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EnCore® ATF and High Energy Fuel Status and Commercialization

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IAEA Technical Meeting on Advanced Technology Fuels

October 28-31, 2025

Vienna, Austria



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EnCore® High Energy Fuel Program



Utilities are striving for maximum electricity generation and reduced operating costs while enhancing safety with Accident Tolerant Fuel (ATF) technologies

The **EnCore** High Energy Fuel (HEF) Program combines near-term and future advancements to support these critical nuclear industry drivers



Chromium Coated Cladding



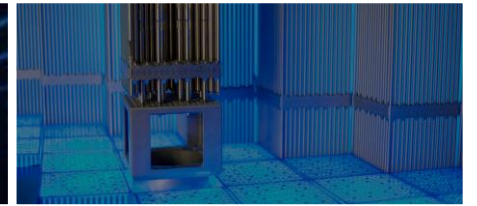
ADOPT™ Fuel Pellets



PRIME™ Fuel Features



AXIOM® High Performance Cladding



LEU+ and Higher Burnup
(>5 w/o & > 62 GWd/MTU)

Applications



Enhanced Safety



Optimization of Fuel Cycle Costs



24-Month Cycle Operations

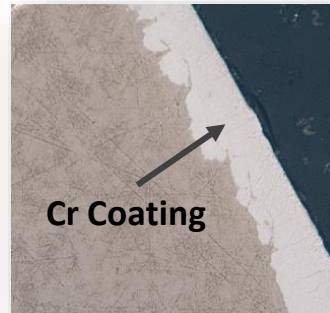


Power Upgrading

Improved Safety and Operational Margins

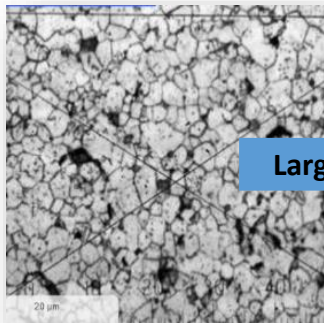
Cr Coated Cladding

- ✓ Reduced Cladding Corrosion / Oxidation
- ✓ Improved LOCA Burst
- ✓ Reduced Cladding Wear

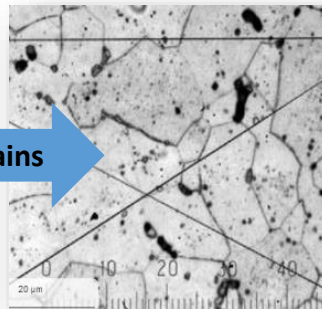


ADOPT Fuel Pellets

- ✓ Higher Uranium Density
- ✓ High Thermal Stability
- ✓ Oxidation Resistance



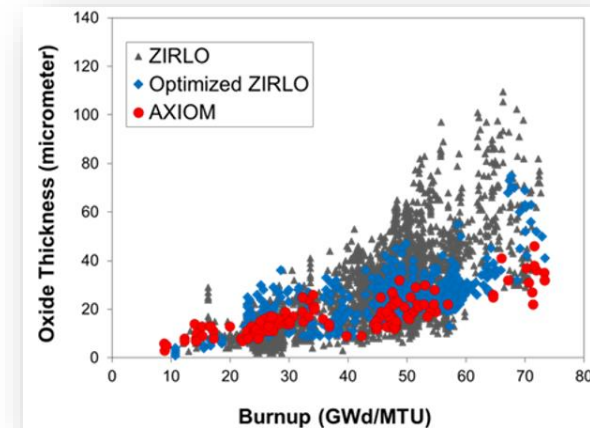
Standard UO₂



ADOPT

AXIOM Fuel Cladding

- ✓ Reduced Corrosion & Hydrogen Pickup
- ✓ Lower Creep & Growth



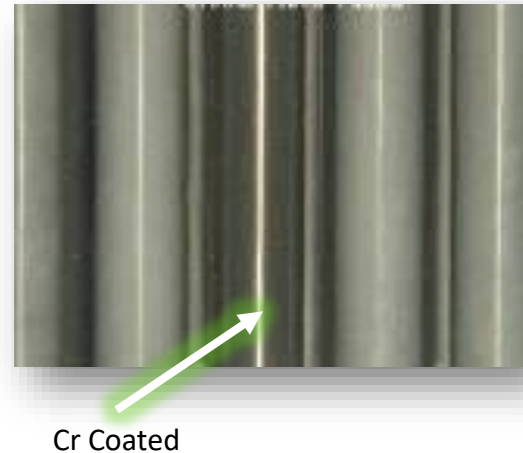
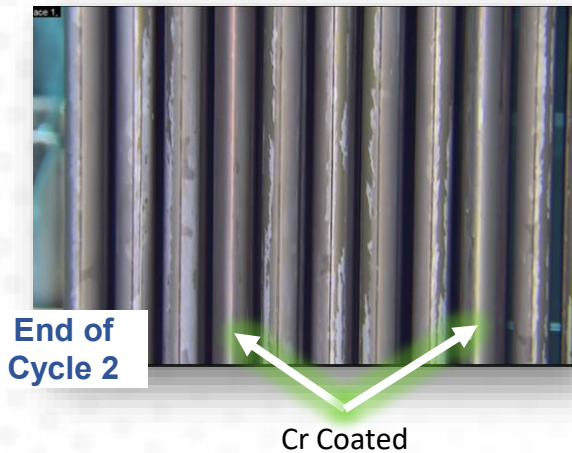
PRIME Fuel Features

