

July 25, 2023

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# DOE AGR Program Review: Concluding Remarks

**DOE ART Gas-Cooled Reactor (GCR) Review Meeting**  
Virtual Meeting  
July 25 – 27, 2023



# Major Program Activities – FY24 and Beyond

- **Complete AGR-3/4 data analysis and reporting**
  - Determine key takeaways in terms of fission product transport
- **Continue/complete AGR-5/6/7 PIE and safety testing**
  - Confirm performance of pilot-scale fuel, including performance at extreme high and low temperature regimes
- **Fuel oxidation tests**
  - Determine fuel and fission product behavior under oxidizing conditions
- **Reporting**
- **Compile AGR datasets for use by reactor designers, e.g.:**
  - Fission product retention characteristics of the fuel
  - Fuel failure analyses under all tested conditions
  - Oxidation behavior and impact on fission product retention
- **Fuel performance and fission product transport modeling**
- **Support industry interaction with the regulator during licensing activities**

# Coated-Particle-Fueled Reactor Concepts and Fuel Designs

Developer	Description	Fuel design
X-energy	<i>Xe-100</i> 200 MWt PB HTGR <i>Xe-Mobile</i> 1 – 5 MWe microreactor	UCO TRISO pebbles, graphitic matrix UCO TRISO
Kairos Power	<i>KP-FHR</i> 140 MWe salt-cooled SMR <i>Hermes</i> 35 MWt test reactor	UCO TRISO pebbles, graphitic matrix UCO TRISO pebbles, graphitic matrix
BWXT	<i>BANR</i> 50 MWt microreactor <i>Pele/MNPP</i> 1 – 5 MWe transportable microreactor	UN TRISO in SiC matrix UCO TRISO in graphitic matrix
Ultrasafe Nuclear	<i>MMR</i> 15 MWt microreactor	UCO TRISO in SiC matrix (“FCM”)
Westinghouse	<i>eVinci</i> 7-12 MWt microreactor	UCO TRISO compacts, graphitic matrix
Radiant Nuclear	<i>Kaleidos</i> >1 MWe transportable microreactor	UCO TRISO compacts, graphitic matrix
Framatome	<i>SC-HTGR</i> 625 MWt prismatic HTGR	UCO TRISO compacts, graphitic matrix
StarCore Power	10 MWe HTGR	TRISO
HolosGen	22 MWt scalable microreactor	TRISO fuel compacts
U-Battery Consortium	<i>U-Battery</i> 10 MWt microreactor	UO <sub>2</sub> TRISO fuel compacts
ORNL	<i>Transformational Challenge Reactor</i>	UN TRISO in SiC matrix
NASA	Nuclear thermal propulsion (NTP), nuclear electric propulsion (NEP)	Various

## Useful references:

- Advances in Small Modular Reactor Technology Developments. A Supplement to: IAEA Advanced Reactors Information System (ARIS), 2020 Edition, IAEA ([https://aris.iaea.org/Publications/SMR\\_Book\\_2020.pdf](https://aris.iaea.org/Publications/SMR_Book_2020.pdf))
- <https://www.world-nuclear.org/information-library/nuclear-fuel-cycle/nuclear-power-reactors/small-nuclear-power-reactors.aspx> (updated Jan 2023)



# Continued Coated Particle Fuel Development and Qualification

- Complete AGR Program scope to qualify LEU UCO TRISO fuel
- Support for emerging needs in industry
  - Unconventional coated particle fuel designs to meet changing reactor design requirements
  - Testing to support HTR reactor fleet operations
  - Development of advanced coated particle fuels
  - Continued refinement of fuel performance models
    - Accommodate unconventional designs and operational envelopes
    - Incorporate findings from PIE to improve predictive capabilities

