Public Meeting to Discuss Power Uprate Reviews

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ADVANCE Act – Opportunities to Enable Change

Key Provisions:

- American Nuclear Leadership
- Developing and Deploying New Nuclear Technologies
- Preserving Existing Nuclear Energy Generation
- Nuclear Fuel Cycle, Supply Chain, Infrastructure, and Workforce
- Improving Commission Efficiency

Aligned with intent of recent NRC Activities:

- Reactor Accident Analysis Modernization (RAAM) Project
- SECY-21-0109: Increased Enrichment Rulemaking
- SRM-SECY-16-0033: Commission SRM (RI and combine 50.46a/c)
- Accident Tolerant Fuel and Power Uprate Project Plan/Charter

Updating Power Uprate Guidance (LIC-109/500)

- Industry seeking to increase regulatory stability for sequential and/or combined LAR submittals
- Flexibility for sequential, concurrent reviews is afforded to industry through the LIC-109, “Acceptance Review Procedures,” R2 and LIC-500, “Topical Report Process”
- Early communications through pre-application meetings could address the intent of the LIC-109/500 exception process and reduce unnecessary regulatory burden:
  - Allow combined, sequential LARs for uprates with linked licensing actions:
    - Detail where reviews can be performed in parallel
    - Industry examples to be provided today and in a white paper
  - Allow LARs that references unapproved topical reports:
    - Risk can be minimized by allowing the submittal of LAR after the previous submittal draft SE is issued
  - Allow LAR submittals that depend on the approval of an LAR still under review if requested by the applicant

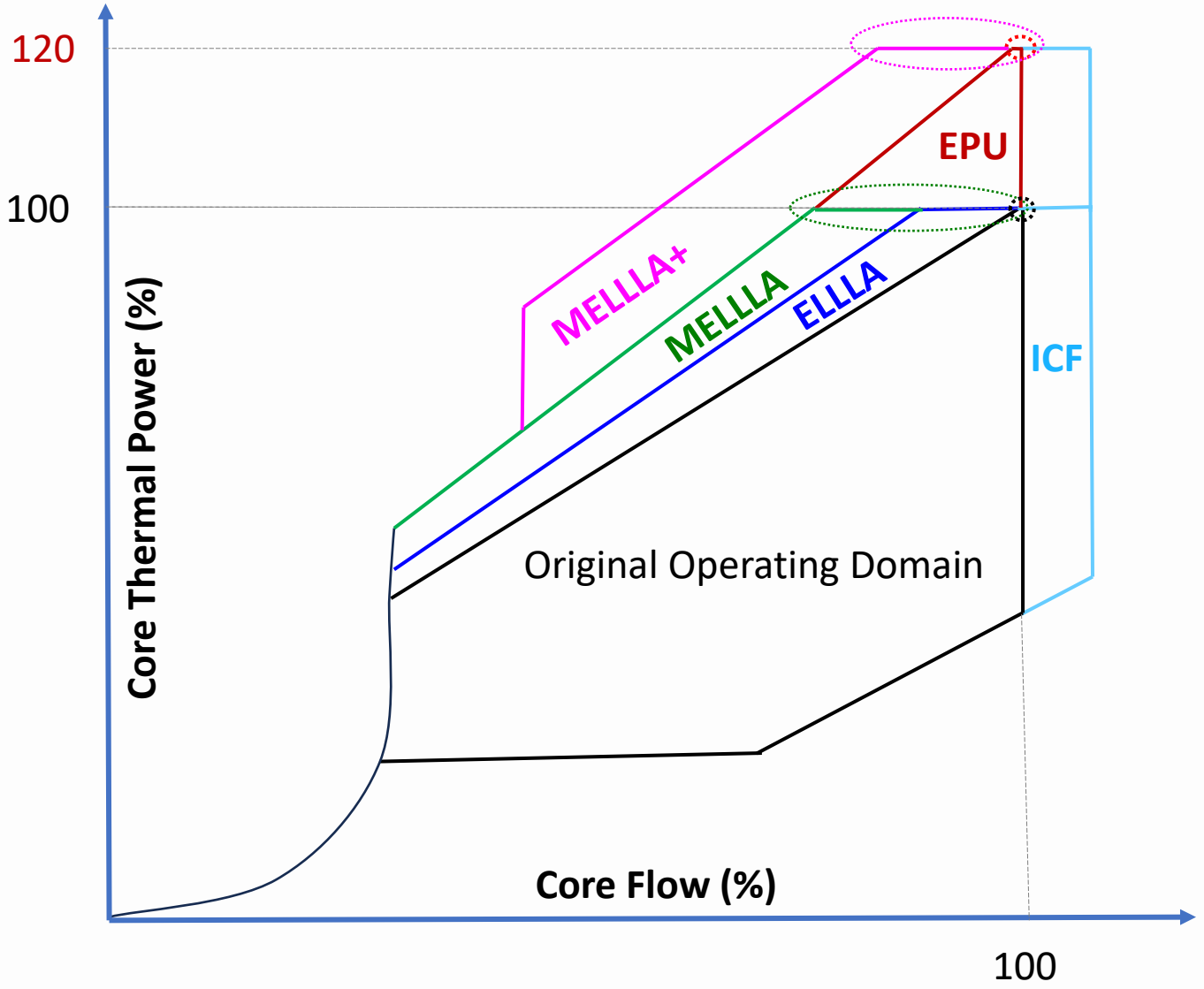
Combined License Applications

EPU & MELLLA+ Case Study -> Implementation Example

	NM2	PB
EPU	31	23
MELLLA+	22	18
MUR		9
Total Review Time	53	50
Total Calendar Time	76	62

