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ANP-10359 Revision 0,

PROtect Incorporation of Chromium-Coated M5$_{Framatome}$ Cladding Material Properties in Framatome PWR Methods Topical Report

June 24, 2025

Safety Message - Complacency is one of the biggest risks we face in terms of completing our day-to-day tasks safely. In our industry, complacency can kill.

Complacency is when someone becomes so comfortable or secure in a situation or task that it leads to unawareness of actual dangers or deficiencies. This state of overconfidence can cause us to disregard weak signals and take potentially dangerous shortcuts, resulting in serious consequences affecting safety, production and quality. If you find yourself saying, “it’s always been that way” or “we’ve always done it this way,” then complacency and overconfidence are your enemy. No activity is hazard-free.

Examples of how using error-prevention tools strengthens the use of this critical element and aids employees in being proactive in identifying, assessing and controlling hazards and preventing safety incidents:

		N.A. Standards of Operational Excellence
Safety tool:	Reviewing the job hazard analysis regularly helps maintain awareness of hazards and risks.	Page 27
Quality tool:	Looking for weak signals increases awareness of potential precursors to major events.	Page 48
HU tool:	STAR Self-checking helps to focus attention on the task before performing a critical activity.	Page 91

Content

1. Objectives
2. Background
3. Topical Report Preliminary Content
4. Next Steps

Objectives

- Inform the NRC of:
  - The topical report preliminary content
  - The strategy for making the topical report
  - The associated submittal schedule

- Provide opportunity for NRC feedback

Objectives

Previous FRA-NRC Exchanges on E-ATF	
E-ATF Touchpoints	2017, 2018, 2019
E-ATF Testing Plans	7/2019
E-ATF Test Plan Update	11/2020
E-ATF Test Plan Update	11/2021
Fuel Performance Meeting	9/2024

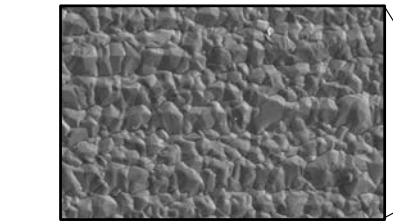
Background

M. Aumand, L. Gerken

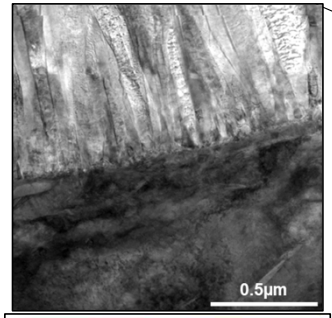
Background

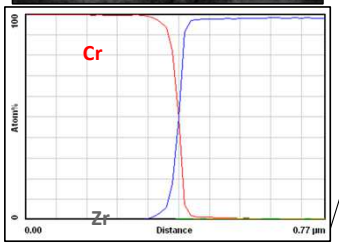
"PROtect: Incorporation of Chromium-Coated $M5_{Framatome}$ Cladding Material Properties in Framatome PWR Methods"

PROtect Cr Concept



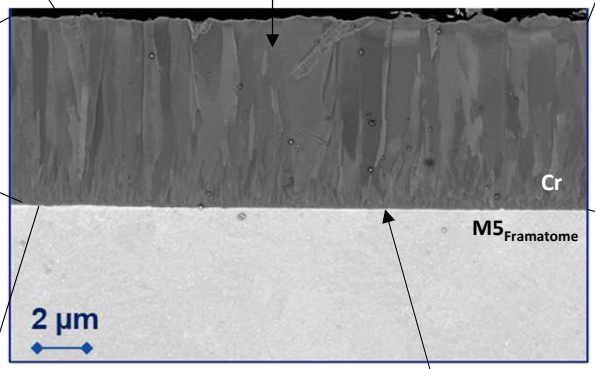
Roughness equivalent to uncoated cladding





No significant modification of cladding microstructure

High density
High purity



Excellent adherence

No delamination at high deformations

Excellent thickness uniformity

PROtect Cr Readiness

OSIRIS 2015

IMAGO 2016

Halden 2017

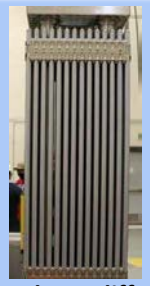
ATR 2018

Vogtle 2019

Gösgen 2019

ANO 2019

Calvert Cliffs 2021



Blayais 3 2023

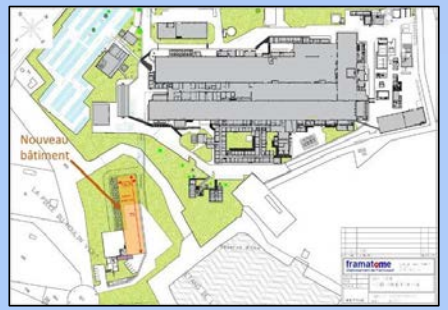
On-track for 2026 reload capacity readiness

2016: Cr-coating of small samples mastered

2018: Cr-coating of full-length cladding begins

2020: Full-length Cr-coating begins at Framatome Paimboeuf

2023: Manufacturing of industrial pilot line and facilities begins



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Background

Background

Cr Topical Report is applicable to Framatome's Advanced Codes and Methods

Background

Topical Report Preliminary Content

M. Aumand, Y. Qi, L. Gerken

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Sample Problems

Summary

DISCUSSION

A. Meginnis

Next Steps

Acronyms/Nomenclature

- C&M: Codes and Methods
- E-ATF: Enhanced Accident Tolerant Fuel
- ECR: Equivalent Cladding Reacted
- EDF: Electricité de France
- GWd: Gigawatt days
- INL: Idaho National Laboratory
- LOCA: Loss Of Coolant Accident
- LTA: Lead Test Assembly
- LTR: Lead Test Rod
- mtU: Metric Ton of Uranium
- NDE: Non-Destructive Examination
- NPP: Nuclear Power Plant
- ORNL: Oak Ridge National Laboratory
- PCT: Peak Cladding Temperature

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Thank you