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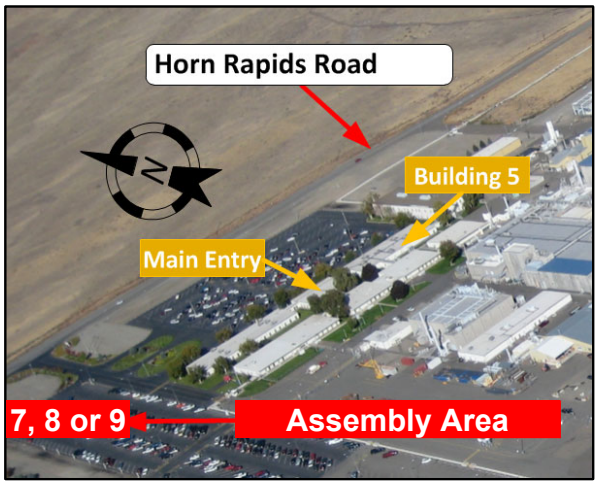
Framatome / NRC Annual Fuel Performance Meeting

Richland WA, September 22, 2022

Site Alerts & Response

You may encounter one of three types of alerts at HRR:

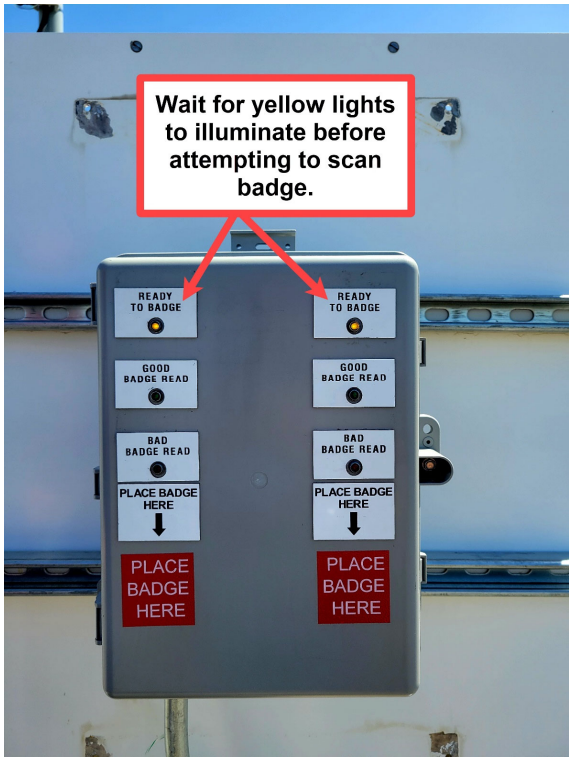
1. Criticality Alert – Site wide
   Klaxon horns (repeating AH-OO-GAH)
   - Response: Walk directly to evacuation assembly area in West parking lot – do not leave site
2. Fire Alert – Typically by building
   A series of high-pitched (morse-code style) sounds alternated with a voice message, "Attention, attention, an emergency has been reported in the building..."
   - Response: Exit building by most direct route and wait for further instructions
3. Public Address Alert
   Spoken message over PA system
   - Response: Stop and listen – follow instructions



Follow your hosts!


Horn Rapids Rd
Horn Rapids Rd
Map
Traffic
A

Parking Lot Badging Stations (Posts 7, 8, or 9)



Fuel Performance Meeting Objectives

- Increase NRC knowledge of Framatome's fuel activities, facilities, products and strategies
- Discuss Framatome's submitted and planned topical reports and associated customer needs
- Increase NRC understanding of Framatome's:
  - Advanced codes & methods development
  - Fuel designs, operating experience, observations and solutions
- Beneficial to NRC and Framatome
  - Exchange ideas and expectations on fuel issues
  - Open communication and questions encouraged

Agenda: September 22, 2022

Time	Topic	Presenters
7:30 – 8:15	Arrival and Security Access Process	Alan Meginnis
8:15 – 8:25	Evacuation Plan and Introductions	Alan Meginnis
8:25 – 8:30	Welcome	Ernie Hockens
8:30 – 9:15	Plant Overview and Safety Briefing	Ernie Hockens
9:15 – 10:30	Manufacturing Plant Tour	Ernie Hockens
10:30 – 11:30	Test Facility Tour with Fuel Product Displays	Kelly Duggan Steve Cole
11:30 – 12:00	Framatome Advanced Fuel Management Plans (Program Overview)	Steve Cole Norm Garner
12:00 – 12:45	Lunch	
12:45 – 13:30	AFM Implementation at Richland Fuel Fabrication Facility	Gannon Johnson
13:30 – 14:45	BWR Fuel Designs, Operating Experience, and Fuel Performance	Stephen Mazurkiewicz
14:45 – 15:00	Break	
15:00 – 16:15	PWR Fuel Designs, Operating Experience, and Fuel Performance	George Borum
16:15 – 16:30	ARCADIA Virtual Interface	Steven Fink
16:30 – 16:45	Upcoming Submittals and Priorities	Paul Clifford
16:45 – 17:00	Discussion / Closing Remarks	All
17:00	Adjourn Day	

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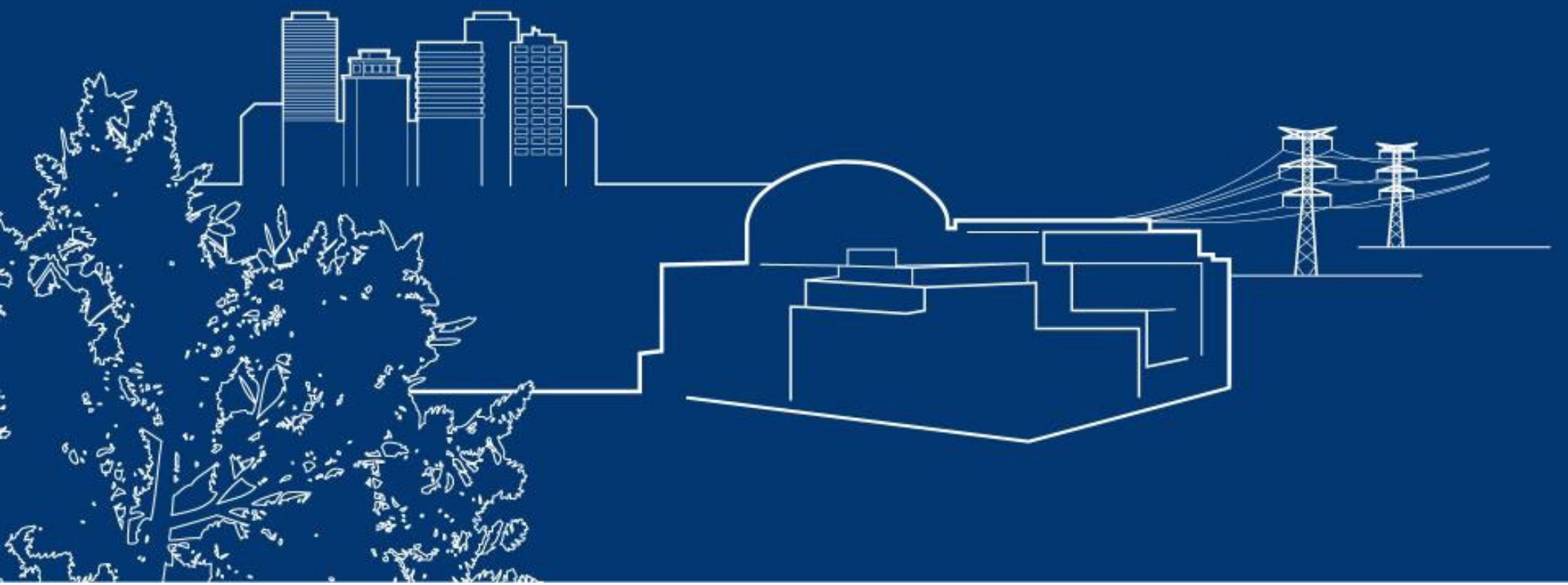


Framatome Advanced Fuel Management Plans (Program Overview)

Steven COLE, AFM Project Manager, Fuel Business Unit
Norman GARNER, Technical Sales Manager, Fuel Business Unit

ACRS / NRC Fuel Performance Meetings
September 20 – 23, 2022

Purpose

- Explain the background and motivation for Framatome's 'Advanced Fuel Management' project (AFM)
- Provide a high level overview of the project and status of key milestones

