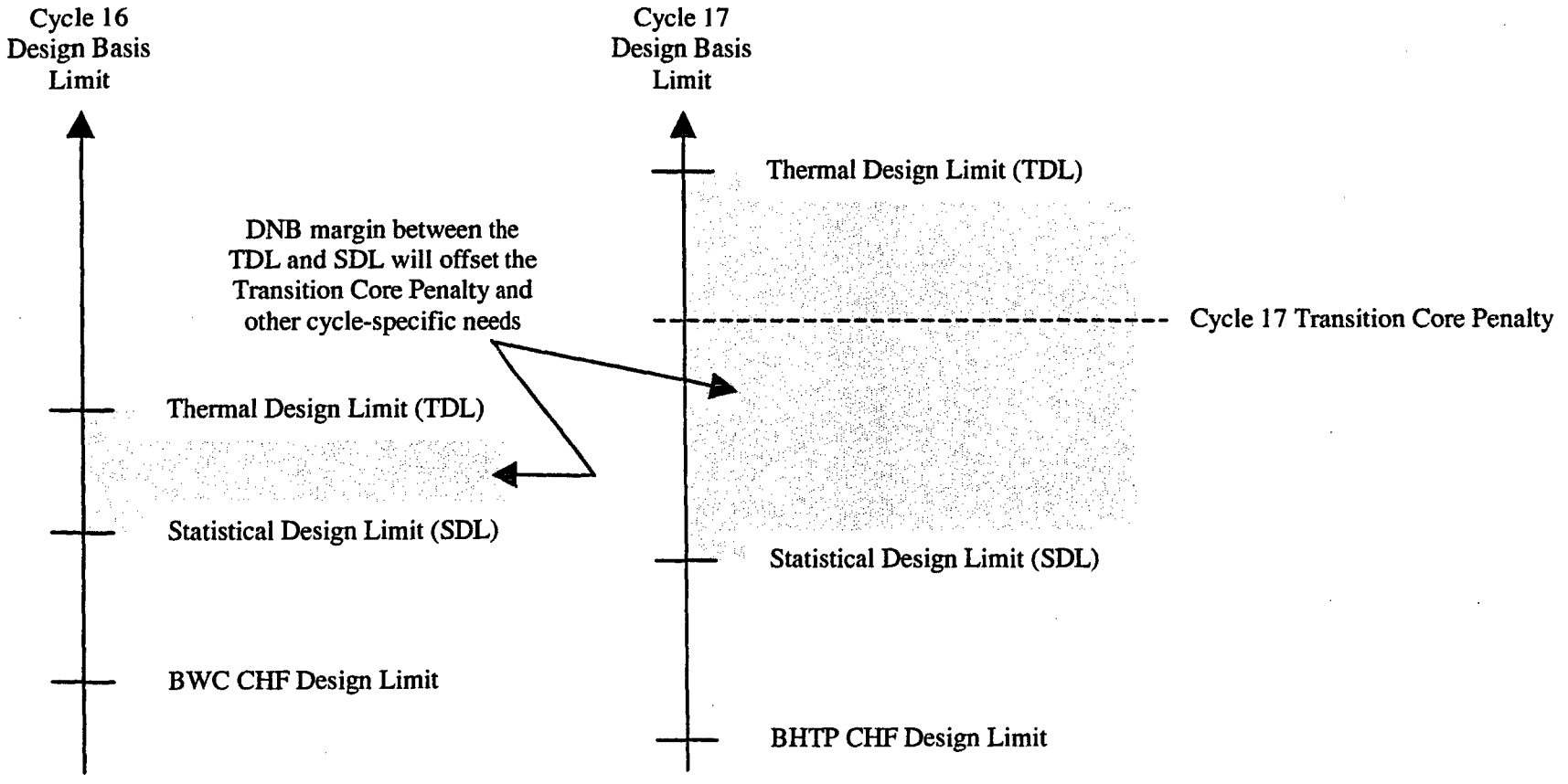
LAR Scope and Technical Content

- Proposed TS changes
- DNB analysis description and mixed core penalty derivation
- LOCA and non-LOCA accident summaries (Analyses not required to support TS change)
- VLPT LSSS derivation
- VLPT setpoint methodology
- Precedents

DNB Transition Core Penalty

- A Thermal Design Limit (TDL) has been determined, which provides sufficient margin for TMI-1 mixed core transition period
  - A Statistical Design Limit (SDL) has been determined for TMI-1 using the SCD methodology assuming a full core of Mark-B-HTP fuel
  - Mixed core penalties have been determined for varying number of Mark-B-HTP fuel assemblies co-resident with Mark-B fuel
  - The first transition cycle, which requires the largest mixed core penalty, is fully accommodated by the margin between the SDL and TDL

DNB Transition Core Penalty (cont.)