Combined License Applications

EPU & MELLLA+ Case Study -> Why EPU & MELLLA+



Combined License Applications

EPU & MELLLA+ Case Study -> Why EPU & MELLLA+

MELLLA+ supports operation at EPU power levels in safe, effective, & efficient manner

Increased operational flexibility

- Improved flow window
- Enables to achieve and maintain EPU power
- Less complicated fuel and core design
- Less complicated cycle management
- Less complicated plant operation
- Less HU error opportunities
- Less OOS needs @ BOP
- Less MCR resource requirement

Fewer Control Rod Maneuvers

- Improved reactivity management -> improved safety
- Fewer fuel conditioning flow ramps -> Improved fuel reliability
- Reduced Operator Burden -> improved safety
- Fewer load drops
  - Higher capacity factor
  - improved equipment reliability
- Less potential for FM to become dislodged and damage fuel

Improved Fuel Cycle Economics

- Less complicated core design
- Less complicated cycle management
- Improved fuel utilization

Combined License Applications

EPU & MELLLA+ Case Study -> Why EPU & MELLLA+

Combined Applications

- MELLLA+ supports operation at EPU power levels in a safe, effective, and efficient manner
- Synergy in analytical scope
- Bundling these LARs into one submittal reduces review time, implementation risk, and operational risk
- Use of NRC approved methods (including methods in review)

Combined License Applications

Power Uprate & Fuel Transition – **Combined Applications**

- Analytical Synergy
- Some units will likely
  - Require IE and HBU to achieve PU (PWRs)
  - Require IE and HBU to achieve 24m cycles (PWRs)
  - Benefit from ATF implementation for IE and HBU transition (BWRs and PWRs)
  - Benefit from ATF implementation for PU (PWRs)

Combined License Applications

Power Uprate & Fuel Transition – **Analytical Synergy**

Power Uprate

- Chapter 15 Analysis
  - AOOs
  - LOCA
  - Stability (BWR)
  - SG tube rupture (PWR)
  - Locked rotor (PWR)
  - RIA
  - ATWS
  - Dose
  - Decay Heat
  - Fire Protection
  - Station blackout
  - etc…
- Chapter 4
- Chapter 6

Fuel Transition

- Chapter 15 Analysis
  - AOOs
  - LOCA
  - Stability (BWR)
  - SG tube rupture (PWR)
  - Locked rotor (PWR)
  - RIA
  - ATWS
  - Dose
  - Decay Heat
  - Fire Protection
  - Station blackout
  - etc…
- Chapter 4
- Chapter 6

Improving Efficiency through Conditioning

Consider the use of Licensing Conditions to facilitate approval of amendments

- LIC-100 addresses Obligations as legally binding requirements imposed through applicable rules, regulations, orders and licenses, to be reserved for matters that satisfy the criteria of 10 CFR 50.36 or are otherwise found to be of high safety or regulatory significance.
- Future analyses may need to account for HBU/IE, but current methodologies are not necessarily approved for use for these conditions. (e.g., Spent Fuel Pool Criticality)
- Use of License Conditions would restrict implementation of methodologies or analyses until a time when the conditions exist to allow their application.
- Potential for more timely reviews of licensing submittals containing HBU/IE content while maintaining control over when the licensee can implement

Other issues: EQ and Implementing HBU

- Impact evaluation performed for uprated HBU/IE reactor utilizing AST (proposed Reg Guide 1.183 Rev 2) vs TID-14844 source term for EQ
  - Core average burnup (end of cycle) increased from 40 to 47 GWD/MTU
  - EQ update for sump fluid using AST resulted in a 700% 1-year integrated dose increase vs ~10% dose increase using TID
  - Additional cost of using AST for EQ is estimated to exceed $10M per site due to component replacement and relocation
- While AST for EQ is specifically noted in the draft of Reg Guide 1.183, Rev. 2 (via referral to Reg Guide 1.89, Rev. 2), results above would lead licensee to elect not to transition to AST from TID
  - Utilizing TID source term for EQ is justified from a regulatory and technical position; related submittals would be made using TID
  - Each submittal would have to include an individual justification for using TID source term
  - These individual justifications would result in increased time to prepare and review submittals

Mandatory application of AST for EQ would impact the decision to pursue HBU/IE

Questions/Comments/Discussions