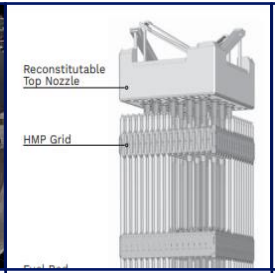
AFM Project: Background

- Recognizing that obtaining efficient 24-month cycle operation is a key business driver for a large segment of the domestic fleet, Framatome formally launched its ‘Advanced Fuel Management’ project in 2018
  - Enable safe and efficient 24-month cycles using technology levers of burnup and enrichment
  - Create customer value to sustain our fuel business for the long term
  - Improve viability of nuclear energy
- In 2021, the DOE renewed its EATF contract with Framatome (Phase 2C), which explicitly directed funding for the development of technologies enabling increased fuel rod burnup (>62 GWd/MTU) and enrichment (LEU+)
- The AFM project is planned and financed to provide ‘reload ready’ capability for PWR and BWR plants by end of 2026

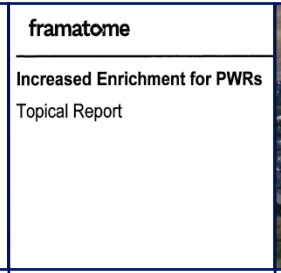
AFM Project: Objectives & Scope

Enrichment

UF6 Transport



Fuel Design



Licensing Methods

Manufacturing

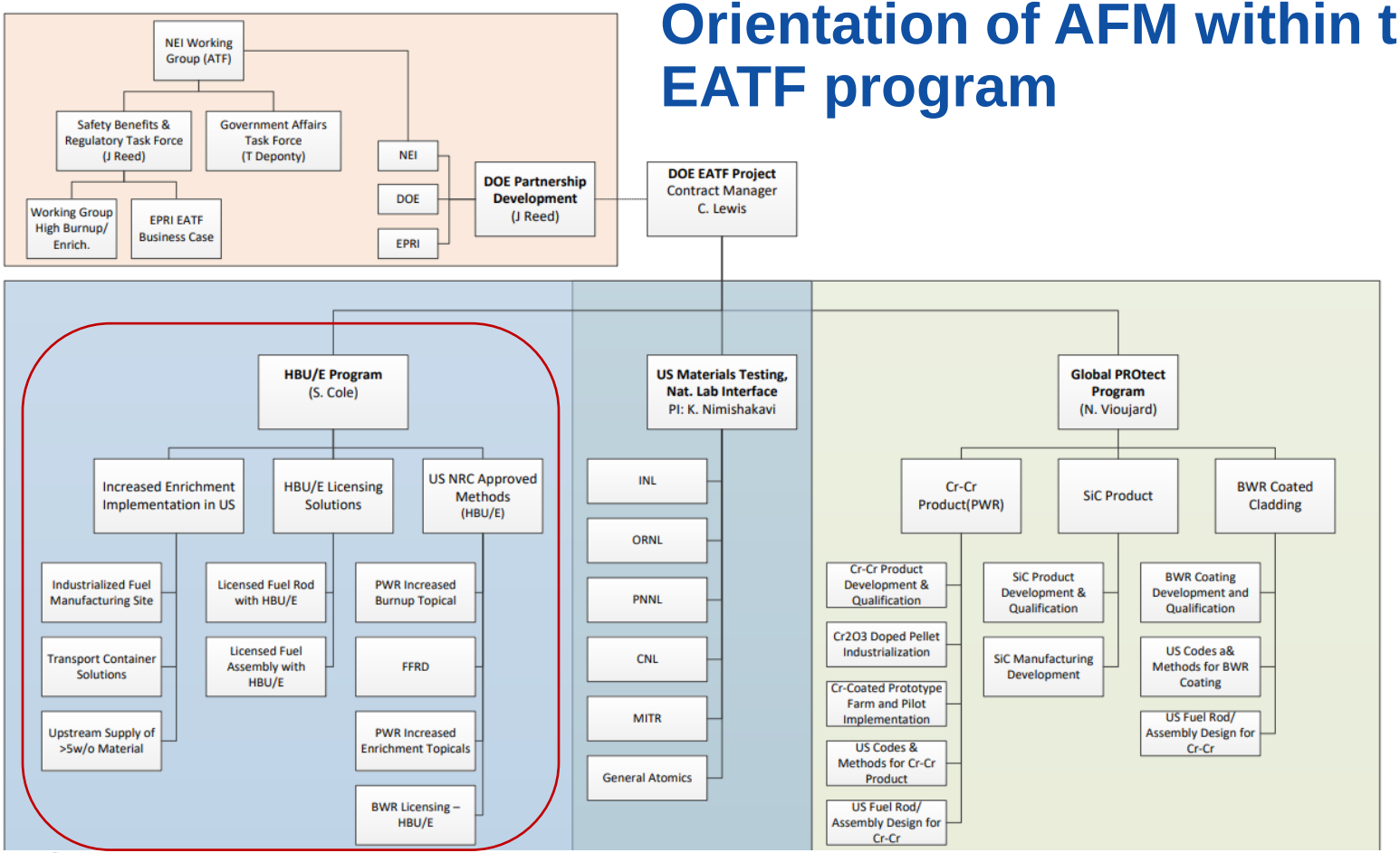
Fresh Fuel Transport

Operation & Backend

AFM Project Perimeter

Framatome Direct Responsibility

Orientation of AFM within the DOE EATF program



AFM Project: PWR Licensing Topical Report Progress

PWR Topical Report	Submittal (actual or planned)	Approval (actual or planned)
GALILEO Fuel Rod Thermal Mechanical Method (75 GWd/MTU) ANP-10323P Rev1	June 2018 ✓	December 2020 ✓
Cr-doped for PWR (62 GWd/MTU) ANP-10304P Supp 1	June 2021 ✓	February 2023
LEU+ Umbrella (8 wt%) ANP-10353P	January 2021 ✓	February 2023

AFM Project: BWR Licensing Topical Report Vision

BWR Topical Report	Submittal (actual or envisioned)	Approval (actual or envisioned)
Cr-doped for BWR (62 GWd/MTU) ANP-10340P	March 2016 ✓	May 2018 ✓
Neutronics Base Topical (ARTEMIS-B) (62 GWd/MTU) ANP-10350P	June 2022 ✓	August 2024

Fresh Fuel Transport

PWR (GAIA 17x17)

- In December 2021, the MAP12/13 container was approved for fresh fuel transport with enrichments up to 8 wt% U235
  - No RAIs

BWR (ATRIUM 11)

[ ]

PWR MAP Container

BWR TNB1 Container

AFM Project Timeline

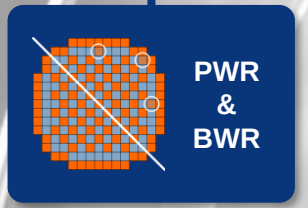
AFM Summary

What are the benefits of AFM?

Enrichment >5 wt% U235 & rod burnup >62 GWd/MTU

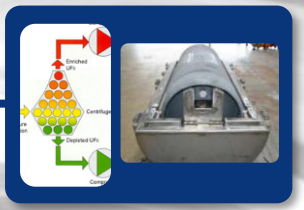
Enabling 24M cycles

Reducing batch size



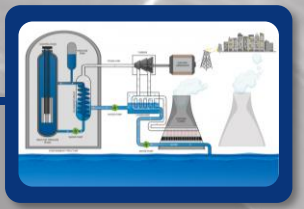
Supporting ATF adoption

EUP Supply:
New cascades and UF_6 shipping approvals



Reload Supply:
Criticality and cycle licensing upgrades

Reactor Readiness:
Criticality upgrades and document revisions



What is required for AFM?

- **>32 US PWRs can shift to 24-month cycles with AFM**
  - Eliminates 1 outage for every 6 years of operation
  - Average generating capacity increases by ~5 days/year
- **Decreases in reload batch size can be realized**

Fuel fabrication facility upgrades and methods submittals are underway to support AFM reload readiness in 2026

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Acknowledgement

This material is based upon work supported by the Department of Energy under Award number DE-NE-0009034, DE-NE0008818 and previously DE-NE0008220.

