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# Hope Creek Fuel Transition PSEG /NRC Meeting 6/2/2004

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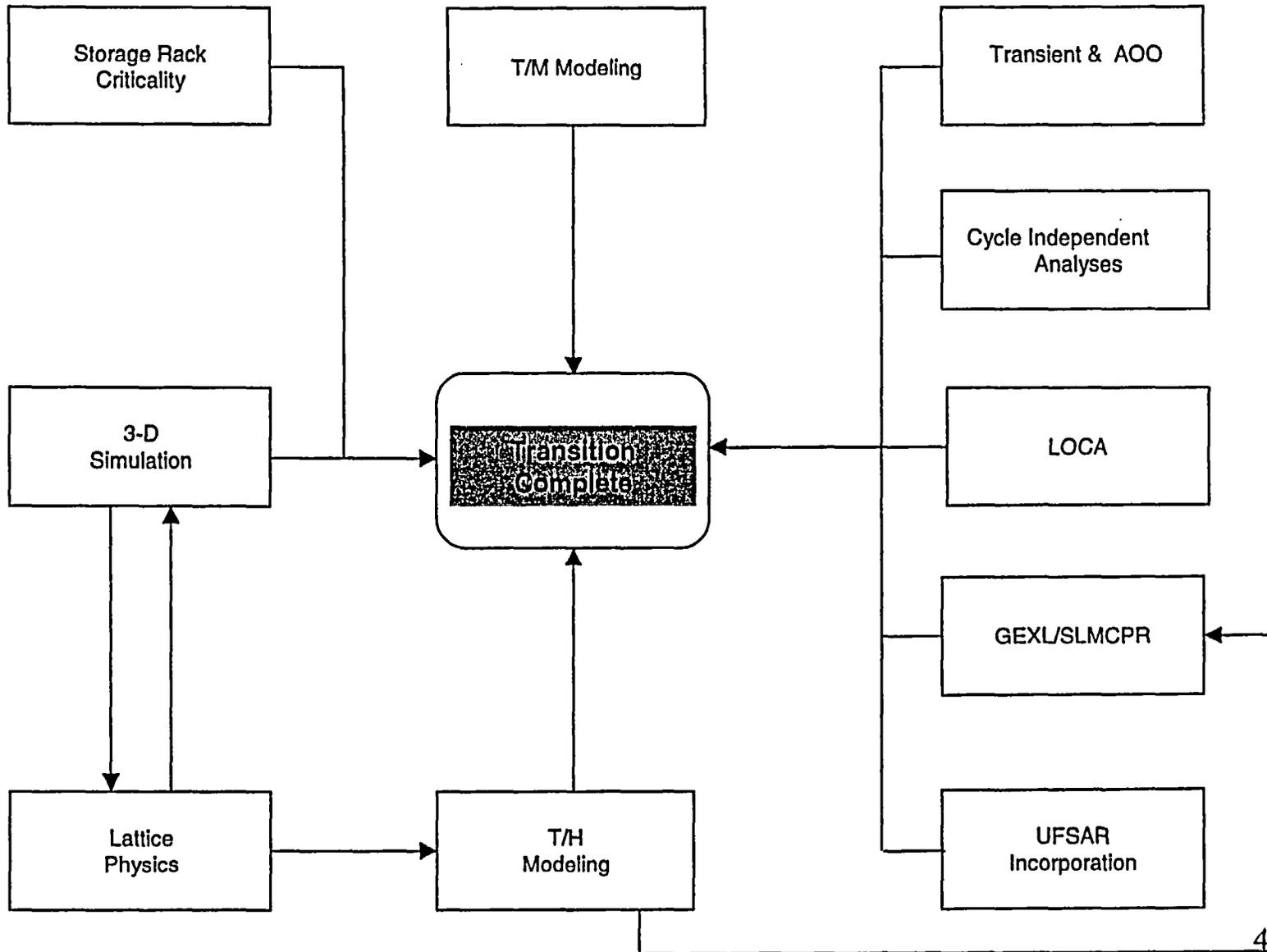
*Non-proprietary version*

