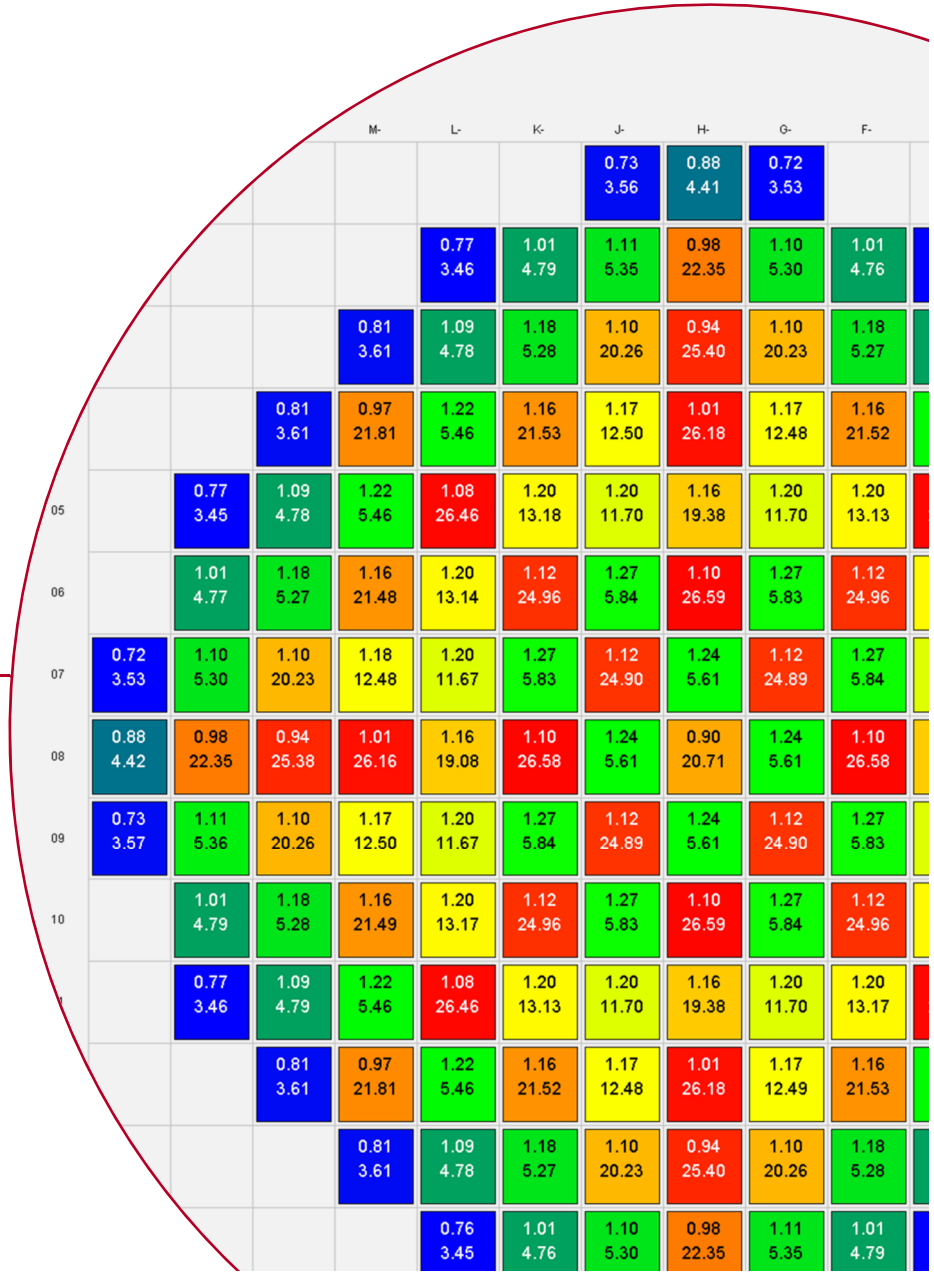
Studsvik

CMS5 PWR Generic Licensing
Topical Report Overview

USNRC Pre-Submittal Meeting
April 8th 2015, 8am – 12pm EST



Outline

- Introduction
- Scope of Topical Report
- Utility Partners
- Topical Report Structure
  - Code Methods/Validation
  - Nuclear Reliability Factor (NRF) Methodology
  - NRF Method Application to produce Generic PWR Nuclear Reliability Factors
- Schedules

Introduction

- The CMS5 codes are an evolution from our established codes CMS3 (i.e. CASMO3/4, CMSLINK, SIMULATE3).
- CMS5 improves upon fundamental cross-section data use and physical model treatment.
- CMS3 has been previously licensed by many Studsvik Scandpower customers
  - Dominion (VEPCO)
  - Arizona Public Services
  - Duke Energy
  - Southern California Edison
  - Omaha Public Power District
  - Entergy
  - Yankee Atomic
- Since there was much overlap and repetition in the above submittals, and in order make the transition for our customers to CMS5 more efficient (including NRC review), Studsvik Scandpower will submit a CMS5 Generic Topical Report, per LIC-500 [16] guidance.
- The CMS5-PWR Generic Topical Report will contain the information needed to allow CMS5 customers to perform [
  ].
- It is expected that most customers will chose to use the Generic Letter 83-11 [14,15] process of moving to the use of CMS5, including those that already have licensed CMS3.