Proposed Technical Specification Changes

- Core Protection Safety Limits specified in TS Figure 2.1-1 and Bases Figure 2.1-3
- TS Table 2.3-1, Reactor Protection System Trip Setting Limits, and Figure 2.3-1, Protection System Maximum Allowable Setpoints, are modified to revise the variable low pressure trip setpoint
- TS Section 2.1 and 2.3 Bases are revised to incorporate reference to Topical Report BAW-10241P-A
- TS Section 2.3 Bases are modified to reflect the revised variable low reactor coolant system pressure trip setpoint
- TS Table 4.1-1 and Section 4.1 Bases modified to add VLPT as-found/as-left requirements

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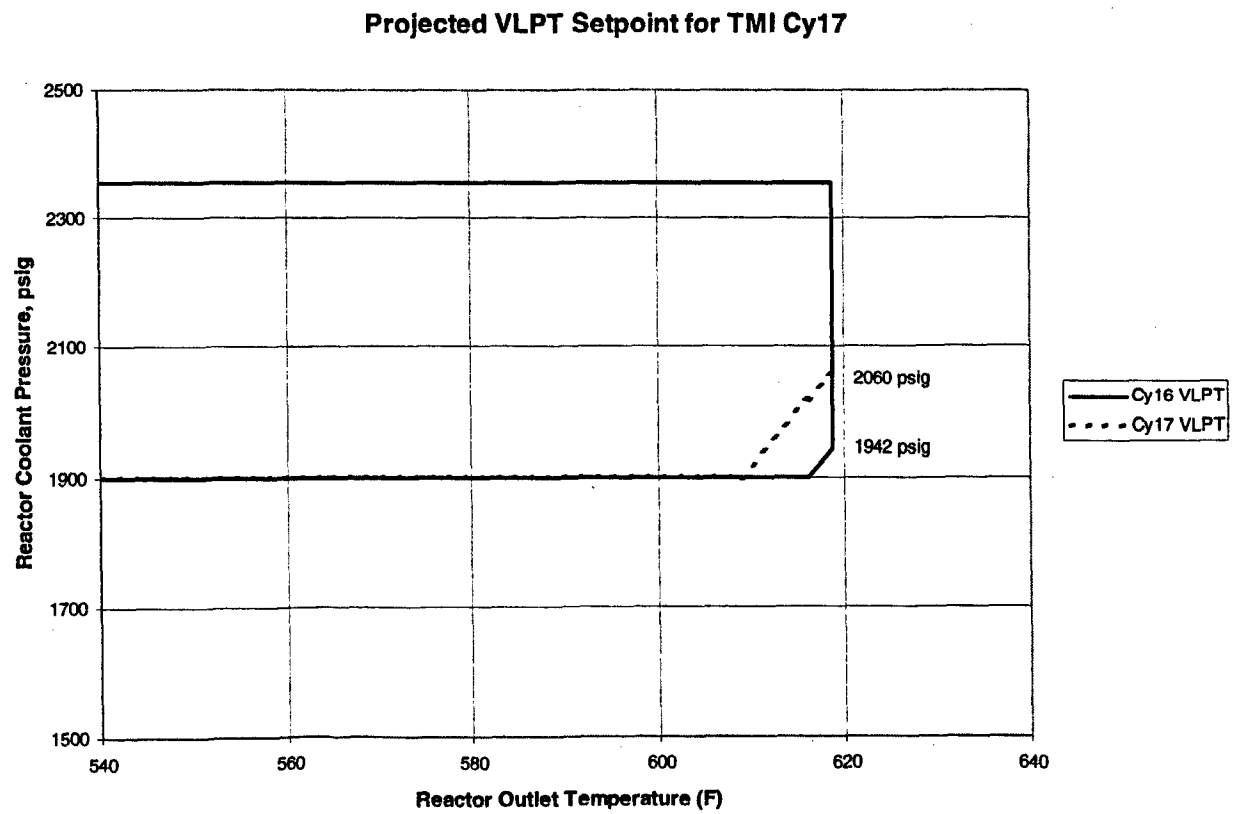
VLPT Setpoint Change