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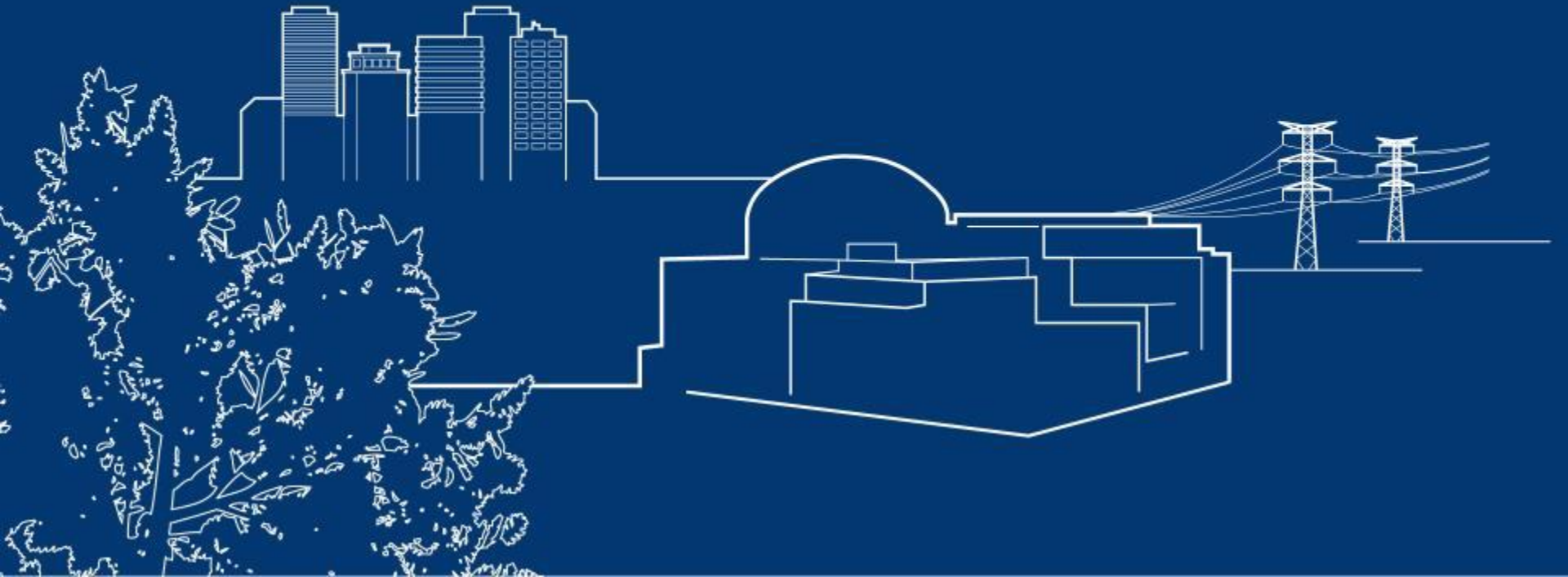

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Advanced Fuel Manufacturing
Richland Fuel Fabrication Facility Updates

Gannon Johnson

Richland WA **September 18, 2022**

CONTENT

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Richland Fuel Fabrication Facility Introduction

This AFM Fabrication Facility sub-task is limited to existing processes and building inside the facility secure boundary. It excludes:

- UF6 transport to the facility
- Transport of finished fuel to NPP customers
- Construction of new facilities for CAT II HALEU
- Out of Service Uranium Processes / Buildings

The Richland Fuel Fabrication Facility is currently capable of producing the mechanical fuel designs targeted AFM.

Scope is limited to the changes on existing manufacturing processes for the new enrichment target of [ ] wt%.

Richland Fuel Fabrication Facility Scope for AFM (1/3)

Framatome has chosen to relicense the entire Richland facility to a higher enrichment limit to support AFM products

- All uranium processing and storage areas will be upgraded for the new enrichment limit
- No areas restricted to enrichment ≤ 5wt% U235
- No down blending

This Approach has 2 major benefits:

- Risk reduction for ongoing operations
  - This approach mitigates the risk of LEU+ being mistakenly moved into areas only analyzed for ≤ 5wt% U235
- Allows to continue other uranium related business lines in LEU+ enrichments (uranium scrap recovery processing and cylinder washing / recert)

Richland Fuel Fabrication Facility Scope for AFM (2/3)

Other Key Objectives:

- **Plant upgrades shall not impact on the time delivery or quality of existing reload contracts**
- Plant upgrades will be completed safely following our standard processes
- Modifications to existing equipment, as required, will be replacement with like kind or proven equipment used at other Framatome fuel fabrication facilities
- Use Global Framatome best practice technologies will be used (No FOAK for Framatome)
- Decommissioning footprint will remain unchanged
- Modifications will not impact bottleneck process capacities during modifications
- Batch sizes in some processing areas may be reduced but plant capacity will remain unchanged
- Return to service for 5% fuel fabrication after modifications and prior to higher enrichment approval

Richland Fuel Fabrication Facility Scope for AFM (3/3)

These Objective Require:

- Updating our computer code benchmarks to support **[ ]** wt% U235 (This is referred to as establishing the Minimum Margin of Sub-Criticality) **Complete**
- Updating all nuclear criticality safety analyses for LEU+ license target
- Designing of equipment modifications to meet new enrichment safety limits and evaluating those changes for potential impact to accident sequences
- Updating manufacturing software to support higher enrichments
- Performing all Integrated Safety Analysis (ISA) activities to support NRC license submittal
- Performing required plant modifications
- Updating required operating procedures and documentation
- Testing and qualifying plant modifications
- Receiving approval from various state and local regulatory agencies
- Receiving NRC approved updated plant license
- Implementing higher enrichment limit plant wide (Preferably with pre-license NRC Onsite Review)

Key Industry Decisions that Affect Scope

The following decisions have a direct impact on the scope of the project:

1. Transport license of the DN30 with the standard 30B Cylinder for LEU+
   - Currently assuming Urenco will be successful with exemption request to 10CFR71.55(b) (water ingress into containment for more than 5wt% U235 in UF6 package) that will likely be submitted to the US NRC at the end of 2022

2. The material code E1 / E2 definitions for safeguards and nuclear accountability as defined by the US governments Nuclear Materials Management and Safeguards System (NMMSS).
   - The NRC's current position is that they will not change the definitions, but rather will grant licensees a one-time exemption on a licensee-by-licensee basis
   - NEI Sr. Director of Fuel and Radiation Safety is confident rules will be clarified in 2023

Types of Equipment Modifications Expected

- Passive control changes to reduce manufacturing equipment geometry where feasible with existing chemical processes
  - Safe slab limit for uranium dioxide reduced from **[ ]** inches to **[ ]** inches
  - Safe cylinder diameter reduced from **[ ]** inches to **[ ]** inches
- Passive control for increased equipment spacing
- Passive control for additional fixed neutron absorbing materials
- Additional active engineered controls to further mitigate existing accident sequences
  - e.g. adding additional isolation valves to ensure back-flow in liquid chemical process is prevented that is currently safe for 5wt% U235
- Existing administrative controls will be adjusted for **[ ]**
  - Critical mass limit in batch-controlled processes changes from 18 kgU to **[ ]**

Process Impacts Summary

System Evaluations - Summary

Areas Requiring Significant Effort but Minor Operational Impact

System Evaluations- Summary

Areas Requiring Significant Effort but Minor Operational Impact

System Evaluations- Summary

Other Key Activities

Timeline and progress to date

Thank You

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BWR Fuel Performance Update

Stephen Mazurkiewicz

Framatome/NRC Fuel Performance Meeting

September 22, 2022

AGENDA

- **Objectives**
- **Framatome BWR Fuel Operating Experience**
  - **Fuel Performance Summary**
  - **Status of Product Implementation**
    - Advanced Debris Filters
    - ATRIUM 11
    - Z4B BQ Channels
- **Status of Framatome BWR Fuel Failures and Investigations**
  - **Fuel Reliability Statistics**
  - **Status of Recent Fuel Failures Discharged**
- **Poolside Surveillance Results and Plans**
  - **Recent BWR Poolside Surveillance and Hot Cell Campaigns**
  - **Upcoming BWR Poolside Inspection Campaigns**
- **Summary / Conclusions**

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Objectives

- **Refresh key aspects of current BWR fuel product features**
- **Provide a status update of the overall performance of Framatome's BWR designs**
- **Provide an updated status of ATRIUM 11 fuel and Z4B BQ (β–quench) channel programs**
- **Provide an overview of BWR fuel examinations and results of recent surveillance campaigns**
- **Provide an overview of anticipated BWR fuel examinations**

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Fuel Reliability Status | Framatome supplied Plants with Leaker Free Cores in Operations (United States)

Leak Free Cores in Operation (Current)

	United States
PWR	100%
BWR	75%
TOTAL	90%

(As of August 2022)

Framatome PWR fuel has operated leaker free since Spring 2019

Framatome BWR Fuel Performance Summary
United States

Advanced ATRIUM 11 fuel product continues to perform well

- **12 ATRIUM 11 lead assemblies in US BWRs reached discharge burnup in 2021**
  - Poolside inspections have been completed and showed as-expected performance
- **First US ATRIUM 11 reload completed its 1st cycle of operation in February 2022**
- **5 ATRIUM 11 reloads in operation with all continuing customers transitioning to ATRIUM 11**