- ✓ Reduced Growth
- ✓ Enhanced Debris Management
- ✓ Improved Stiffness

EnCore HEF Irradiation Campaigns

Campaign 1 LTRs

Campaign 2 LTRs



- LTR campaigns with Utility Partners provide data for fuel qualification
- Campaigns 1 & 2 complete
 - 36-month pool-side and PIE data available
 - 54-month high burnup rod poolside inspections underway
- Campaign 3 started Spring 2025
- Additional programs in planning stages

	Cr Coated Cladding	ADOPT Pellets	PRIME Features	LEU+ Pellets	AXIOM Cladding
Campaign 1 (2019)	✓	✓			
Campaign 2 (2020)	✓				
Campaign 3 (2025)	✓	✓	✓	✓	✓

Campaign 1
(2019)



Campaign 2
(2020)

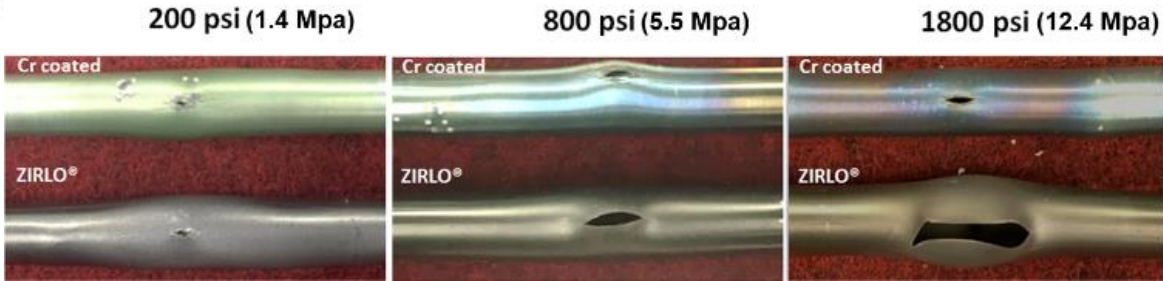
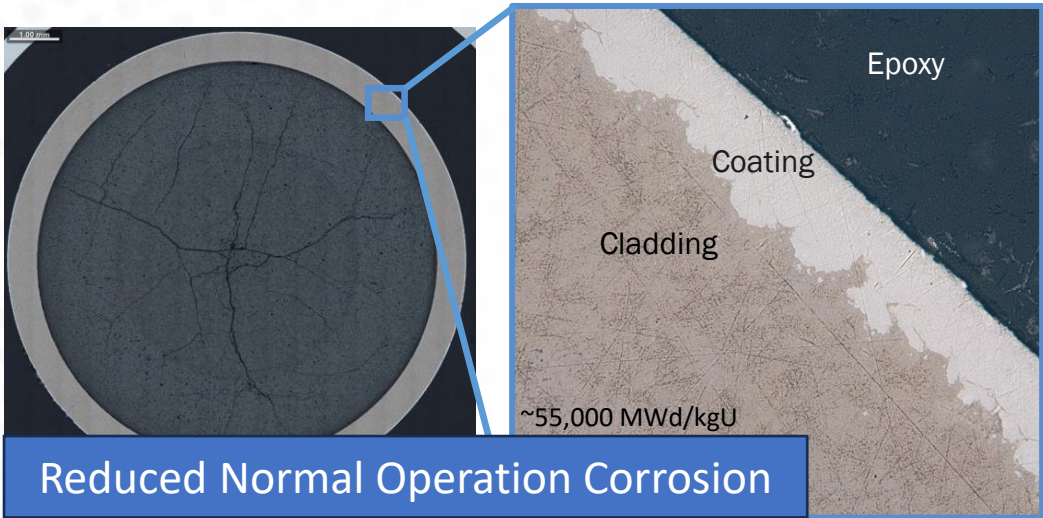


Campaign 3
(2025)