# Meeting Objectives

- Provide overview of Hope Creek fuel transition
- Discuss licensing approach
- Gain NRC insights from previous fuel transitions

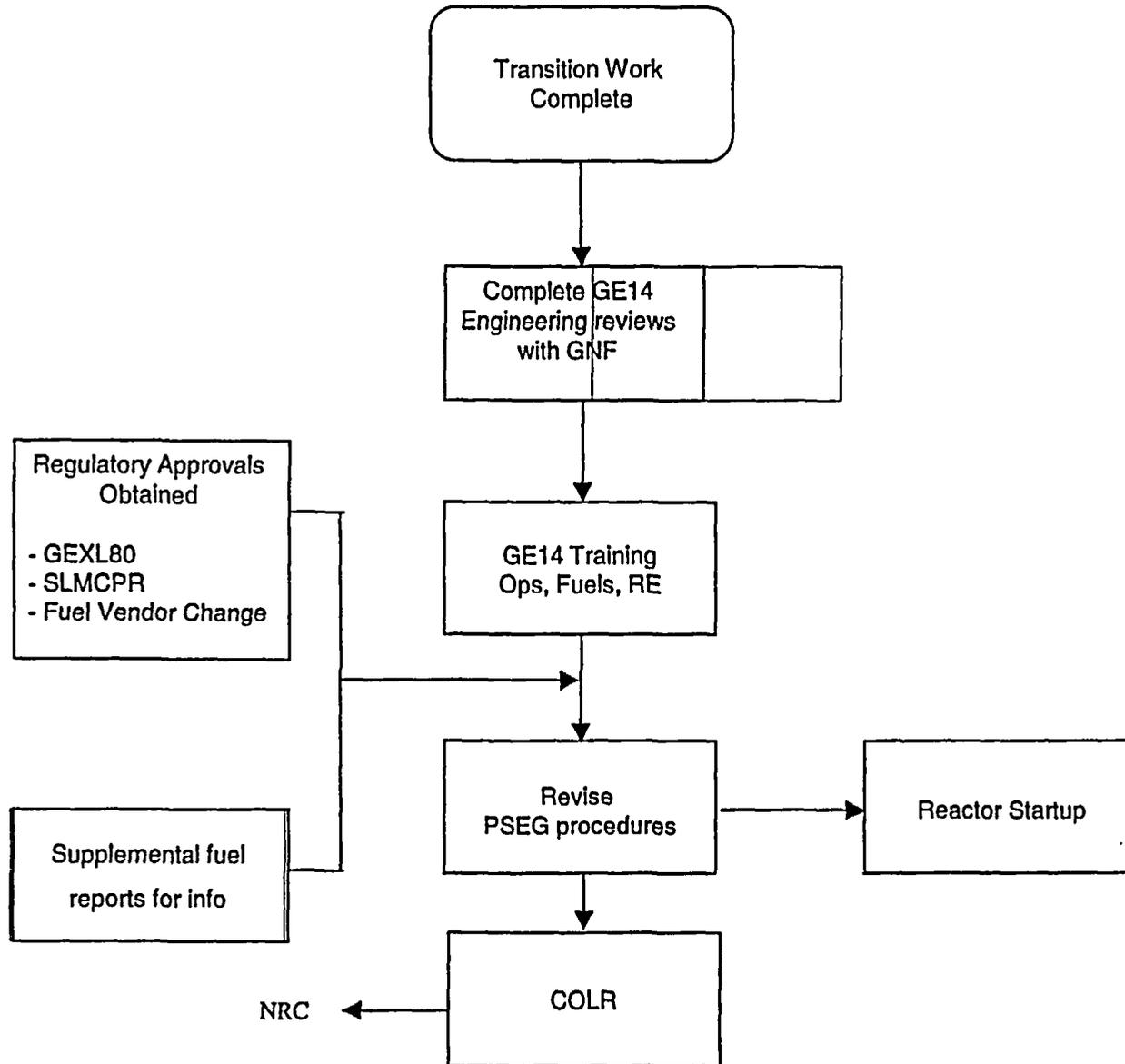
# Agenda

- GE14 Hope Creek Fuel Transition Overview
- Discuss LCR # H03-08 (Fuel Vendor Change)
- Discuss LCR # H04-03 (SLMCPR)
- Discuss Fuel Supplemental Reports
- Integrated GE14 fuel & EPU-MELLLA Program in Hope Creek reactor
- Future Communications Forum
- Questions & Answers



