Brunswick Steam Electric Plant (BSEP) – Units 1 and 2

Maximum Extended Load Line Limit Analysis Plus (MELLLA+)

DUKE ENERGY® PROGRESS

Purpose of Presentation

Provide NRC -

- Background
- Overview of Proposed License Changes
- License Application Request Contents
  - LAR Body
  - Safety Analysis Report
  - Proposed Markups
  - Supporting Documents
- Similarities with other MELLLA+ Submittals
  - T.S. Instrumentation
  - Standby Liquid Control Boron Enrichment
  - Operational Restrictions
  - T.S. Administrative Requirements
- Differences with other MELLLA+ Submittals
- Licensing/Implementation Timeline

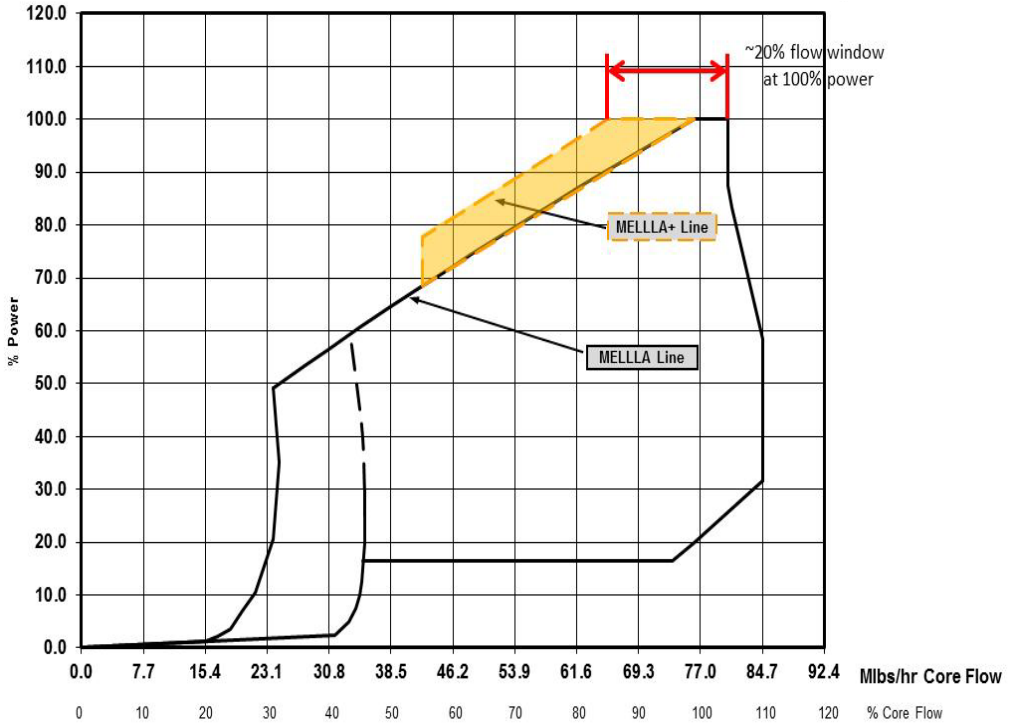
Brunswick Steam Electric Plant (BSEP) - MELLLA+

Background

- The 2002 Extended Power Uprate (EPU) reduced the licensed flow window at rated power from approximately 24% to 6% Total Core Flow.
- MELLLA+ will expand the licensed flow window at 100% power to approximately 20% Total Core Flow.
- Operating domain expansion does not include changes to the licensed reactor power, the maximum licensed core flow or the current dome pressure

Benefits

- Increased net electric generation
  - Lower average pumping power
  - Fewer downpowers
- Fewer reactivity manipulations



Overview of Proposed Licensing Changes

- T.S. Instrumentation
  - Changes consistent with GEH DSS-CD LTR template (NEDC-33075P-A, Revision 8) *
  - TS LCO 3.3.1.1 RPS Instrumentation (Simulated Thermal Power- High setpoints and OPRM Upscale)
  - New proposed LCO actions for equipment out of service including Automated Backup Stability Protection
- Standby Liquid Control Boron Enrichment
  - TS 3.1.7 SLC Boron-10 minimum enrichment increased to ≥92 atom-%
  - Revised graph showing required volume (TS Figure 3.1.7-1) – no changes to boron concentration
- Operational Restrictions
  - License Condition - Operation in MELLLA+ domain not allowed with Feedwater Temperature Reduction (FWTR)
  - LCO 3.4.1 – Operation in MELLLA+ not allowed with Single Loop Operation (SLO)
- T.S. Administrative Requirements
  - TS 5.6.5 - COLR content requirements for MELLLA+ / Updated list of analytical methods
  - New TS 5.6.7 – Reporting requirements supporting LCO 3.3.1.1 changes

