High Temperature Reactor Technology Working Group

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

Pyrolytic Carbon
Silicon Carbide
Uranium Dioxide or Oxycarbide Kernel
Porous Carbon Buffer

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)
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)

• Regulatory Framework Updates
    • 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
IMPRESSIONS OF NSUF