### Applied to GE14 and SVEA-96+ Fuel

- General Criteria
- Stability Licensing Acceptance Criteria
- Nuclear
- SLMCPR
- Thermal-Mechanical
- Refuel Accident
- LOCA
- Thermal-Hydraulic
- Rod Drop Accident
- OLMCPR
- Critical Power Correlation
- Overpressure Protection Analysis
- ATWS





## *GE14 Transition*



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# Fuel Vendor Change RAI

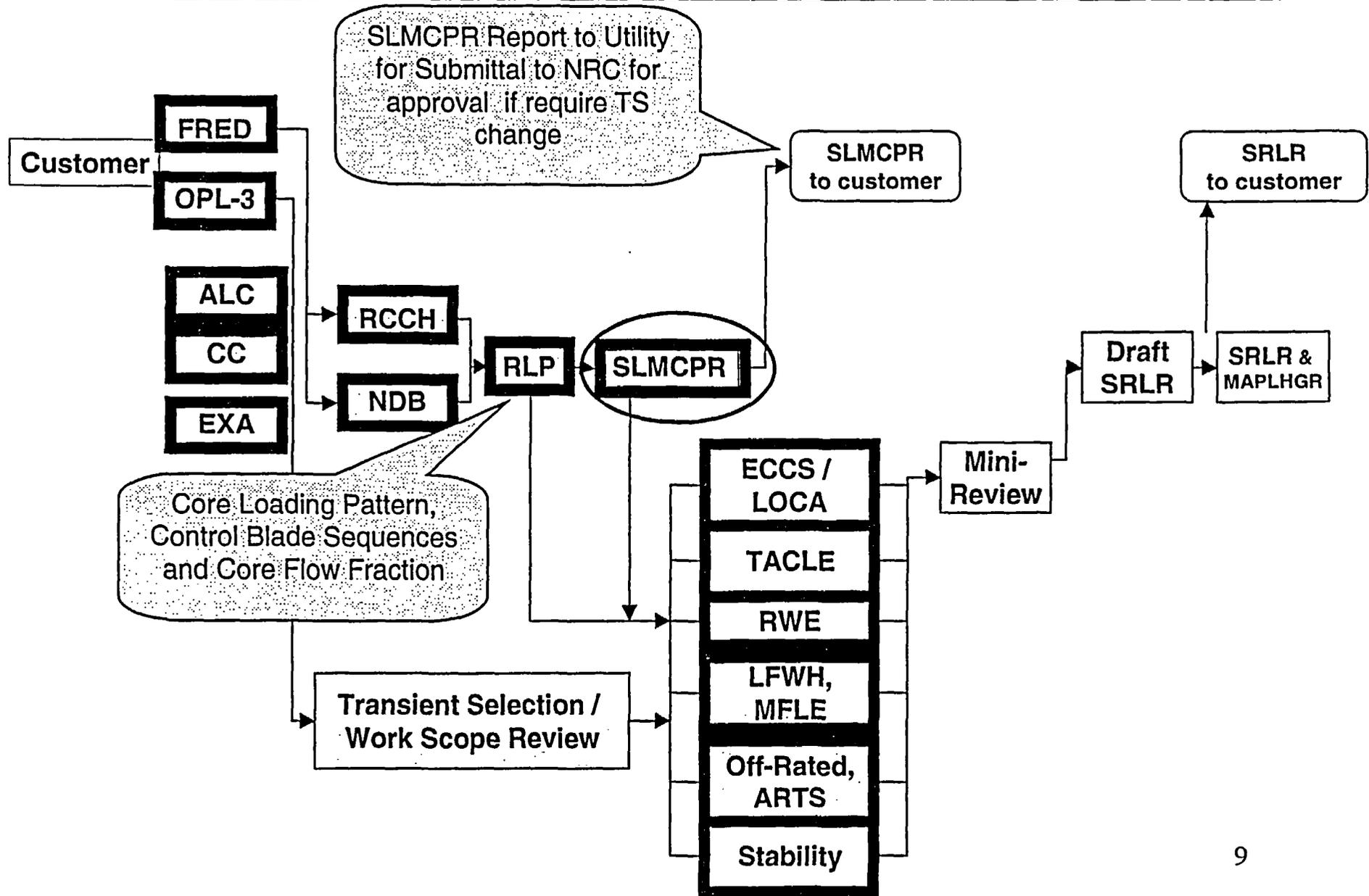
- LCR submitted 12/24/03
- RAI conference call 5/10/04
- PSEG response 6/7/04

