



**HTR**

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# High Temperature Reactor Technology Working Group

NSUF Industry Advisory Meeting  
Charlotte, NC  
October 8-9, 2018



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# **HTR TWG OVERVIEW**

# High Temperature Reactor Technology Working Group





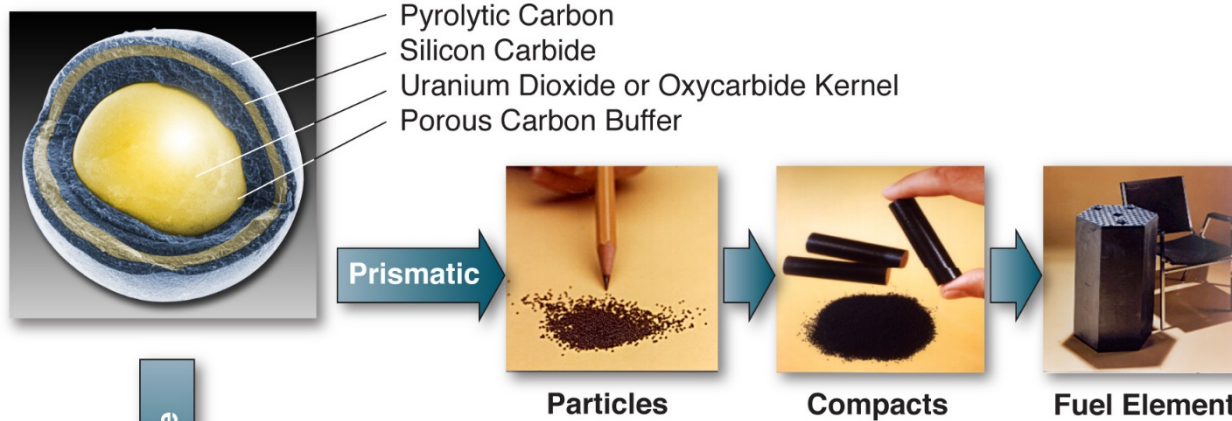
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# HTR TWG

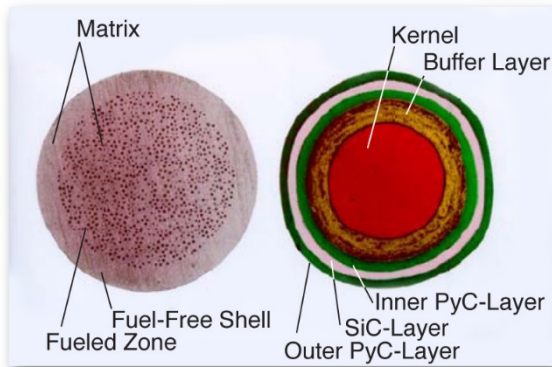
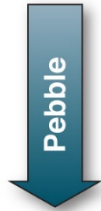
- Mission
  - Ensure that RD&D infrastructure is created, maintained, and available to support the timely development, demonstration and deployment of high temperature reactor technology.
- Objectives
  - Coordinate R&D needs with DOE and National Laboratories to ensure relevant work is aligned with technology goals
  - Support advancement, development, and deployment of high temperature reactor technology
  - Establish domestic US fuel supply chain including identification and resolution of issues related to front-end of HTR fuel supply, TRISO manufacturing, and back-end storage, transportation, and/or recycling
  - Support and coordinate efforts with other organizations and technology working groups to achieve shared objectives



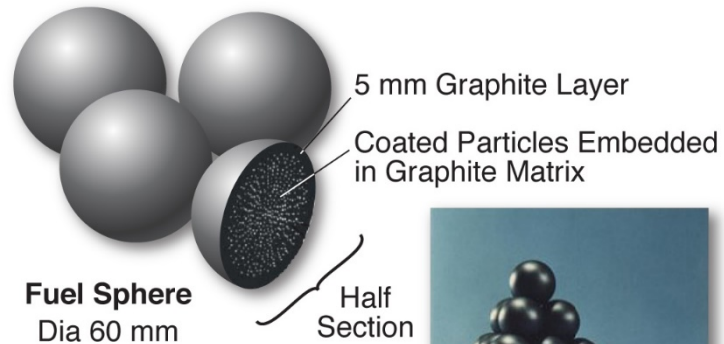
# TRISO Fuel



TRISO-coated fuel particles (left) are formed into fuel compacts (center) and inserted into graphite fuel elements (right) for the prismatic reactor



TRISO-coated fuel particles are formed into fuel spheres for pebble bed reactor





# HTR Evolution

- HTGR → HTR
- Rotation of chair (year-end)
  - Outgoing: Farshid Shahroki (Framatome)
  - Incoming co-chairs:
    - Peter Hastings (Kairos Power)
    - Martin van Staden (X-energy)



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# **HTR TWG PRIORITIES**



# HTR Priorities

- Advanced Gas Reactor (AGR) Fuel Program
  - AGR-1, -2, -3/4 irradiation in ATR complete; PIE underway
  - AGR-5/6/7 tests pending, irradiation scheduled through FY21
  - ~\$20M/yr through FY20, declining to ~\$6M in FY24
  - Limited Scope Topical Report to demonstrate performance to date of UCO TRISO particles and summarize irradiation, safety testing, and PIE results to date
- Advanced Graphite Creep (AGC) Program
  - AGC-1, -2, -3 irradiation complete; PIE underway
  - AGC-4 underway, AGC-5 through -8 pending as required
  - ~\$5-7M through FY22, ~\$1-2M through FY26





# HTR Priorities (continued)

- Codes & Standards
  - ASME Section III Div. 5 (graphite and other high temperature materials)
  - ASME/ANS RA-S-1.4-2013, “Probabilistic Risk Assessment Standard for Advanced Non-LWR Nuclear Power Plants,” (Trial Use)
  - ANS-30.1-201x, “Integration of Risk-Informed, Performance-Based Principles and Methods into Nuclear Safety Design for Nuclear Power Plants” (new standard)
  - ANS-30.2-201x, “Categorization and Classification of Structures, Systems, and Components for New Nuclear Power Plants” (new standard)
  - ANSI/ANS-53.1-2011, “Nuclear Safety Design Process for Modular Helium-Cooled Reactor Plants”, R2016
- Regulatory Framework Updates
  - Regulatory Guide 1.232, “Guidance for Developing Principal Design Criteria for Non-Light-Water Reactors”
  - Draft Regulatory Guide (DG-) 1353, “Guidance for a Technology-Inclusive, Risk-informed, and Performance-Based Approach to Inform the Content of Applications for Licenses, Certifications, and Approvals for Non-Light-Water Reactors”
    - NRC endorsement of Southern-led “Licensing Modernization Project”
    - Includes TWG member pilot demonstrations
- Participation in generic activities, e.g., HALEU



# HTR Priorities (concluded)

- Evaluating additional collaboration opportunities
  - Fuel handling and waste management
  - Material control and accounting (safeguards)
  - Design and manufacturing of various components
- Ongoing integration of R&D and licensing efforts
- Updates
  - *High-Temperature Reactor Research and Development Roadmap* (INL/EXT-17-41803, Revision 6 draft)
  - HTR R&D Needs document



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# IMPRESSIONS OF NSUF