




UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

June 6, 2023

MEMORANDUM TO: Joseph A. Proffitt, Acting Chief
Advanced Reactor Licensing Branch 1
Division of Advanced Reactors and Non-Power
Production and Utilization Facilities
Office of Nuclear Reactor Regulation

FROM: Matthew Hiser, Senior Project Manager  Signed by Hiser, Matthew
on 06/06/23
Advanced Reactor Licensing Branch 1
Division of Advanced Reactors and Non-Power
Production and Utilization Facilities
Office of Nuclear Reactor Regulation

SUBJECT: SUMMARY OF FEBRUARY 9, 2022, PUBLIC MEETING ON THE
KAIROS HERMES PRELIMINARY SAFETY ANALYSIS REPORT

On February 9, 2022, the U.S. Nuclear Regulatory Commission (NRC) staff held a public observation meeting via teleconference. The purpose of this meeting was to discuss the NRC's safety review of the Kairos Power, LLC (Kairos) Hermes test reactor construction permit application. Specifically, the staff and Kairos discussed questions relating to quality assurance, principal design criteria, materials, and structural evaluations. The meeting notice and agenda, are available in the Agencywide Documents Access and Management System (ADAMS) at Accession No. ML22028A155.

To facilitate the discussion, staff provided questions to Kairos by email in advance of the meeting. The questions are available at ML22034A991 and ML22062B324. During the meeting, following the NRC staff introductions and management remarks, staff and Kairos discussed the emailed questions. Notes on the discussion are provided below. A list of meeting attendees is enclosed.

Summary of discussion during the meeting:

- Regarding quality assurance for testing or experiments to support a power reactor, Kairos will conduct testing, but no specific tests have been defined. The tests for the power reactor will meet the higher quality assurance standards of Title 10 of the *Code of Federal Regulations* (CFR) Part 50 Appendix B.

CONTACT: Matthew Hiser, NRR/DANU
301-415-2454

- Some information on compliance with the American National Standards Institute (ANSI) 15.8 Quality Assurance (QA) standard is contained in other sections of the preliminary safety analysis report (PSAR) besides 12.9, and some items are not applicable to Hermes or only reference another standard.
- Kairos has not yet begun developing procedures for Hermes.
- Regarding maximum hurricane wind speeds, Hermes is close to the 130 mph line in Figure 2 of Regulatory Guide 1.221.
- Regarding snow loading, Kairos does not have the final design roof slope, but will use ASCE guidance in determining the final design.
- Kairos will consider the ground snow loading and will revise the PSAR if appropriate.
- Kairos will need to finalize roof design to see if rain on snow surcharge applies. Kairos is waiting to finish the roof design before determining the need for American Society of Civil Engineers (ASCE) 7.9 or 7.10.
- Regarding protection of safety related system, structures and components (SSCs) from fire water, Kairos intends to protect SSCs from spray as well as flooding. Kairos will look at whether PSAR clarification is needed, and specific design features will be described in the final safety analysis report (FSAR).
- Regarding safety significant versus safety related classification of SSCs, Kairos feels that design requirements are encompassed since safety related is more rigorous than safety significant.
- Since Kairos will not be submitting a probabilistic risk assessment (PRA), there will be no distinction between anticipated operational occurrences (AOOs) and design basis accidents (DBAs). Kairos wanted to avoid use of the accidents label because of the lower consequences of Hermes events.
- The specification of the number of cycles on American Society of Mechanical Engineers (ASME) components is not needed for the preliminary design in the PSAR but will be provided in the FSAR.
- Details of the vessel connector will be provided in the FSAR.
- Testing of a control element assembly will be conducted in-pile with maximum seismic deflection and the presence of Flibe.
- Kairos will be conducting tests to determine the effect on control element neutron absorber if it exposed to Flibe. Also, Kairos will design the control element cladding to accommodate wear and will monitor the Flibe for boron.
- Kairos intends to use ASME Section III Division 5 for SS 316H, which includes seismic loads for control elements.
- The trip function for control elements is the only function that needs seismic loading. Operational movement of elements does not need to consider seismic loads.
- Kairos will perform out of pile tests to identify the anticipated wear on control elements.
- A reactor coolant siphon is prevented by having the pump suction being at the top of the vessel and the pebble handling and storage system (PHSS) chute is also above the core. The pebble insertion line extends to the bottom of the core but will have an overflow cutout.
- The primary salt pump suction is in a pump well formed by the graphite, which excludes pebbles. The PHSS will be inspecting pebbles and remove any that are damaged.

- A monitoring device for vessel temperature is described in PSAR Section 7.3.1 and is a safety related input to RPS. The monitor also feeds to the plant control system. The measurement is the core outlet temperature at the top of the core. The measurement will be described in a revision to the PSAR with details provided in the FSAR.

In general, the discussion clarified many things for the NRC staff. Kairos also noted several changes to make to the PSAR.

Docket No. 05007513

Enclosure:
List of Attendees

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HERMES PRELIMINARY SAFETY ANALYSIS REPORT DATE JUNE 6, 2023

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JProffitt, NRR

MHiser, NRR

SCuadrado, NRR

EHelvenston, NRR

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NAME	MHiser	JProffitt	MHiser
DATE	6/6/2023	6/6/2023	6/6/2023

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List of Attendees

Public Meeting on Kairos Hermes Preliminary Safety Analysis Report

Wednesday, February 9, 2022

Name	Organization
Ben Beasley	U.S. Nuclear Regulatory Commission (NRC)
Meg Audrain	NRC
Alex Chereskin	NRC
Joseph Colaccino	NRC
Candace de Messieres	NRC
Michelle Hayes	NRC
Bryce Lehman	NRC
Tim Lupold	NRC
Tony Nakanishi	NRC
Stephen Philpott	NRC
Ed Helvenston	NRC
William (Duke) Kennedy	NRC
Jeff Schmidt	NRC
Alex Siwy	NRC
Binesh Tharakan	NRC
Darrell Gardner	Kairos Power LLC
Drew Peebles	Kairos Power LLC
Margaret Ellenson	Kairos Power LLC
Marty Bryan	Kairos Power LLC
Peter Hastings	Kairos Power LLC
Sarathiraja Sekar	Kairos Power LLC
Bri Hughes	Kairos Power LLC
Brian Song	Kairos Power LLC
Jim Tomkins	Kairos Power LLC
John Price	Kairos Power LLC
Zackary Rad	Kairos Power LLC
Ryan Lighty	Morgan Lewis
Kaniel Tilow	Simpson Gumpertz & Heger
Brandon Chisholm	Southern Company
Charlotte Geiger	X-energy
Ingrid Nordby	X-energy
Steve Vaughn	X-energy
Paul Loza	X-energy

Enclosure

Jana Bergman	Curtiss-Wright
Michelle Byman	Concurrent Technologies
Donald Behnke	Westinghouse
John Pfabe	Westinghouse
Robert Armistead	Public
Hadi	Public