- The revised VLPT setpoint will not pose a challenge to Operators
  - Cycle 17 setpoint will be less limiting than previous settings



Variable Low Pressure Safety Limit Derivation

- Variable Low Pressure Safety Limit derived following NRC approved methodology in BAW-10179 (Section 7.6) using BHTP CHF correlation
  - Variable low pressure safety limit is determined from DNB analyses for 2-, 3-, and 4-pump operation and provides 95/95 steady-state protection for DNBR using the TDL
  - 3- and 4-pump limits were derived using BHTP CHF correlation approved in BAW-10241P-A, Rev. 0
  - 2-pump limits were derived using the BHTP CHF correlation approved in BAW-10241P-A, Rev. 1, which expanded the range of the correlation

VLPT Setpoint Derivation

- VLPT Setpoint (LSSS) derived following NRC approved methodology in BAW-10179 (Section 7.6)
  - Variable low pressure safety limit from DNB analysis is conservatively adjusted to account for the pressure drop from the core exit to the pressure instrument tap
  - The adjusted safety limit is conservatively bounded by a straight line
  - Instrument uncertainties for the pressure and temperature components of the VLPT trip hardware are combined and translated into a pressure uncertainty that is conservatively applied to the adjusted safety limit line
  - If necessary, the slope of the error-adjusted safety limit line is conservatively rotated to ensure the final setpoint is within the capability of the instrumentation

VLPT Setpoint Methodology

- Methodology for establishing limiting setpoint and limiting acceptable values for As-Found and As-Left setpoints measured in Surveillance Tests
  - Safety Limit Related Determination
    - Calculate the VLPT LSP, NSP, Total Loop Uncertainty (TLU) and Margin using methodology provided by ANSI/ISA-67.04
  - Calculate predefined limits for the as-found TSP based on the NSP
    - The predefined limits will be determined in accordance with the NRC accepted methodology described in NRC RIS 2006-17.
      - The setting tolerance band is less than or equal to the square root of the sum of the squares of reference accuracy, M&TE accuracy, and readability uncertainties
      - The setting tolerance is included in the total loop uncertainty
      - The pre-defined test acceptance criteria band for the as-found value is less than or equal to the square root of the sum of the squares of reference accuracy, M&TE accuracy, readability uncertainties and drift

VLPT Setpoint Methodology

- Safety Limit Related Determination
  - The VLPT Setpoint is a Limiting Safety System Setting (LSSS) as defined in TMI Unit 1 TS 2.3
    - The VLPT initiates an automatic reactor trip
    - The VLPT provides reactor protection for the core safety limits contained in TMI Unit 1 TS Figure 2.1-1, which ensure margin to core DNBR limits

VLPT Setpoint Methodology

- Compliance with 10 CFR 50.36 ensured by compliance with RIS 2006-17
- As-Found Setpoint Evaluation
  - If the as-found Trip Setpoint exceeds the Limiting Setpoint, declare VLPT channel inoperable
  - If the as-found Trip Setpoint exceeds the predefined limits, determine if the instrument is functioning as required prior to returning the VLPT channel to service. If it cannot be determined that the instrument is functioning as required, declare VLPT channel inoperable.
  - If the as-found Trip Setpoint exceeds the predefined limits, the condition must be entered into the Corrective Action program
- As-Left Setpoint Control
  - Instrument will be left within the setting tolerance band

VLPT Setpoint Methodology

- Proposed TS and TS Bases Changes to address setpoint methodology
  - Table 4.1-1 specifies required actions regarding response to as-found/as-left criteria
    - Actions similar to those proposed in TSTF-493.
  - TS Section 4.1 Bases specifies that the UFSAR incorporates by reference the document that contains the following:
    - Limiting Trip Setpoint
    - Methodology used to determine the Limiting Trip Setpoint, pre-defined as-found acceptance criteria band, and as-left setpoint tolerance band
  - TS Section 4.1 Bases specifies the definition of the pre-defined as-found acceptance criteria band for the VLPT