# Acknowledgements

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Irradiated Materials Characterization Laboratory  
North Holmes Lab  
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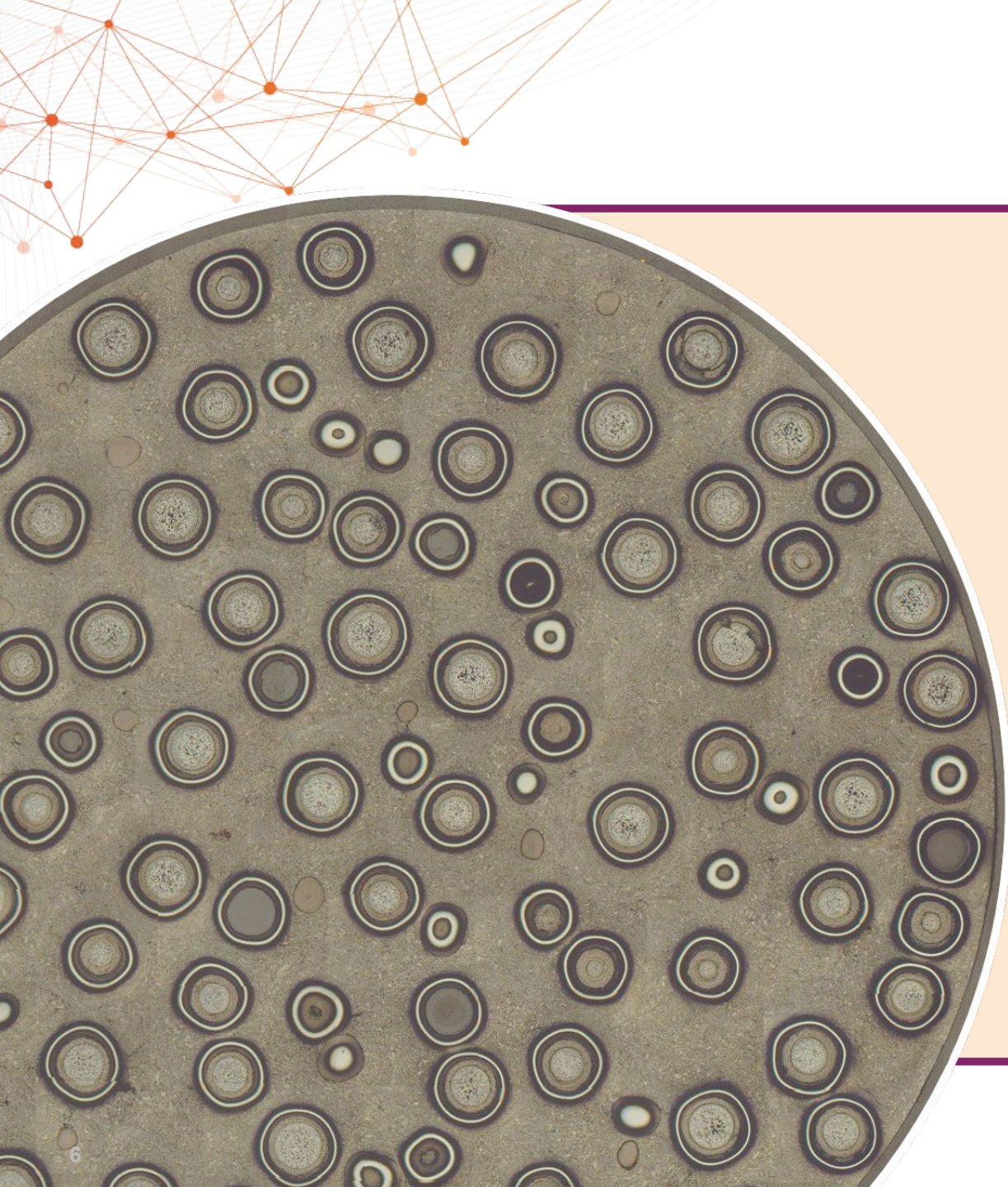
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Coated Particle Fuel Development (CPFD) Laboratory  
Radioactive Materials Analytical Laboratory (RMAL)  
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***Thank you for your attention***

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