Turkey Point Units 3 and 4

2nd Pre-Submittal Meeting Regarding

License Amendment Requests for Transition to 24-Month Fuel Cycles

June 28, 2023

FPL Project Team

- Steve Catron — Director Licensing & Reg. Compliance
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Westinghouse Project Support

Meeting Agenda

- Objectives
- Spent Fuel Pool Criticality Analysis and related items
- 24-Month Fuel Cycle Transition
- Proposed Schedule
- Questions

Objectives

- **Describe the criticality analyses methodology for the proposed Turkey Point Units 3 and 4 License Amendment Request (LAR)**
  - Incorporates fuel design changes
  - Incorporates fuel management changes due to 24-month cycles
  - Updates analysis to comply with latest guidance
- **Update 24-Month Fuel Cycle LAR content from December 7, 2022, pre-submittal meeting**
- **Seek feedback from NRC staff**

Spent Fuel Pool Criticality Analysis

- **Current criticality analysis was implemented ~10 years ago**
- **FPL has decided to move to 24-month cycles, which will impact fuel design and depletion parameters in current criticality analysis**
  - New criticality analysis to supersede current analysis
- **Fuel Design changes:**
  - **ADOPT** fuel pellets (higher theoretical density)
  - **AXIOM** fuel cladding
  - **PRIME** advanced fuel features
  - Adding Gadolinium as integral burnable absorber
  - Removing reduced enrichment axial blankets (fully enriched)
- **Depletion Parameters changes:**
  - Soluble boron
  - Axial profiles

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Spent Fuel Pool Criticality Analysis

- **The new analysis will follow the guidance of NEI 12-16, Revision 4 as endorsed by RG 1.240, Rev. 0**

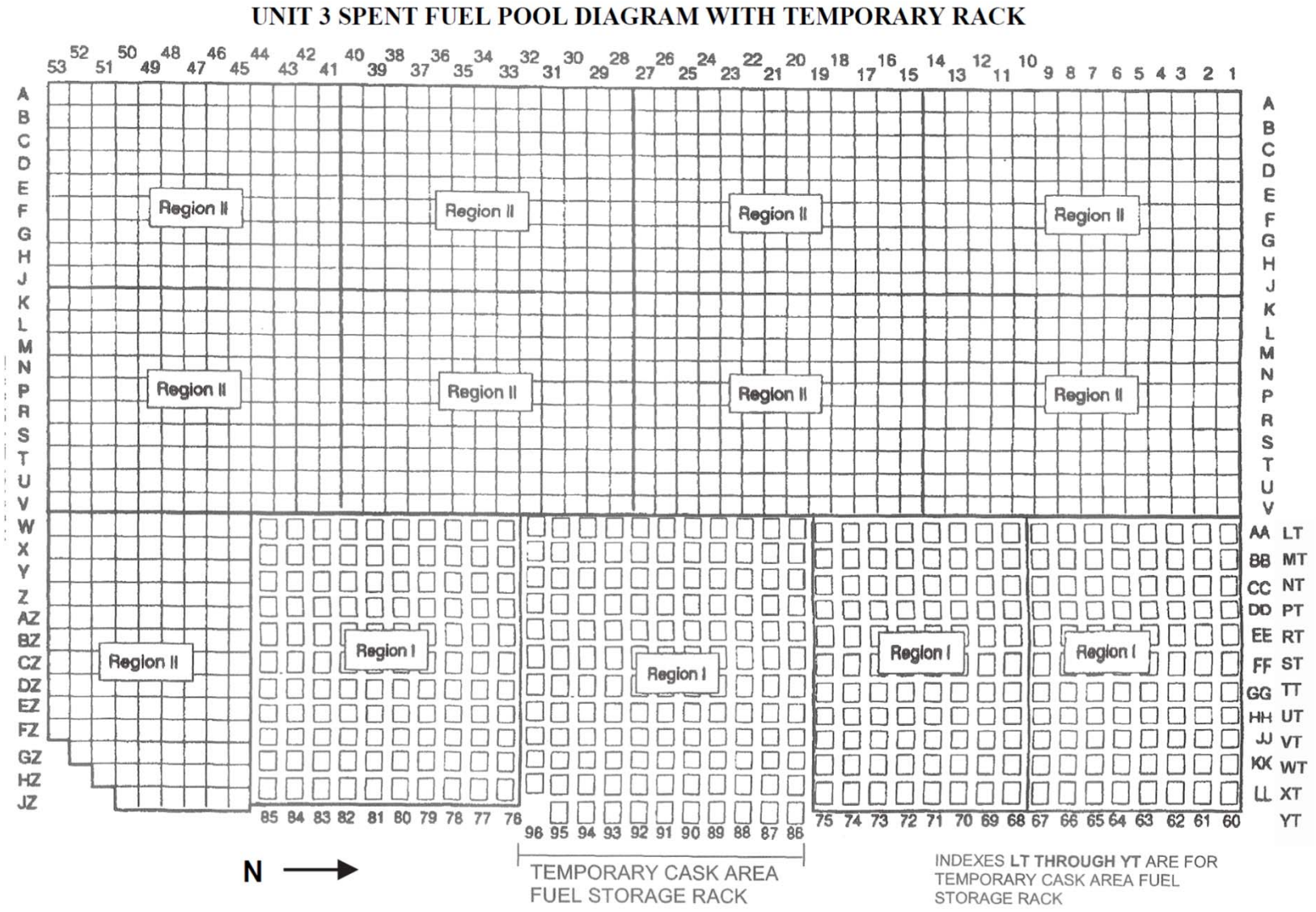
- **Same as for current criticality analysis, new analysis will be applicable to spent fuel pools for both units**
  - Analysis also addresses new fuel rooms