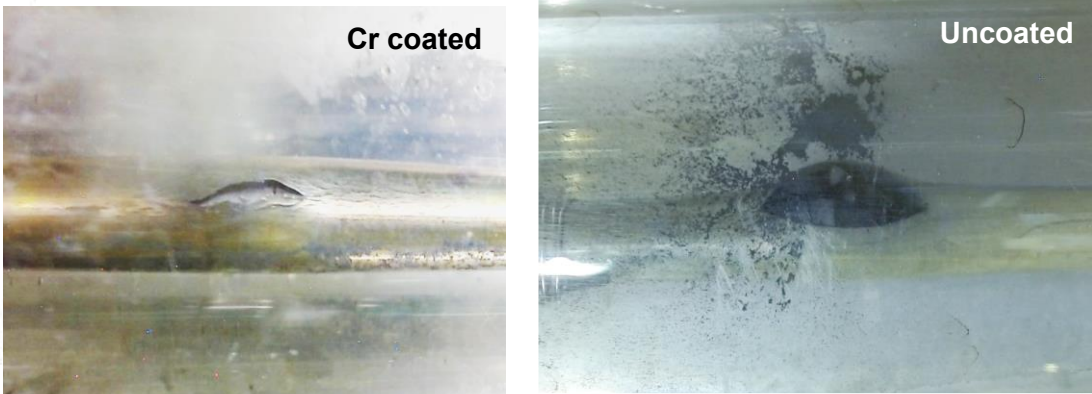
Cr coated rods appear "pristine" with excellent adherence and little indication of crud

Cr Coated Rod Operating Experience



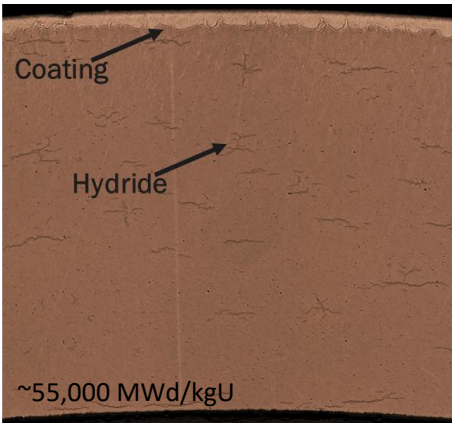
Burst Opening Size as a Function of Burst Pressure (Unirradiated)

Improved Accident Performance



LOCA Burst Test Results (Irradiated)

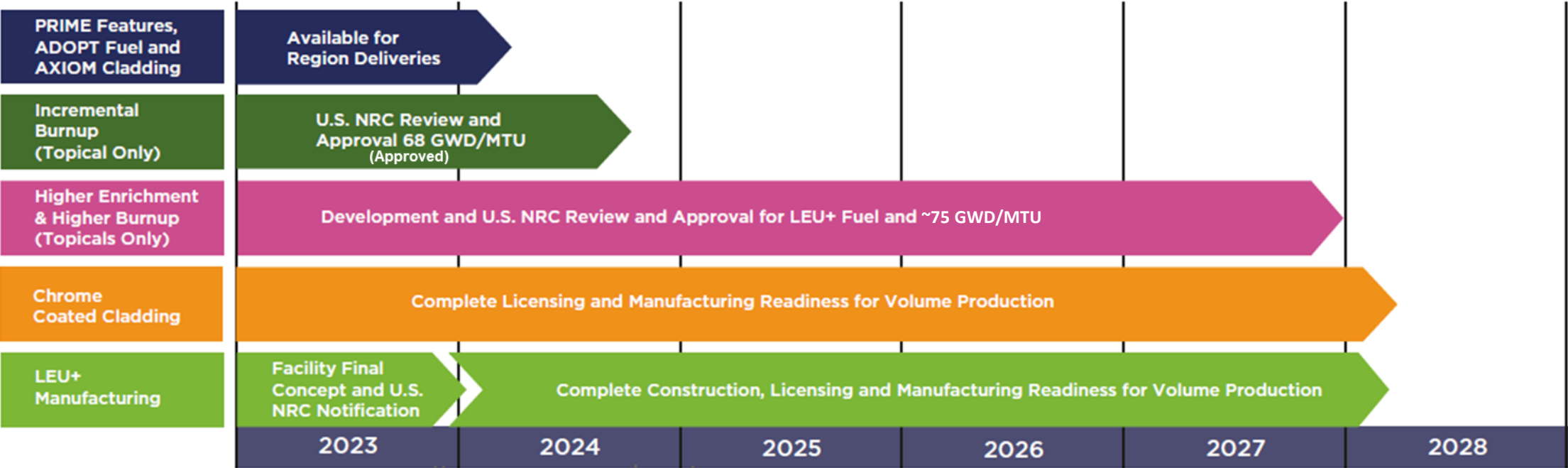
Reduced Hydrogen Pickup	
Approximate Burnup (MWd/kgU)	Average H-Content (ppm)
~31,000	< 50
~55,000	