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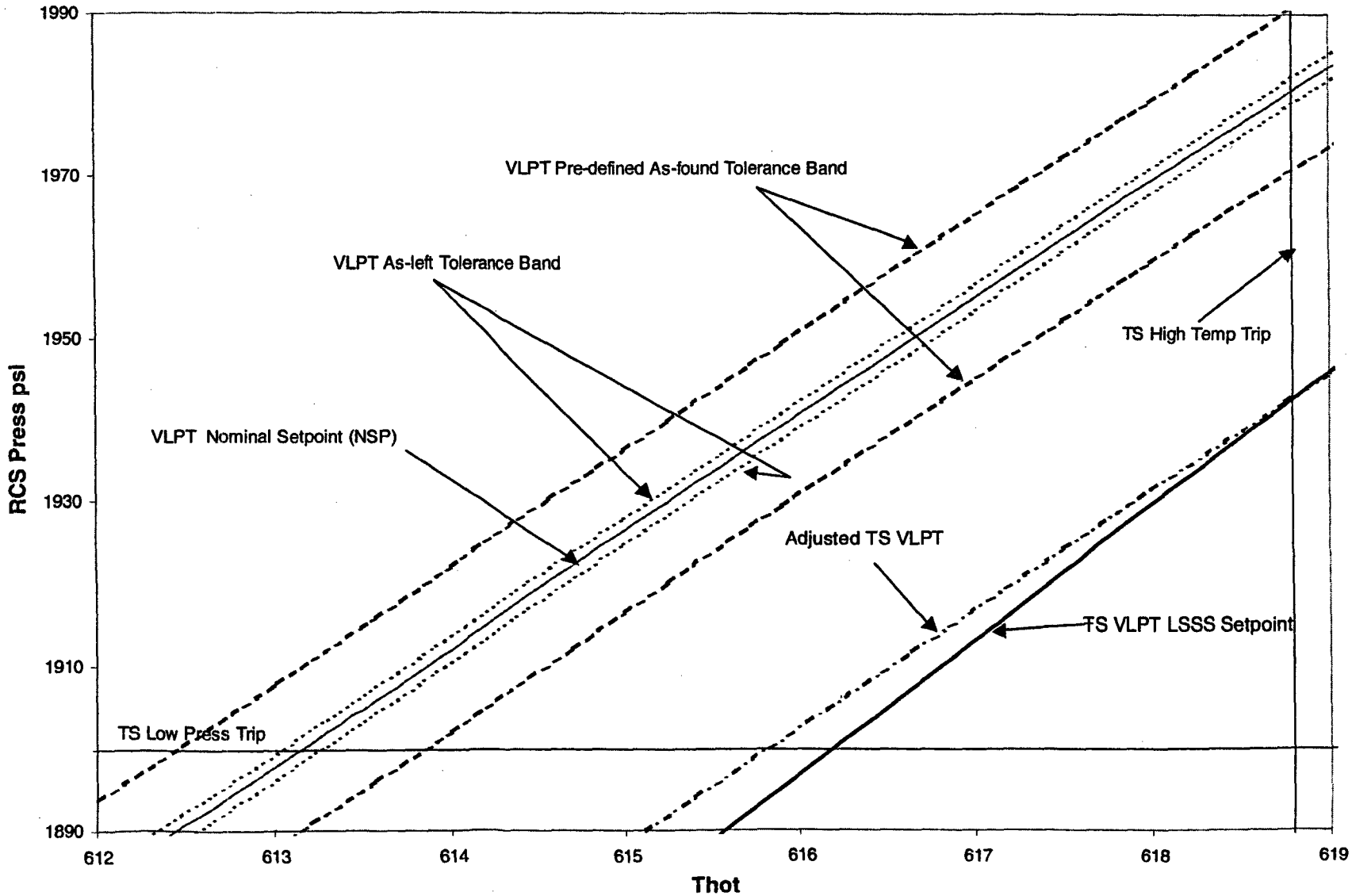
VLPT Setpoint Methodology

Sample of Variable Low Pressure Trip (VLPT) Setpoints and Calibration Criteria



Summary

- Mark-B-HTP design provides improved fuel reliability
- NRC approved Reload Topical Report and methodologies used for Cycle 17 core reload design
- Revised VLPT provides required safety margin and does not challenge plant operation
- NRC approved methodology used to determine VLPT safety limit
- VLPT parameters established based on ANSI/ISA–67.04
- VLPT predefined limits determined based on NRC RIS 2006-17
- TS & TS Bases changes similar to recent NRC approved VLPT amendment for B&W plant design
- TMI Amendment requested to support Cycle 17 startup

Questions / Feedback