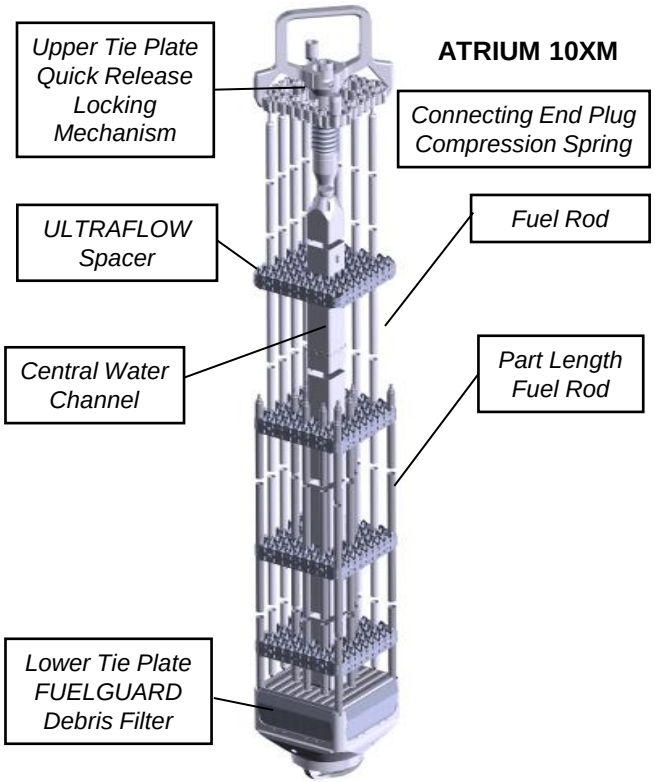
3rd Generation FUELGUARD debris filter now most common filter in operation

Full reloads of distortion-resistant Z4B β-quenched channels currently being delivered

BWR additive manufactured components loaded in US reactor in spring 2021

BWR EATF LTRs loaded in a US commercial reactor in spring 2021

ATRIUM Product Platform



Summary of Current ATRIUM Product Line | Primary Design Differences

Global ATRIUM Product Line Supply

Global ATRIUM Irradiation Experience

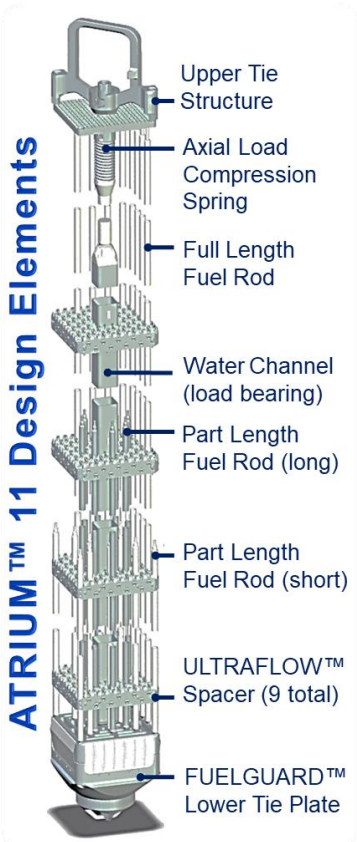
Domestic ATRIUM Product Supply

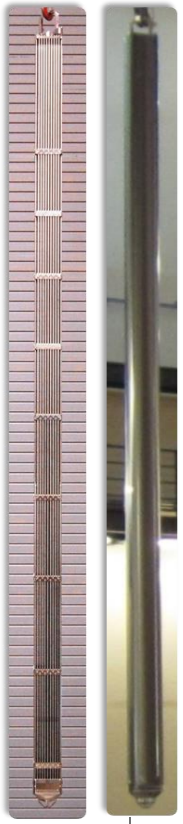
BWR Fuel Product Line | Advanced Debris Filters

BWR Fuel Product Line – Advanced Channel Materials

BWR Fuel Product Line | ATRIUM 11

- **The ATRIUM 11 is the latest evolution of Framatome's ATRIUM product line for BWRs**
  - 11x11 fuel rod array to enhance enrichment utilization efficiency and increase thermal-mechanical margins
  - Vaned ULTRAFLOW spacer grids and increased fuel rod surface area to improve dryout performance
  - Debris protection at inlet with 3GFG filter, entrapment resistant spacer grids, and top entry grid lattice
  - Cr-doped pellets to reduce PCI failure risk
  - Z4B BQ fuel channels to minimize channel distortion risk





The ATRIUM 11 is the most efficient BWR fuel assembly in reload operation

Fuel Design Materials | ATRIUM 11

BWR Fuel Product Line
Advanced Fuel Pellet Materials

ATRIUM 11 Reloads | United States

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BWR Industry Fuel Leaker Update | United States

- **Level 2 Industry Event Report (IER) 19-6, “Preventing Debris-Induced Fuel Failures” was issued by INPO in response to declining fuel performance**
  - **Implementation of IER recommendations correlated with improved leaker-free fuel performance across the industry**

BWR Industry Fuel Leaker Update United States

Framatome BWR Fuel Failures (10 Years) United States

Framatome BWR Fuel Performance Summary |
United States: Leaker-Free Sustainability (Current Customers

Recent Framatome BWR Fuel Failures

Recent Framatome BWR Fuel Failures

Recent Framatome BWR Fuel Failures

Recent Framatome BWR Fuel Failures

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Recent Framatome BWR Fuel Failures

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Domestic BWR Poolside Surveillances

Domestic BWR Poolside Surveillances

Domestic BWR Poolside Surveillances

ATRIUM 11 Fuel Assembly Growth

ATRIUM 11 Fuel Rod Growth

ATRIUM 11 Fuel Rod Diametral Creep

ATRIUM 11 Span Maximum Liftoff

ATRIUM 11 Spacer Maximum Liftoff

Z4B BQ Fuel Channel Growth

Z4B BQ Channel Bow

Domestic BWR Poolside Surveillances

Domestic BWR Poolside Surveillances

Domestic BWR Poolside Surveillances

ATRIUM 10XM Fuel Rod Diametral Creep

ATRIUM 10XM Span Maximum Liftoff

ATRIUM 10XM Spacer Maximum Liftoff

Domestic BWR Poolside Surveillances

Fuel Rod Hot Cell Program

Hot Cell Examination | Status

Hot Cell Examination | Results (Preliminary)

LaSalle Hot Cell Schedule

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Summary/Conclusions

- **Framatome BWR fuel continues to perform well, recent failures notwithstanding**
- **Framatome BWR customers are actively transitioning to advanced debris filter technology which are more effective solutions for in-reactor debris mitigation**
- **Framatome is committed to proactively monitor for and resolve conditions adverse to fuel reliability consistent with customer support**
- **Framatome is successfully implementing next generation products incorporating proven and effective design features**
- **Framatome's active Post Irradiation Examination program continues to validate fuel performance**

Framatome is committed to proactively addressing conditions adverse to fuel reliability and supporting our customers with leaker free performance

BACKUP

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Recent Framatome BWR Fuel Failures

Recent Framatome BWR Fuel Failures

Recent Framatome BWR Fuel Failures

Recent Framatome BWR Fuel Failures

Hot Cell Examination | Results (Preliminary)

Acronyms/Nomenclature

- 3GFG — 3rd Generation FUELGUARD
- AM — Additive Manufacturing
- BFE — Browns Ferry
- BRK — Brunswick
- BQ — Beta Quench
- BWR — Boiling Water Reactor
- CER — Ceramography
- CNL — Canadian Nuclear Laboratories
- Cr — Chromium
- EATF — Enhanced Accident Tolerant Fuel
- ECA — Eddy Current Array
- ECT — Eddy Current Testing
- EFID — Effective Full Power Days
- EOC — End of Cycle
- EOL — End of Life
- EU — European Union
- FC — Fuel Channel
- F-SECT — Frequency Scanning Eddy Current Technique
- GAD — Gadolinia
- GWd — Gigawatt-day
- H — Hydrogen
- HC — Hot Cell
- ID — Inside Diameter or Identification
- IER — Industry Event Report
- IFG — Improved FUELGUARD
- INPO — Institute of Nuclear Power Operators
- LTA — Lead Test Assembly
- LTL — Lower Tolerance Limit

Acronyms/Nomenclature

- LTP Lower Tie Plate
- LTR Lead Test Rod
- MAX Maximum
- MET Metallography
- MIN Minimum
- MM Millimeter
- MON Monticello
- MTU Metric Ton Uranium
- NRC Nuclear Regulatory Commission
- OD Outside Diameter
- PIE Post Irradiation Examination
- PLFR Part Length Fuel Rod
- PST Power Suppression Testing
- PWR Pressurized Water Reactor
- RXA Recrystallized Annealed
- SFG Standard FUELGUARD
- SRA Stress-Relief Annealed
- SUS Susquehanna
- TVA Tennessee Valley Authority
- UO2 Uranium Oxide
- US United States
- UTL Upper Tolerance Limit
- YTD Year to date
- Z4B Zircaloy-4 BWR
- Zry-2 Zircaloy-2
- Zry-4 Zircaloy-4