# Hope Creek Cycle 13 Safety Limit Minimum Critical Power Ratio (SLMCPR)

## NRC Items of Interest

- Cycle 9 – 12 TIP Comparisons
- Cycle 12 SLMCPR Comparison
- SVEA96+ MCPR Performance using GNF Methodology

# Standard Licensing Process





# SLMCPR Uncertainties



Hope Creek Cycle 12 and 13

## DESCRIPTION Non-power Distribution Uncertainties

Revised NEDC-32601P-A

Core flow rate (derived from pressure drop)	2.5 Two Loop 6.0 SLO
Individual channel flow area	[[ ]]
Individual channel friction factor	5.0
Friction factor multiplier	[[ ]]
Reactor pressure	2.04
Core inlet temperature	0.2
Feedwater temperature	[[ ]]
Feedwater flow rate	[[ ]]

## Power Distribution Uncertainties

Reduced NEDC-32694P-A

GEXL R-factor	[[ ]]
Random effective TIP reading	1.2 Two Loop 2.85 SLO
Systematic effective TIP reading	[[ ]]
Integrated effective TIP reading	[[ ]]
Bundle power	[[ ]]

Hope Creek  
TIP  
Uncertainties  
are consistent  
with approved  
value



# TIP Comparisons

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# SLMCPR Comparison

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- SLMCPR analysis
  - Simulates the limiting point during the transient
  - Verifies that at least 99.9% of the rods in the core would be expected to avoid boiling transition
  - Performed using NRC approved GNF methodology
- Cycle 13 evaluation submitted for NRC approval
- Cycle 12 being provided for comparison



# Comparison Results



QUANTITY, DESCRIPTION	Hope Creek Cycle 12	Hope Creek Cycle 13
Number of Bundles in Core	764	764
Limiting Cycle Exposure Point <sup>1</sup>	EOR-1.1K	EOR-1.1K
Cycle Exposure at Limiting Point (MWd/MTU)	12020	10704
Reload Fuel Type	SVEA	GE14
Latest Reload Batch Fraction, %	32.5	21.5
Latest Reload Average Batch Weight % Enrichment	3.61	4.02
Core Fuel Fraction for GE14 (%)	0.0	21.5
Core Fuel Fraction for GE9B (%)	6.9	0.0
Core Fuel Fraction for SVEA (%)	93.1	78.5
Core Average Weight % Enrichment	3.44	3.64
Core MCPR (for limiting rod pattern)	1.38	1.42
[[		]]
[[		]]
[[		]]
Calculated Safety Limit MCPR (Two Loop)	1.09	1.06
Calculated Safety Limit MCPR (SLO)	1.10	1.08

# Comparison Results

<u>Parameter</u>	<u>EOR Cycle 12</u>	<u>EOR Cycle 13</u>	<u>Expected Effect on Cycle 13 SLMCPR (per correlation)</u>
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SLMCPR