Scope

- The information presented in the TR will demonstrate that the CMS5 codes are acceptable for performing all [
-
-]

Range of Applicability

Parameter	Range
Pin Lattice Geometries	Square Pitch Lattice
Integral Burnable Absorber	[ ]
Fixed Burnable Absorber	[ ]
Control Rod Absorber	[ ]
Reactor Size	[ ]
U235 enrichments	[ ]
In-Core Detector Types	[ ]
Soluble Boron	[ ]

Utility Partners

- The benchmarking of operating PWR plants is an essential part of the demonstration of the accuracy of the CMS5 codes.
- We are using the results provided by a utility partner as part of the TR.
- Our current partner is Dominion Resources.

Code Methodology

- The topical report will present the right size description of the methodology associated with each code in CMS5 (i.e. CASMO5, CMSLINK5, and SIMULATE5)
- The purpose of the methodology description is to provide the reviewer with an appropriate level of detail to understand the data and process of how each code functions.
- The descriptions are supported by references to public literature or internal manuals that describe the basis and derivation of the models implemented.

Code Validation

- The CMS5 system of codes have been validated in two ways.
  - Comparison to measured data, either experimental, or operational.
  - Comparison to other codes typically higher order methods such as Monte-Carlo.
- The results of this validation are summarized in the topical report and include:
  - CASMO5 predictions of critical experiments
    - [
    -
    -
    -
    -]
  - CASMO5 predictions of isotopic measurements
    - [
    -]

Code Validation (Cont.)

- CASMO5 Code to Code predictions
  - [
  -]
- CMSLINK5
  - [ ]
- SIMULATE5
  - [
  -]
- CMS5 System
  - 7 Operating PWR Multi-Cycle Benchmarks

Nuclear Reliability Factor (NRF) Methodology

- Process (with Bases) to determine appropriate factors to apply to CMS5 predictions
  - Intended to be used by licensees who have “bounding parameter” style core reload design processes
  - Two main methods of determining conservative NRFs for each reload parameter
- [
  -
  -
  -]
- [
  -
  -
  -]

NRF Methodology Application

- The proposed NRF methodology will be applied to 7 PWR reactors.
- The benchmark will include over 60 cycles of data.
- Measurement Comparisons are made to:
  - Critical Boron Concentration
  - Startup Physics Test Predictions
  - Flux Maps

- Plant A, Westinghouse 2-Loop System
  - 14x14 Small Water Hole Lattice
  - Offset Movable Fission Chamber Incore Detectors
- Plant B, CE 2x4-Loop System
  - 14x14 Large Water Hole Lattice
  - Fixed Rhodium Incore Detectors.
- Plant C, Westinghouse 4-Loop System
  - 17x17 Small Water Hole Lattice
  - Movable Fission Chamber Incore Detectors
- Plant D, 2 Units, Westinghouse 3-Loop
  - 15x15 Small Water Hole Lattice
  - Movable Fission Chamber Incore Detectors
- Plant E, 2 Units, Westinghouse 3-Loop System
  - 17x17 Small Water Hole Lattice
  - Movable Fission Chamber Incore Detectors

NRF Methodology Application (Cont.)

- The benchmark cycle data will be analyzed to produce Nuclear Reliability Factors (NRF's) for parameters important to operation and safety.
- The resulting Generic NRF's could be used by Studsvik Scandpower customers, who fall within the range of applicability.
- The customers may use the Generic Letter 83-11 [14,15] process to demonstrate proficient use of the code and reference the TR.
- Also customers may perform plant specific modeling and analysis to generate their own NRF's using the approved method.

Schedule

- The current schedule for the Topical Report to be submitted is in [ ].
- NRC target approval date of [ ] to accommodate lead customer (Dominion) plans to reference the TR for a reload occurring in the spring of [ ]
- Indication from other customers is to adopt the new codes following the issuance of the SER.

References

1. [
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11.
12.
13.]
14. USNRC GL83011, “Licensee Qualification for Performing Safety Analyses in Support of Licensing Actions, Generic Letter No. 83-11”, February 8, 1983
15. USNRC GL83011s1, ”Licensee Qualification for Performing Safety Analyses, Generic Letter 83-11, Supplement 1”, July 24, 1999
16. LIC-500, Revision 4 , “Topical Report Process”, December 21, 2009

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