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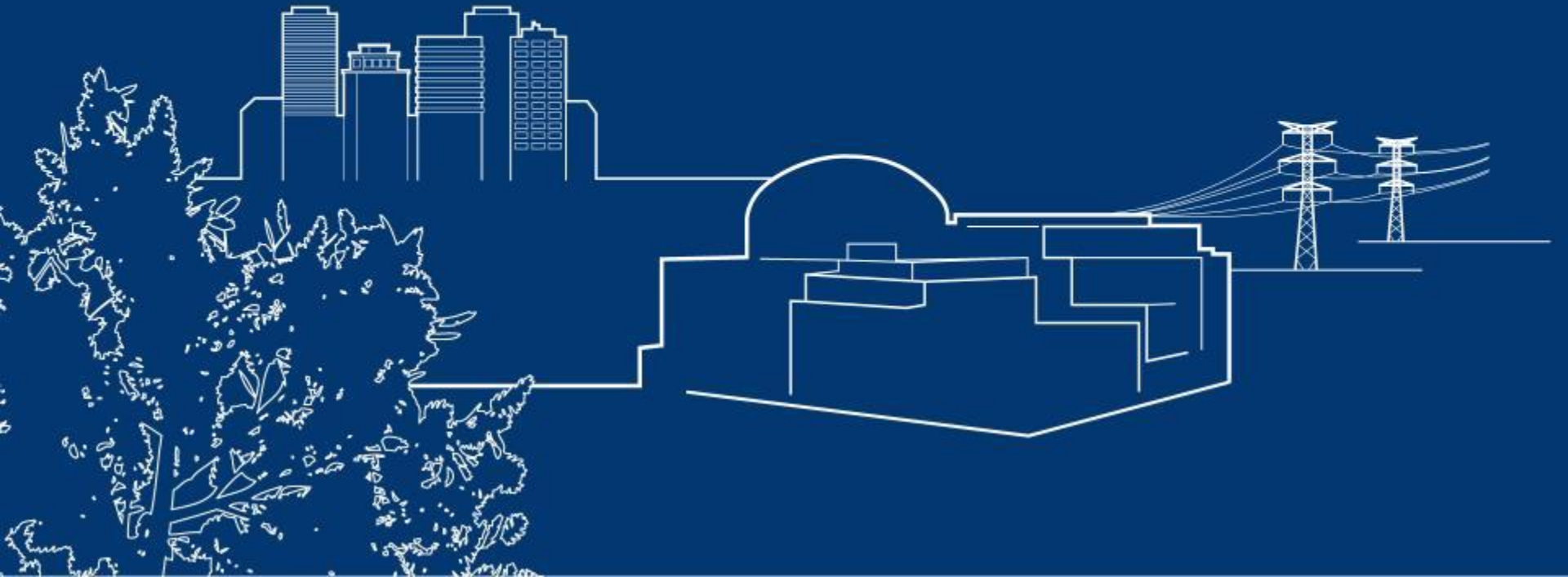

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PWR Fuel Performance Update

George Borum

Framatome/NRC Fuel Performance Meeting

September 22, 2022

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- Status of Framatome PWR Fuel Failures and Investigations
  - Cause of Failure Examinations
- EATF PROtect Summary
- Poolside Surveillance Results and Plans
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- Summary / Conclusions

Objectives

- Summarize key aspects of current PWR fuel product features
- Provide a status update of the overall performance of Framatome's PWR designs
- Provide an updated status of GAIA program
- Provide an overview of the current EATF projects
- Provide an overview of PWR fuel examinations and results of recent surveillance campaigns
- Provide an overview of anticipated fuel examinations

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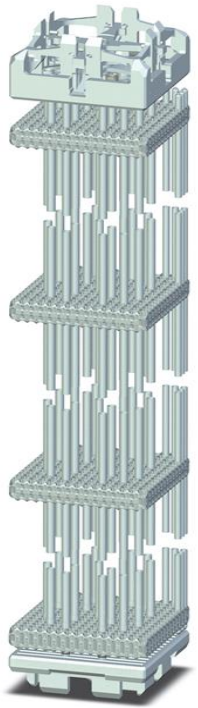
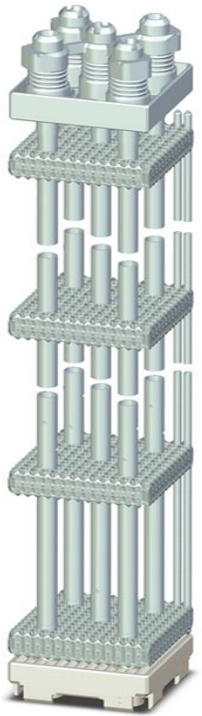
HTP Fuel - Proven Features

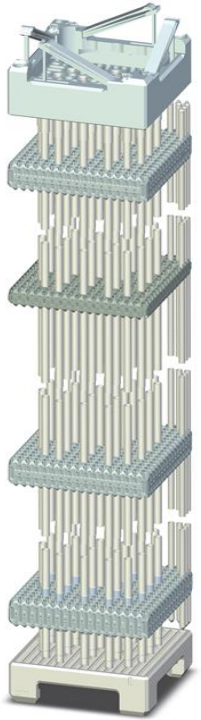
- Reconstitutable Upper Nozzle/ End Fitting / Tie Plate
- $M5_{Framatome}$ Fuel Rod Cladding
  - Low oxidation compared to Zry-4
  - Low hydrogen pick up
- HTP Spacer Grid
  - Exceptional GTRF performance
- HMP Lower Grid
- FUELGUARD Bottom Nozzle/ End Fitting / Tie Plate



Mark-B HTP

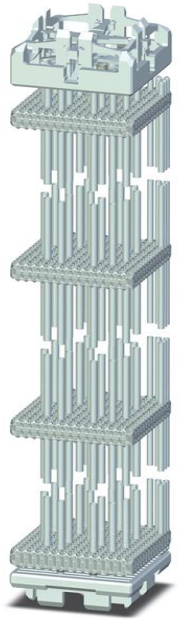


CE HTP



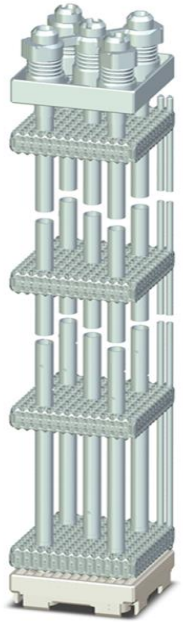
W HTP

Framatome PWR Reloads
B&W Plants



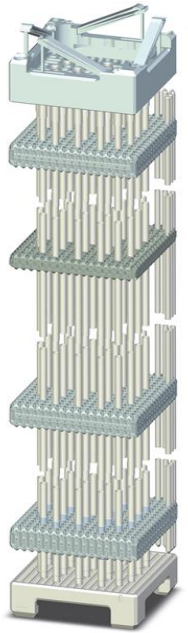
Mark-B HTP has effectively eliminated past performance issues associated with GTRF, growth and fuel assembly distortion

Framatome PWR Reloads
CE Plants



Framatome PWR Reloads
CE Plant HTP Grid Update

Framatome PWR Reloads Westinghouse Plants



Second domestic GAIA Reload will begin operation in Fall 2022

HTP Irradiation Experience

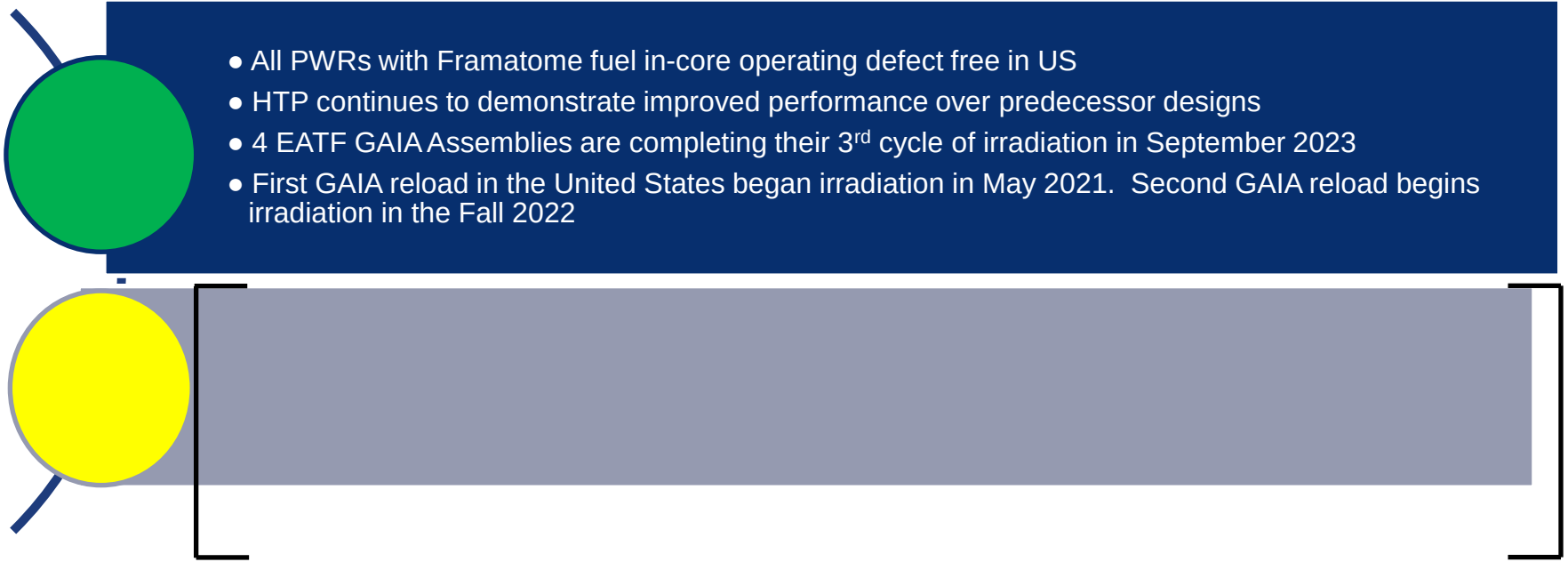
Over 26,000 HTP assemblies irradiated in 51 reactors worldwide