DLO

SLO

[[

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1.06

[[

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1.08

DLO change agrees with expectation

SLO change is less due to approaching minimum calc value of ~ 1.07



# SLMCPR Historical Data

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# MCPR using GNF Methods

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# SLMCPR Conclusions

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- Reduced power uncertainties are applicable to Hope Creek mixed cores (GE14 & SVEA 96+)
- Differences between Cycle 12 and Cycle 13 SLMCPR results are fully understood
- Results agree with estimations and GNF historical database using NRC approved methodology

- **Four Reports to be submitted “for information”**
  - **Fuel Transition Report**
  - **Mixed Core Analysis Report**
  - **Stability**
  - **LOCA Report**
- **Address the Cycle independent and Cycle dependent requirements for introducing GE14 at HCGS**
- **Address the mixed core performance of GE14 and SVEA-96+**
- **Apply GENE/GNF Methods to SVEA-96+ for consistent design and licensing bases**

- Decay Heat
- Reactor Internal Structural Integrity
- Radiation Source Term
- Reactor Internal Pressure Differences
- Seismic
- Combustible Gas Control (LOCA hydrogen generation)
- Mechanical Compatibility
- Emergency Procedure Guidelines
- Neutron Fluence
- Reactor Recirculation Pump Seizure Event
- Fuel Handling Accident
- Anticipated Transient Without SCRAM
- Fuel Storage Requirements
- Banked Position Withdrawal Sequence Acceptability
- Appendix R



- **Qualification of Nuclear Methods for SVEA96+ Application**
  - **TGBLA06 and MCNP Models**
  - **3D Simulator Accuracy**
  - **Lattice Physics Results for (SVEA-96+ and GE14)**
- **HCGS Core Follow Benchmark**
- **TIP Comparisons**
- **Thermal Mechanical Analysis Report**
- **SLMCPR Report**
- **Fuel Management Summary**
- **SRLR**



- **First cycle with GE14 Fuel will also be first cycle with OPRM system armed and operable**
- **Thermal hydraulic compatibility report concluded no adverse effect on relative performance of GE14 and SVEA-96+ fuel designs operating in the Hope Creek core**

- **ICA region confirmation or adjustment**
  - Reference Loading Pattern from cycle 13 core design input will be used to perform decay ratio calculations
  - Either will confirm or adjust the existing ICA boundaries
- **Plant-specific DIVOM curve generation**
  - Reference Loading Pattern from cycle 13 core design input will be used

- LOCA analysis using SAFER/GESTR
- Demonstrate acceptable performance of GE14 and SVEA-96+fuel
- Demonstrate plant's ability to operate safely and meet all safety and regulatory requirements

## LOCA Report Content

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- **Description of Models (GE14 core & SVEA 96+ core)**
- **Analysis approach (full break spectrum analysis)**
  - Large recirculation line breaks
  - Small recirculation line breaks
  - Non-recirculation line breaks
  - Alternate operating modes
- **Input to Analysis (CLTP – 3339 MWt)**
- **SER Compliance**
  - Licensing basis PCT evaluation
  - Plant Specific upper bound PCT not required
- **Conclusion**

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- MSAR - Submittal - 06/04
    - Non-fuel dependent evaluations
      - New methods of evaluation
    - Fuel dependent evaluations
      - GE14 representative core of fuel
      - Similar plants
  - Updated MSAR - Submittal – 09/04
    - Plant and fuel specific analyses
    - Additional TS changes if required
  - Permits additional time for NRC Reviews

- Prerequisites
  - Alternative source term - approved
    - Amendments 134 & 146
  - GEXL80 - submitted
  - Fuel vendor change - submitted
  - SLMCPR - submitted
  - P/T Limits - submitted
  - MELLA - all required submittals by Sep 04



## EPU Licensing Approach

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- EPU License Change Request - March 2005
  - 3840 MWt
- Cycle 14 Fuel Supplemental Reports - March 2005



# Future Communications

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- Establish periodic status communications with SRXB regarding progress of reviews
- Next Meeting
  - Approximately July, following Fuel Transition Report transmittal



# Open Questions

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