- **Same as for current criticality analysis, new analysis credits soluble boron in spent fuel pool**

- **Same as for current criticality analysis, new analysis does not credit Boraflex, relies on Metamic inserts, control rods and empty cells for criticality control**
  - Boral in cask area racks

Turkey Point Unit 3 Spent Fuel Pool Diagram

- **Pools have Region 1, Region 2, and a Cask Area Rack**



Spent Fuel Pool Criticality Analysis

Methodology

- **Criticality analysis performed with**
  - Two-dimensional code PARAGON Version 1.4.3 with cross-section library based on ENDF/B-VI.3
  - SCALE Version 6.2.4 with ENDF/B-VII.1 252 group cross-section library

- **Depletion uncertainty is 5% of the reactivity decrement**

Spent Fuel Pool Criticality Analysis

Methodology (continued)

- **Majority of items in NEI 12-16 Rev. 4 Checklist included, with a few exceptions:**
  - Schematics of guide tubes, fuel inserts
  - Rack model nominal temperature with bias for limiting temperature
  - Borated uncertainties not calculated, raised soluble boron by 50 ppm
  - In-core thimble depletion considered negligible given short duration of operation with inserted thimbles
  - Full pool misload accident analyzed, other accidents are bounded
  - Expect to resolve issue with regards to including the HTC critical experiments; if not, will adjust as necessary

Spent Fuel Pool Criticality Analysis

Criticality Fuel Designs

1) Pre-EPU with no axial blankets

- Used in Unit 3 Cycles 1-13 and Unit 4 Cycles 1-15

2) Pre- and Post-EPU with mid-enriched blankets

- Used starting with Unit 3 Cycle 14 and Unit 4 Cycle 16
- Will continue to be used through completion of 18-month cycles (Cycle 34 for both units)

3) (NEW) Post-EPU with fully enriched blankets

- Will be used for 24-month cycles, starting with Cycle 35 for both units

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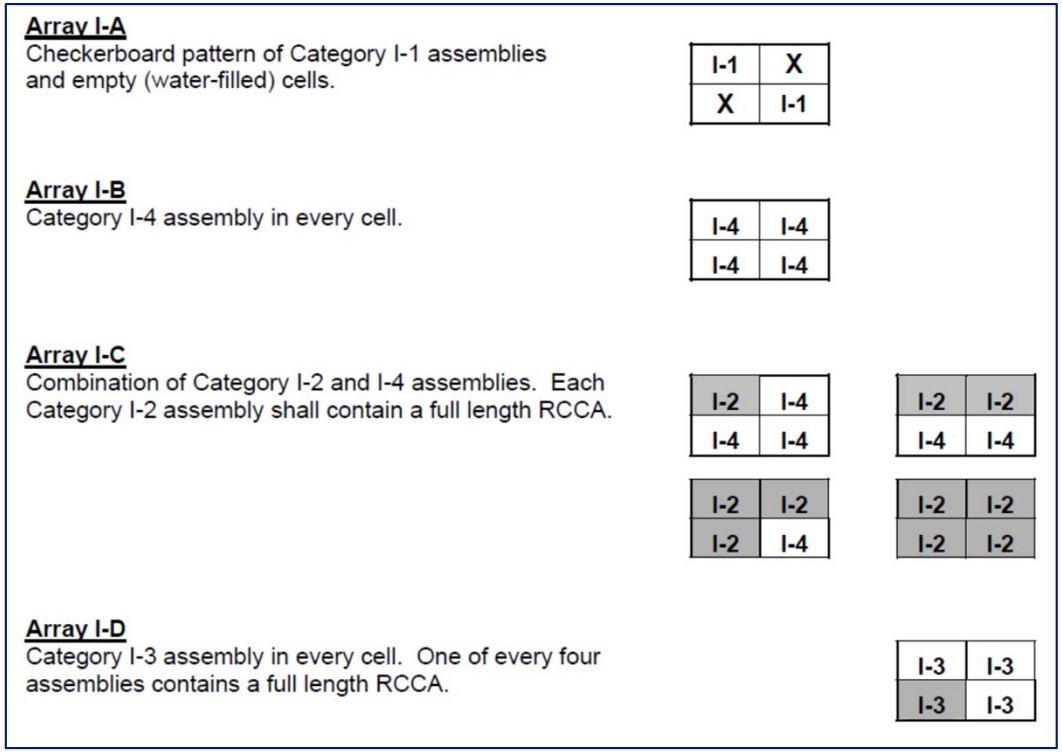
Spent Fuel Pool Criticality Analysis