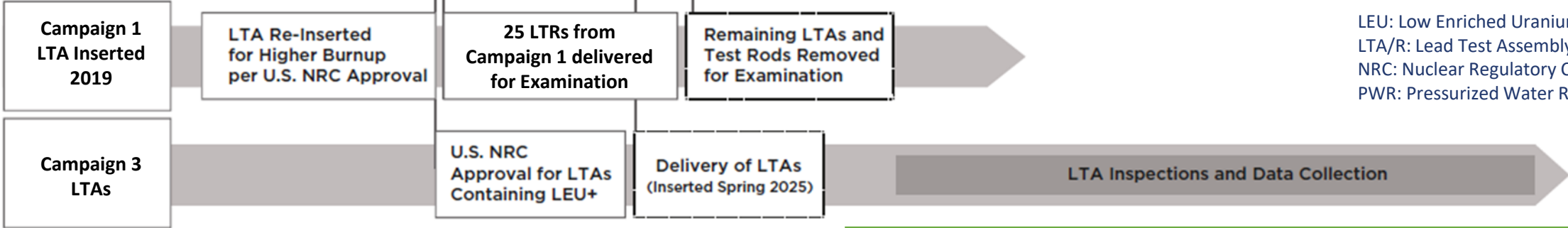
Cr Coated Rods Demonstrate Performance Enhancements Through ~55,000 MWd/kgU

Westinghouse High Energy PWR Fuel Program

Integrated Timeline



LEU: Low Enriched Uranium (>5%)
LTA/R: Lead Test Assembly / Rod
NRC: Nuclear Regulatory Commission
PWR: Pressurized Water Reactor



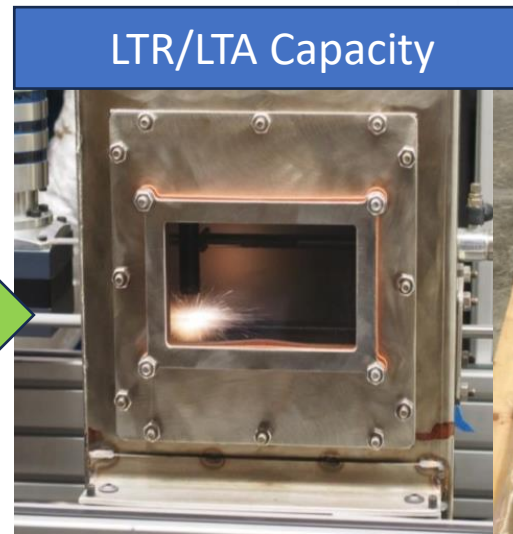
Engaging NRC early for multiple licensing actions to support 2028 reloads

Cr Coated Cladding Manufacturing

- Early development coatings provided confirmation of performance and refinement of coating specifications
- Adaptation of existing manufacturing techniques to process and inspect new cladding materials
 - Development of new inspection methods, visual standards, confirmation that some processes can be maintained
- Coating equipment designed with manufacturing line supporting production demands and projected operability in 2026



B. Maier, et al. Development of Cold Spray Chromium Coatings for Improved Accident Tolerant Zirconium-alloy Cladding. *Journal of Nuclear Materials*, 519 (2019), pp 247-254. <https://doi.org/10.1016/j.jnucmat.2019.03.039>.



Initial Production Capacity

Lessons Learned Throughout Development Critical to Aid Product Commercialization



Overview of High Energy Fuel LEU+ Manufacturing



New Facility being fabricated for LEU+ Mfg. in Columbia, SC, USA to support US Market PWR and BWR fuel production

BWR: Boiling Water Reactor
LEU: Low Enriched Uranium (>5%)
PWR: Pressurized Water Reactor

Conversion

- Ammonia-free dry conversion process 8% enriched UF₆
- Lower emissions with use of dry process
- Consideration of automated conversion lines and enclosed processes

Pelleting

- Advanced Doped Pellet Technology (ADOPT) blending
- Consideration of automated pelleting lines and enclosed processes

Burnable Absorbers /Rods

- Integrated Fuel Burnable Absorber (IFBA) dry room
- Automatic rod loading and welding

Uranium Recovery

- Uranium recovery process
- Reduced ammonia process

Mechanical

- Single control access point
- Ship to customers in Traveller package

Summary

- High energy fuel including ATF features provide enhanced safety and operational flexibility to support tomorrow's energy needs
- Initial PIE of Cr coated rods demonstrates operational performance enhancements
- Licensing and manufacturing implementation are underway to enable reload quantities of HEF/ATF fuel features



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