- Arrays from 14x14 to 18x18
- Operating in a variety of reactor platforms
  - B&W, CE, Framatome, Siemens, and Westinghouse

GAIA Fuel Assemblies
Key Design Features & Irradiation Experience

Framatome PWR Fuel Performance Summary United States

- All PWRs with Framatome fuel in-core operating defect free in US
- HTP continues to demonstrate improved performance over predecessor designs
- 4 EATF GAIA Assemblies are completing their 3rd cycle of irradiation in September 2023
- First GAIA reload in the United States began irradiation in May 2021. Second GAIA reload begins irradiation in the Fall 2022



Framatome PWR Fuel Performance Summary United States

PWR Fuel Failure Mechanisms (United States 2018-Current)

AGENDA

- Objectives
- Framatome PWR Fuel Operating Experience
  - Status of Product Implementation
  - Fuel Reliability Statistics
- Status of Framatome PWR Fuel Failures and Investigations
  - Cause of Failure Examinations
- EATF PROtect Summary
- Poolside Surveillance Results and Plans
  - Recent PWR Poolside Surveillance Campaigns
  - Upcoming PWR Poolside Surveillance Campaigns
- Summary / Conclusions

Recent US PWR Failed Fuel Exams

2021 Cause-of-Failure Exams

Reactor	Cycle	Assembly	Fuel Product	# Rods	Exam	Cause
No PWR Failures						

2022 Cause-of-Failure Exams

Reactor	Cycle	Assembly	Fuel Product	# Rods	Exam	Cause
No PWR Failures						

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EATF PROtect Summary

GAIA Fuel Assemblies with EATF PROtect Fuel Rods Vogtle-2

ANO-1 EATF PROtect Fuel Rods

Calvert Cliffs EATF PROtect Fuel Assembly

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Domestic PWR Poolside Surveillances

Domestic PWR Poolside Surveillances

GAIA Fuel Assemblies with EATF PROtect Fuel Rods

Good overall performance of lead assemblies confirmed

GAIA Fuel Assemblies with EATF PROtect Fuel Rods Visual Inspection

GAIA Fuel Assemblies with EATF PROtect Fuel Rods Visual Inspections

GAIA Fuel Assemblies with EATF PROtect Fuel Rods Visual Inspections

GAIA Fuel Assemblies with EATF PROtect Fuel Rod Diameter Inspections

GAIA Fuel Assemblies with EATF PROtect Fuel Rods
Fuel Assembly Length Inspections

GAIA Fuel Assemblies with EATF PROtect Fuel Rods Oxide Assessment

Palo Verde-2 CE16-HTP PIE

Palo Verde-2 CE16-HTP Fuel Assemblies
Fuel Assembly Length Inspections

Palo Verde-2 CE16-HTP Fuel Assemblies
Fuel Rod Liftoff Inspections

Millstone-2 CE14-HTP Grid-to-Rod Fretting Inspections

Millstone-2 CE14-HTP Grid-to-Rod Fretting Inspections

ANO-1 EATF PROtect Fuel Rods

ANO-1 EATF PROtect Fuel Rods

ANO-1 EATF PROtect Fuel Rods

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Summary/Conclusions

- HTP and GAIA continue to demonstrate improved performance over predecessor designs
- All US PWR customers have transitioned to advanced cladding ($M5_{Framatome}$) with low oxidation, growth, and hydrogen pickup
- Framatome is successfully implementing next-generation PWR products (via LFA programs) incorporating proven and effective design features
- Framatome is committed to resolving conditions adverse to fuel reliability
- Framatome's active PIE program continues to validate the successful performance of Framatome PWR fuel products

Framatome is committed to proactively addressing conditions adverse to fuel reliability and supporting our customers with leaker free performance

Acronyms/Nomenclature

- ANO Arkansas Nuclear One
- B&W Babcock and Wilcox
- CE Combustion Engineering
- DNB Departure from Nucleate Boiling
- EATF Enhanced Accident Tolerant Fuel
- EOC End of Cycle
- FA Fuel Assembly
- FR Fuel Rod
- GTRF Grid-to-Rod Fretting
- ID Inside Diameter
- IFM Intermediate Flow Mixer
- IGM Intermediate GAIA Mixer
- LFA Lead Fuel Assembly
- LOCA Loss of Coolant Accident
- NRC Nuclear Regulatory Commission
- PIE Post Irradiation Examination
- PWR Pressurized Water Reactor
- RCCA Rod Control Cluster Assembly
- TMI Three Mile Island
- US United States
- W Westinghouse
- Zry-4 Zircaloy-4 alloy

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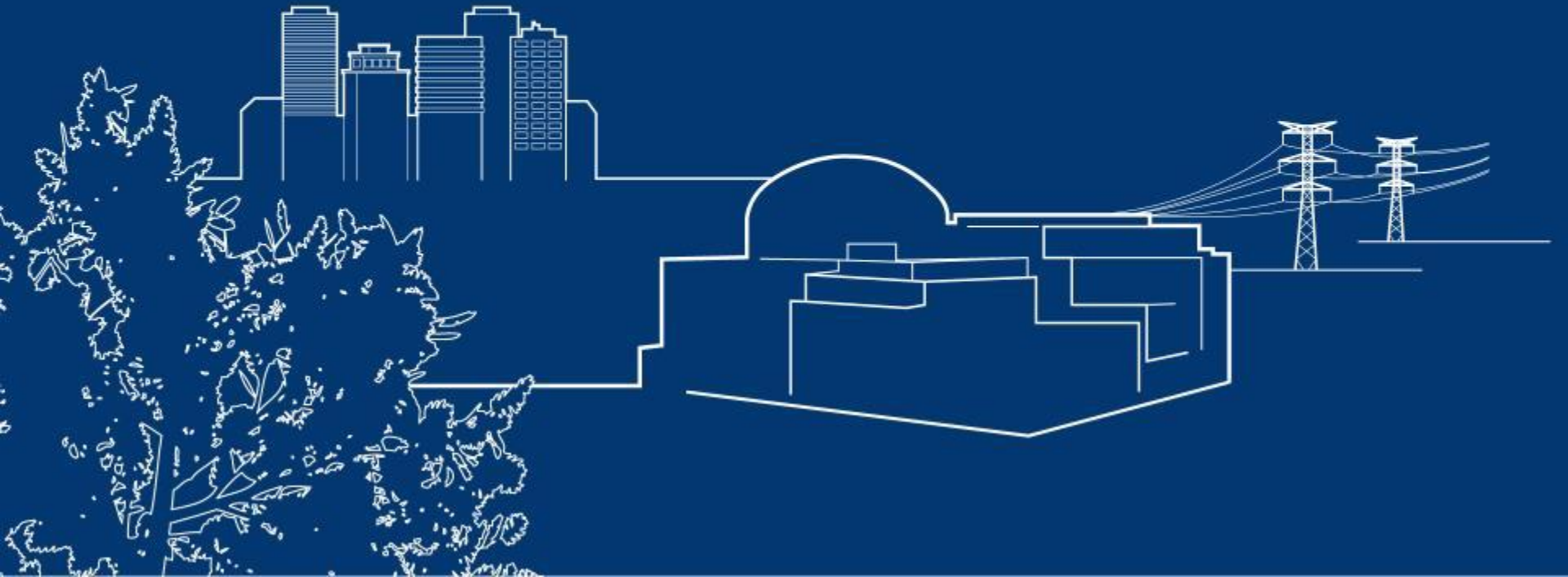