* Earlier plans to utilize AREVA's Enhanced Option III stability solution for MELLLA+ were revised to the GEH DSS-CD stability solution

License Application Request (LAR) Contents

- LAR Body
  - Provides roadmap of changes and justification, no significant hazards, etc.
  - Provides specific discussion addressing license changes
  - Additional topics based on Operating Experience from other docketed MELLLA+ submittals
- Safety Analysis Report (SAR)
  - Follows the NRC Approved GEH MELLLA+ Licensing Topical Report (LTR) - NEDC-33006P-A
  - Integrates analyses from GEH, AREVA and Others
  - Summarizes the results of significant safety evaluations
  - Proprietary and non-proprietary versions included
- Proposed Mark-ups
  - Technical Specifications
  - Operating License
  - TS Bases (information only)
- Supporting Documents – proprietary and non-proprietary
  - Methods Applicability Report
  - Representative cycle MELLLA+ Reload Safety Analysis Report (RSAR)
  - Representative cycle Fuel Cycle Design Report
  - LOCA-ECCS Analysis Report

Similarities with other MELLLA+ Submittals

(Monticello, Grand Gulf, Nine Mile Point-2, Peach Bottom)

- T.S. Instrumentation
  - Changes consistent with DSS-CD LTR and other plants
  - Some minor administrative variations
- Standby Liquid Control Boron Enrichment (from ≥47 atom-% to ≥92 atom-%)
  - Not included as part of all MELLLA+ submittals - adopted to provide additional ATWS margin.
  - Minimal changes to existing BSEP TS
  - Similar to approved NMP2 SLC Submittal
- Operational Restrictions
  - Operation in MELLLA+ domain not allowed with Feedwater Temperature Reduction (FWTR)
  - Single Loop Operation (SLO) not allowed in the MELLLA+ domain
- T.S. Administrative Requirements
  - TS 5.6.5 - COLR content requirements for MELLLA+ / Updated list of analytical methods
  - New TS 5.6.7 – Reporting requirements supporting LCO 3.3.1.1 changes

BSEP license changes are consistent with license changes approved for other MELLLA+ Plants

Differences with other MELLLA+ Submittals

The major difference for BSEP is the use of a full core of AREVA ATRIUM™ 10XM Fuel. The justification demonstrating the acceptability of ATRIUM™ 10XM in the MELLLA+ operating domain is addressed in the MELLLA+ SAR as follows:

- GEH methodologies and analyses address:
  - Detect and Suppress Solution – Confirmation Density (DSS-CD) solution
  - Long term ATWS and ATWS instability explicitly modeling ATRIUM™ 10XM fuel
  - Uncertainties in modeling ATRIUM™ 10XM fuel with GEH methods addressed

- AREVA methodologies and analyses address:
  - Thermal-Hydraulics, Core Neutronics, Transient Analysis, Overpressure, LOCA and Stability are all evaluated and acceptable for MELLLA+ conditions
  - There are no SER restrictions on AREVA methodology that are impacted by MELLLA+ operation
  - MELLLA+ core and assembly conditions for Brunswick are equivalent to core and assembly conditions of other plants for which the methodology was benchmarked
  - Additional details on the application of AREVA methods to MELLLA+ conditions are addressed in the AREVA Report ANP-3108P included with the LAR submittal

License Amendment Request Timeline

- BSEP MELLLA+ LAR submittal (both Units) September 2016
- NRC reviews (18 - 24 months) 3Q 2016 – 3Q 2018
- MELLLA+ approval (both Units) 3Q 2018
- MELLLA+ implementation
  - UNIT 1 – Online during B1C22 3Q 2018
  - UNIT 2 – Online during B2C23 3Q 2018

Questions and Discussion?