Kairos Power Leverages EPRI's Topical Report to Qualify Fuel and Obtain Construction Permit

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Fuel qualification is typically a years-long, costly process. To avoid that traditional path, Kairos Power fast-tracked licensing of its Hermes Test Reactor on a first-of-its-kind construction permit application by using EPRI's TRISO Topical Report, developed with the Department of Energy (DOE) and Idaho National Laboratory (INL), to demonstrate fuel safety to the Nuclear Regulatory Commission (NRC). Relying on this established technical basis allowed the company to move forward without launching a full qualification campaign, significantly shortening the regulatory review timeline.

Benefits

Irradiation campaigns of TRISO fuel alone could have cost Kairos Power more than $20 million USD, not including manufacturing and analysis of results. By leveraging the topical report, the company avoided redundant testing, saving millions of dollars and thousands of labor hours. This strategy also strengthened regulatory confidence and set a valuable precedent for more efficient fuel qualification in future advanced reactor licensing.

Application

The Kairos Power team incorporated NRC-accepted conclusions drawn from the EPRI report directly into its construction permit application, eliminating the need for extensive new fuel-qualification work. The report consolidates experimental data from DOE's Advanced Gas Reactor Campaign into a format the NRC finds acceptable, forming the technical basis for regulatory approval of TRISO fuel. EPRI coordinated efforts across national labs and industry stakeholders, ensuring the report met NRC requirements and could be used broadly by advanced reactor developers. As a result, Kairos Power only needed to show—through its own topical report—that its manufacturing process complied with the specifications outlined in the EPRI document.

Prior to this application, Kairos Power also played a central role in the development of the EPRI's TRISO Topical Report itself. From the initial 2016 concept discussions to project scoping and pre-application engagements with the NRC, the company helped shape the document, supported responses to regulator questions, and contributed to preparations for advisory committee review. Its involvement helped secure regulatory acceptance, enabling the report to be used precisely as intended: to streamline compliance and support efficient licensing for advanced reactors.

The related research is available to all EPRI members interested in these applications:

- Uranium Oxycarbide (UCO) Tristructural Isotropic (TRISO)-Coated Particle Fuel Performance: Topical Report EPRI-AR1, 3002019978

Figure 1
Kairos Power's annular fuel pebble and TRISO fuel particles.

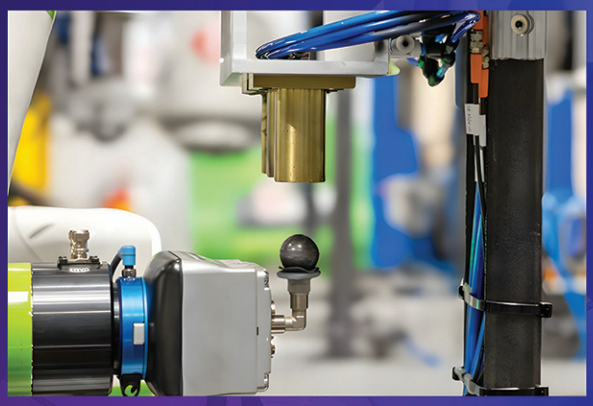

Figure 2
Kairos Power and BWXT collaborate on commercial TRISO manufacturing.

Figure 3
Pebble with surrogate TRISO in production.

EPRI