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Increased Burnup – focus on Coolability and Criticality

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Objectives

- Recall Framatome's High Burnup Licensing plan
- Discuss Framatome's progress evaluating FFRD effects
- Focus on Coolability and Criticality for the Increased Burnup Topical Report
- Provide an opportunity for NRC feedback

Agenda

Introduction and background

Core Cooling Following FFRD (closed)

Criticality Following FFRD (closed)

Summary and Next Steps (closed)

Introduction and Background

Morris Byram

Introduction and Background

High Burnup topical pre-submittal meeting to date

Advanced Codes and Methods topical reports

Scope of future topical report submittals – Increased Burnup

High Burnup Topical Report Pre-Submittal Meetings

- Overall High Burnup Topical Report Pre-submittal……..12/18/2020
- FFRD - Use of GOTHIC for Fuel Particle Transport…….. 2/24/2021
- High Burnup Topical Report Content (Topics and Expected Sample Problems) and Radiological Dose……5/25/2021
- FFRD – Core Coolability and Criticality…… 9/15/2021

Background – Advanced Codes and Methods

Neutronics	ARCADIA (ANP-10297P-Aand S1P-A)
Thermal–Hydraulic	COBRA-FLX (ANP-10311P-ARevision 1)
CHF	GAIA CHF (ANP-10341P-A)
Non-LOCA	ARITA (ANP-10339P) and AREA (ANP-10338P-A)
SB LOCA	S-RELAP5 (EMF-2328P-Aand S1P-A)
LB LOCA	S-RELAP5 (EMF-2103P-ARevision 3)
GALILEO in SB and LB LOCA	ANP-10349P
Fuel Performance Code	GALILEO (ANP-10323P-ARevision 1)
External Loads	ANP-10337PAand Supplement 1P
Fuel Design topical report	GAIA (ANP-10342P-A) with Q12 (ANP-10334P-A)
M5Framatome	BAW-10227P Revision 2
Liftoff	BAW-10243P-A(statistical holddown)
Cladding Collapse	BAW-10084P-A Revision 3 (CROV)
Bow Penalties	XN-75-32P-A

Scope of Future Submittal - Increased Burnup

Scope

- Umbrella report to address all issues outside of:
  - ANP-10323P-A (GALILEO) &
  - BAW-10227P Rev 2 (M5Framatome)

Range of Applicability

- Burnup – max
- Enrichment – max
- Advanced codes and methods – see previous slides for definition
- Fuel designs - Standard designs (HTP (W15x15, CE14x14, CE16x16) and GAIA 17x17)
- Plants (Westinghouse and Combustion Engineering)

Acronyms

AFM – Advanced Fuel Management

ANS – American Nuclear Society

ANSI – American National Standards Institute

AREA – ARCADIA Rod Ejection Accident

CE – Combustion Engineering

CHF – Critical Heat Flux

DG – Draft Guidance

ECCS – Emergency Core Cooling System

FFRD – Fuel Fragmentation, Relocation, and Dispersal

FPC – Fuel Performance Code

HPU – Hydrogen Pickup

ICSBEP – International Criticality Safety Benchmark Evaluation Project

LBLOCA – Large Break Loss of Coolant Accident

LB - Large Break

LCT – LEU-COMP-THERM

LOCA – Loss of Coolant Accident

NRC – U.S. Nuclear Regulatory Commission

PIE – Post Irradiation Examination

PNNL – Pacific Northwest National Laboratory

PWR – Pressurized Water Reactor

RAI – Request for Additional Information

RCS – Reactor Coolant system

RIA – Reactivity Insertion Accident

RLBLOCA – Realistic Large Break Loss of Coolant Accident

SB – Small Break

SBLOCA – Small Break Loss of Coolant Accident

SRP – Standard Review Plan

W - Westinghouse

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