Region 1 Storage

- **Four fuel categories and four storage arrays in Region 1**
- **The Region 1 fuel categories and storage arrays are the same as current criticality analysis**
  - Modified burnup requirements



- **Region 1 Boral cask area racks are full load to maximum enrichment**
  - Modeled areal density lower than minimum certified

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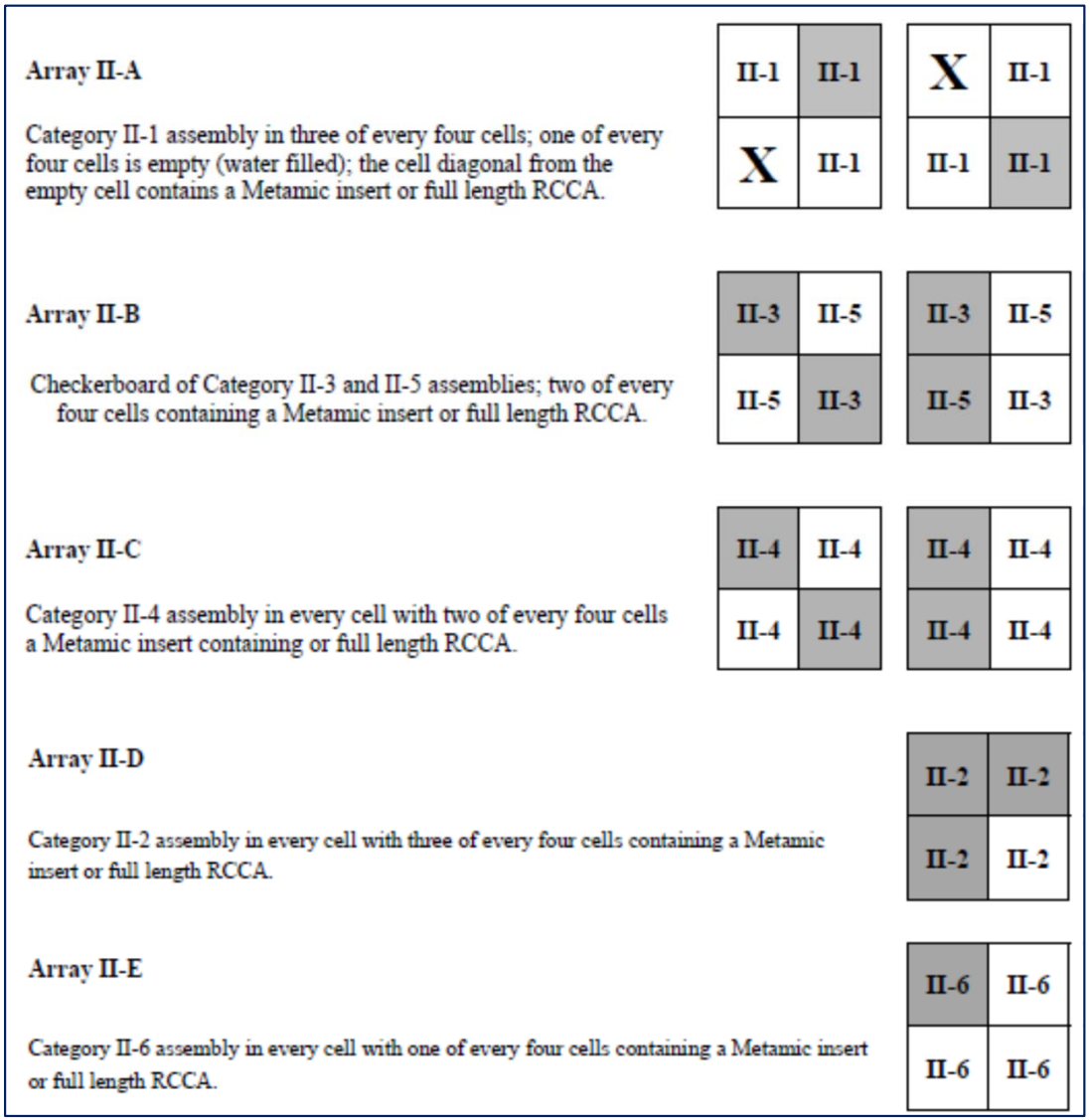
Spent Fuel Pool Criticality Analysis