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MYARCADIA - NRC

Steven Fink – Fuel BU Manager of Digital Business Development

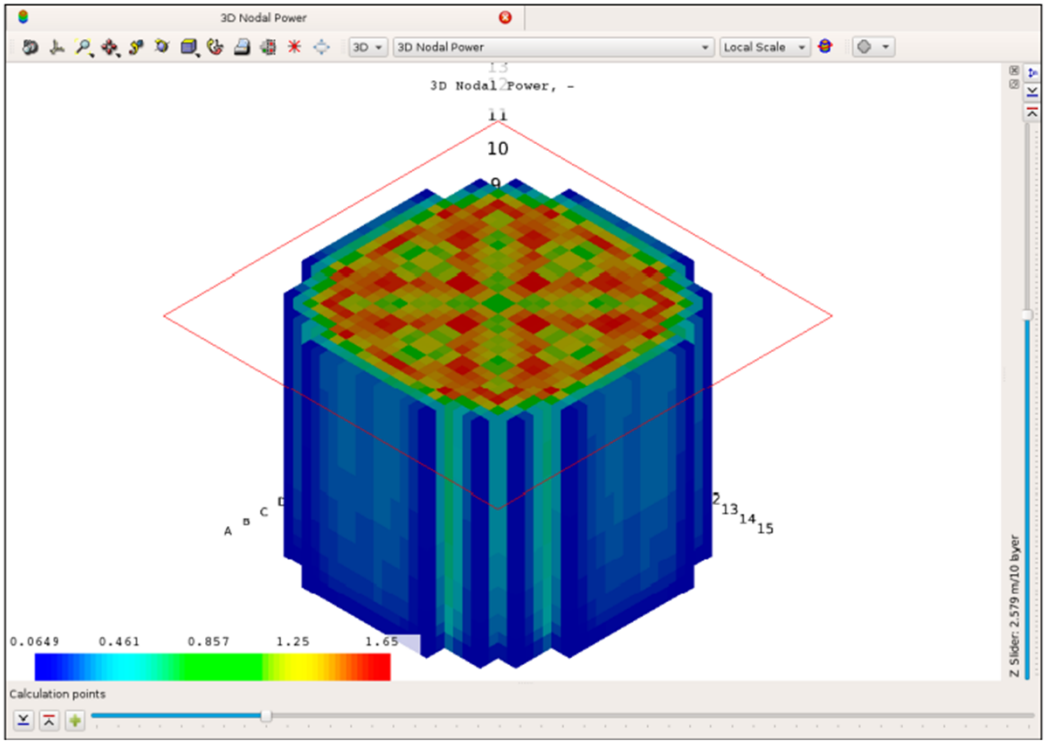
Richland, WA 22 September 2022

MYARCADIA

What is ARCADIA?

An advanced suite of codes for PWRs and BWRs analysis of both normal and postulated accident conditions

The package contains advanced physical simulations, advanced GUI interfaces and process automation



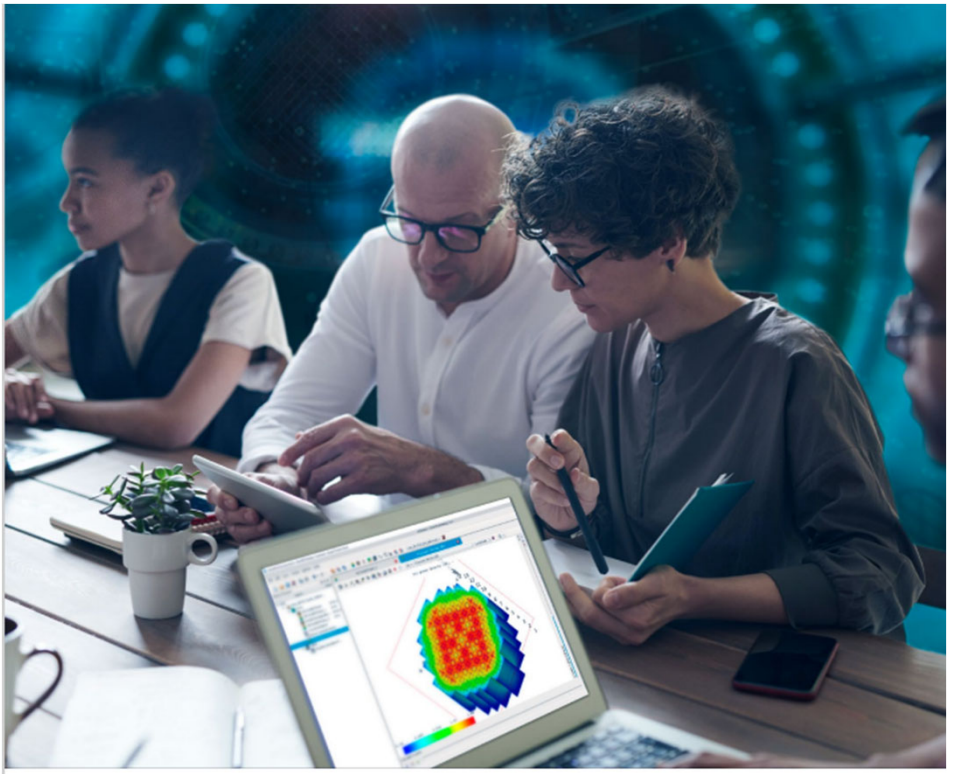
POWERFUL suite of NRC-Approved codes

MYARCADIA

What is **MYARCADIA** ?

Online access to state-of-the-art codes

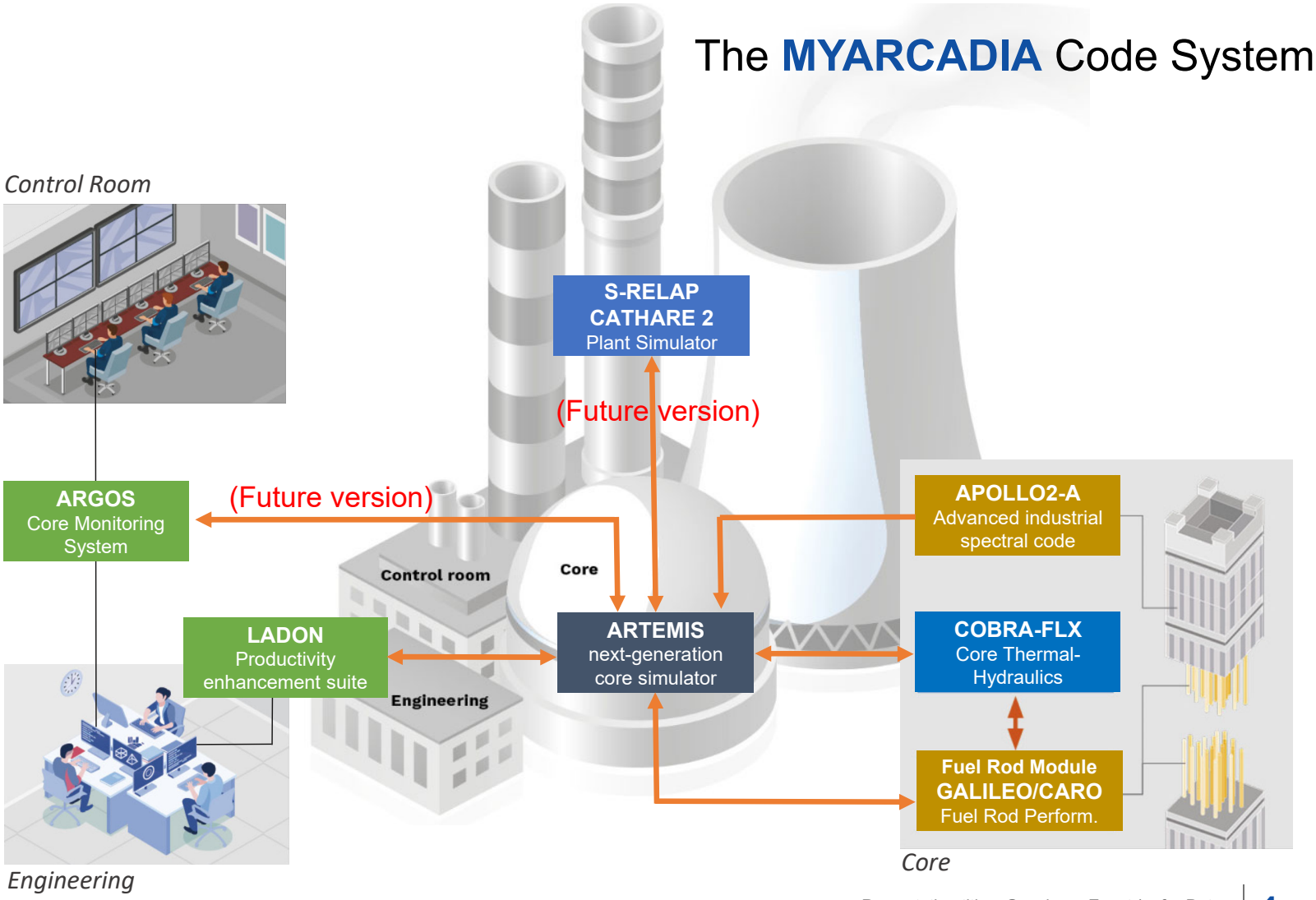
- No additional infrastructure needed
- No support personnel needed
- Remote maintenance and upgrades



EASY access to the platform

The **MYARCADIA** Code System

BROAD
functionality



MYARCADIA

Why MYARCADIA?