Region 2 Storage

- **Six fuel categories and five storage arrays in Region 2**
- **Fuel category II-6 and storage array II-E are new**
  - All other fuel categories and storage arrays are the same as current criticality analysis, with modified burnup requirements
- **Interface restrictions between Regions 1 and 2 are the same as current criticality analysis**
  - Requires Region 2 inserts/RCCAs/empty cells to be in row adjacent to Region 1



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Spent Fuel Pool Criticality Analysis

Additional Information

- **Analysis includes a 0.005 administrative margin to regulatory limits**
- **Results for the updated analysis may slightly increase the current spent fuel pool boron concentrations**
- **Results for the new fuel room analysis support maintaining the same requirements as current analysis**
- **Current criticality storage requirements are mainly in CTS 5.5, "Fuel Storage"**
  - Improved Standard Tech Specs (ITS) to be implemented, criticality storage requirements being moved to ITS 3.7.14, "Spent Fuel Storage" and ITS 4.3, "Fuel Storage"

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Absorber Monitoring Programs

- **Turkey Point uses Metamic inserts in Region 2 as well as crediting Boral in the cask area racks**

- **Metamic has a monitoring program described in UFSAR Section 16.2.17, "Metamic Insert Surveillance Program," as well as Section 17.2.2.27, "Monitoring of Neutron-Absorbing Materials other than Boraflex"**
  - Monitoring requires visual inspections and measurements of installed inserts and coupon testing

- **Boral has a monitoring program described in UFSAR Section 17.2.2.27, "Monitoring of Neutron-Absorbing Materials other than Boraflex"**
  - Monitoring requires visual inspections of installed racks and in-situ testing

24-Month Fuel Cycle Transition LAR

- TS 4.2.1 (Fuel Design) is modified to include AXIOM cladding to the list of non-zirconium based cladding material
- TS 4.2.1 is also modified to recognize the inclusion of dopants into the standard UO_2 fuel pellets
- TS 5.6.5.b is modified to include WCAP-18546-P-A (AXIOM cladding) into the list of approved topical reports for the development of the COLR
- Changes to UFSAR Section 14.2.6 necessary to reflect the use of a new methodology for analyzing the impact of control rod ejection

24-Month Fuel Cycle Transition

- **Surveillance Frequency Extension Method**

  The Technical Specification Surveillance Frequencies impacted by the increase in cycle duration will be extended from 18 months to 24 months using the deterministic methods described in Generic Letter (GL) 91-04.

  - The non-EPU RTS/ESFAS functions will first be upgraded to the same setpoint methodology as described in the UFSAR for the EPU, i.e., RG 1.105, Rev. 3 compliant. [Ref: WCAP-17070-P-A, Rev.1, January 2011]
  - Calibration SR loop uncertainties will be determined for 24 months + 25% grace.
  - Non-calibration SRs will be reviewed for safety impact, test history, etc.

- **LAR will revise as necessary Nominal Trip Setpoints (NTSPs) and/or Allowable Values (AVs) impacted by the revised loop uncertainty calculations**

Proposed Schedule

Submit SFP Criticality LAR	Early August 2023
Submit 24-Month Fuel Cycle LAR (with attached AXIOM Exemption Request)	Late August 2023
Requested Approval for SFP Criticality LAR	September 2024
Requested Approval for 24-Month Fuel Cycle LAR	September 2024
24-Month Fuel Cycle Implementation for Unit 4	Spring 2025
24-Month Fuel Cycle Implementation for Unit 3	Spring 2026

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Questions?