Flexible pricing based on

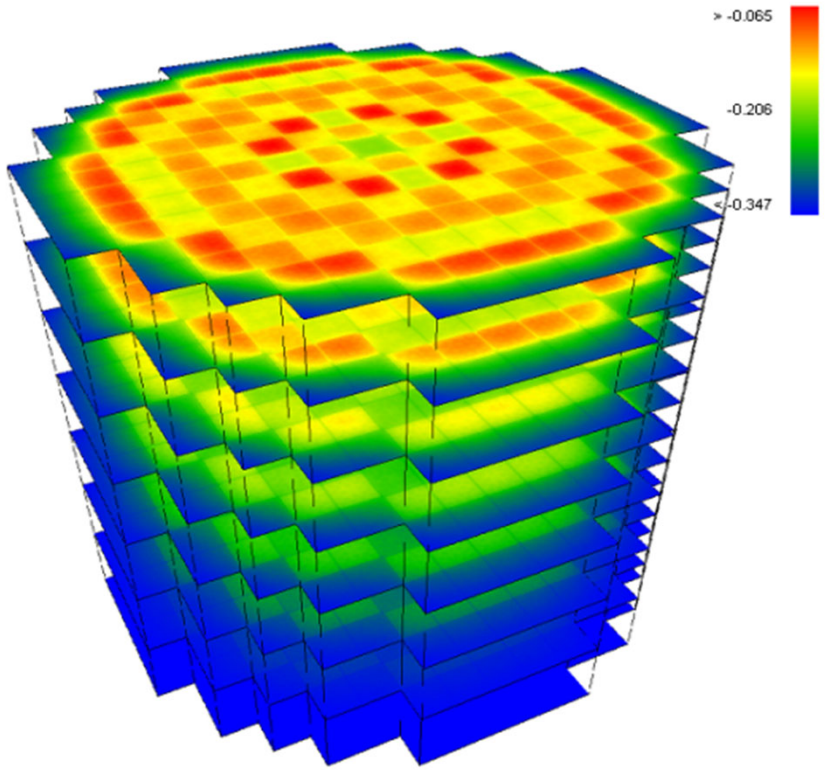
- Your number of users
- The functions you use
- Your volume

Safety

- Easy access to an additional V&V platform
- Improved recommendations for plant operators

Computing Power

- Instant Access to HPC – no IT requirements



SCALABLE to meet any need

MYARCADIA

OK, SO WHAT?

In addition to enabling access for educational institutions, Utilities, and research labs, Framatome would like to create a special regulator access

PARTNERSHIPS available for regulators

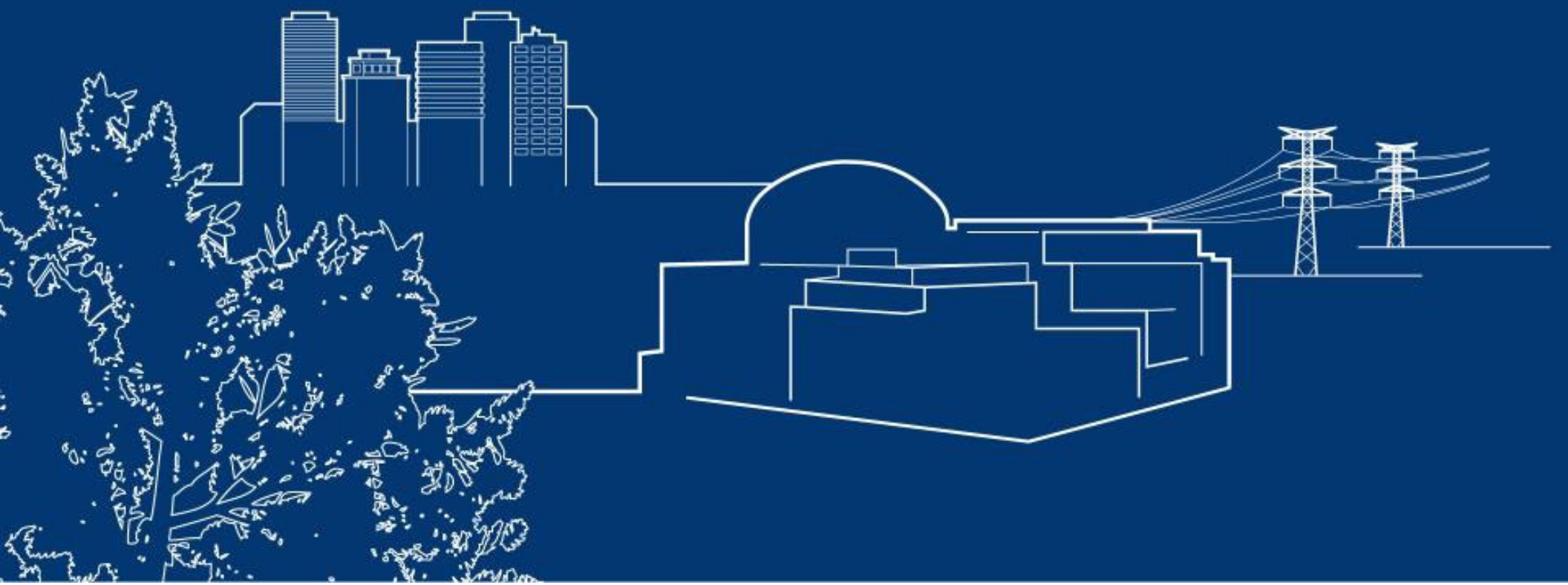
FOR MORE INFORMATION

Contact :

Steven Fink (steven.fink@framatome.com)

Dr Nico Vollmer (nico.vollmer@framatome.com)

framatome



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Licensing Actions

Paul Clifford

Richland, WA **September 2022**

Topical Reports Under Review

Topical Report	Description	Submittal Date	Completion Date
ANP-10339P, ARITA – ARTEMIS/RELAP Integrated Transient Analysis Methodology	• ARITA is an analytical framework which couples previously approved codes: ARTEMIS, S-RELAP5, and GALILEO, within a Monte Carlo statistical approach for analyzing AOOs and postulated Non-LOCA events (except CRE)	3Q 2018	1Q 2023
BAW-10227 Rev. 2, Evaluation of Advanced Cladding and Structural Material (M5) in PWR Reactor Fuel	• Update M5 cladding material properties for up to 75 GWd/MTU • Updated LOCA fuel rod balloon / rupture models	4Q 2019	1Q 2023

Topical Reports Under Review (cont.)

Topical Report	Description	Submittal Date	Completion Date
ANP-10353P, Increased Enrichment for PWRs	• Umbrella topical report requested approval of Framatome methods out to 8.0 wt% 235U	1Q 2021	3Q 2022
ANP-10340P Supplement 1, Chromia-Doped UO2 Fuel - PWRs	• Chromia-doped UO2 fuel pellets for PWRs • Follows earlier approval for BWRs	2Q 2021	4Q 2022
ANP-10311 Supp. 1, New PWR CHF Correlation for Low Pressure Conditions	• Supplement to COBRA-FLX • Low pressure CHF correlation	4Q 2021	4Q 2022

Topical Reports Under Review (cont.)

Topical Report	Description	Submittal Date	Completion Date
EMF-2310 Supplement 2, SRP Chapter 15 Non-LOCA Methodology for PWRs	• CHF correlation design limit for HTP fuel	1Q 2022	3Q 2022
ANP-10350P, Framatome Methodology for Boiling Water Reactors: Evaluation and Validation of APOLLO2-A / ARTEMIS-B	• The APOLLO2-A/ARTEMIS-B code system is the extension of the ARCADIA® code system to boiling water reactors. The code system includes the APOLLO2-A spectral code, the ARTEMIS-B core simulator, and the cross-section functionalization code HERMES-B. • This report consists of the methodology, V&V, and uncertainty analysis for the APOLLO2-A/ARTEMIS-B code system.	2Q 2022	3Q 2024

Upcoming Topical Reports

Upcoming Topical Reports (cont.)

Upcoming License Amendment Requests

Upcoming License Amendment Requests (cont.)

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