

**Enclosure 1**  
**Response to Hermes 2 General Audit Question 1.5-1**  
**(Non-Proprietary)**

**Hermes 2 Audit Question Number: 1.5-1**

On page 1-2 of the Hermes 1 safety evaluation (SE) (Agencywide Document Access and Management System (ADAMS) Accession No. ML23158A265), the NRC staff identified several supplements to the Hermes 1 construction permit (CP) application that provide additional information on that docket beyond the latest versions of the Preliminary Safety Analysis Report and referenced technical reports. Please identify which of these Hermes 1 application supplements are applicable to and incorporated by reference into the Hermes 2 CP application.

**Kairos Power Response:**

The following supplements to the Hermes construction permit application (CPA) identified in the Hermes SE (Reference 1) are provided below with their applicability to the Hermes 2 CPA:

- Transmittal of Responses-to NRC Questions 2.3-1 and 2.3-2 on the Hermes Preliminary Safety Analysis Report, dated February 3, 2022 (Reference 2)

This supplement provided raw meteorological data and ARCON96 input and output files for the Hermes Reactor. The response to question 2.3-2 identified a formatting error in the meteorological data and an error in the chronological order the files were listed in for the ARCON96 run. These errors were corrected and the updated site-specific  $\chi/Q$  values were submitted to the NRC by letter dated March 1, 2022 (Reference 12).

The raw meteorological data and the ARCON96 input files contained in this supplement are applicable to Hermes 2. The updated site-specific  $\chi/Q$  values submitted to the NRC by letter dated March 1, 2022 are also applicable to Hermes 2.

This supplement and the updated site-specific  $\chi/Q$  values submitted to the NRC by letter dated March 1, 2022 following correction of the errors identified in the supplement is applicable to the Hermes 2 CPA. No changes are required to the Hermes 2 PSAR because the updated values provided in the March 1, 2022 letter have been incorporated into Hermes 2 PSAR Tables 13.2-1 and 13.2-2.

- Kairos Power Response to NRC Questions 2.4-1, 2.4-2, and 2.4-3 for PSAR Section 2.4 on Hermes Construction Permit Application, dated February 8, 2022 (Reference 3)

This supplement provided description of how the flood elevation shown in PSAR Table 2.4-2 was developed, stated no dam safety updates were identified for Norris or Melton Hill dams since 2014, and included the submissions of flooding evaluations referenced in the Hermes PSAR.

This supplement is applicable to the Hermes 2 CPA with one clarification. In the response to question 2.4-1, Hermes Environmental Report Figure 3.4-2, FEMA Flood Hazards, is referenced as providing the currently available FEMA map that indicates that the estimated 100-yr and 500-yr floodplains remain well below the site footprint. For the Hermes 2 Environmental Report, the FEMA Flood Hazards are provided in Figure 3.2-1.

- Kairos Power Response to NRC Questions 2.5-1, 2.5-2, 2.5-3, and 2.5-4 for PSAR Section 2.5 on Hermes Construction Permit Application, dated February 9, 2022 (Reference 4)

This supplement provided:

- A response that the PSAR reflects an assumption that the Clinch River Early Site Permit application earthquake catalog (ending in 2013) is representative of the seismic activity to be expected at the Hermes site,

- A description of the method for determining that foundation rock shows no signs of karstic dissolution,
- A new PSAR Figure 2.5-2 that includes the Mascot Dolomite shown in PSAR Figure 2.5-1, and
- A new PSAR Figure 2.5-3 showing the dip interface consistent with the Elverton Quadrangle.

This supplement is applicable to the Hermes 2 CPA with one clarification. The approximate depths of weathered rock, the top of sound rock, and the planned excavation depth for the Hermes 2 reactor locations may be different from the approximate depths specified for the Hermes reactor location. No changes are required to the Hermes 2 PSAR because the changes to Figures 2.5-2 and 2.5-3 described in this submittal have already been incorporated.

- Kairos Power Transmittal of Responses to NRC Requests for Confirmation of Information for Hermes Preliminary Safety Analysis Report Section 9.1, dated August 19, 2022 (Reference 5)

This supplement provided confirmatory information that the application for an operating license will show the selected coolant chemistry sampling locations to be well-mixed, representative samples of the coolant, the inert gas system will be capable of measuring both the air and moisture content of the cover gas, the entirety of the inert gas system can be periodically leak checked, and the inert gas system is not needed to control the hot cell temperature referenced in the Pebble Handling and Storage System Malfunction Event.

This supplement is applicable to the Hermes 2 CPA.

- Kairos Power Response to NRC Request for Additional Information 348 and 339, dated August 31, 2022. (Reference 6)

This supplement provided responses to requests for additional information for questions regarding the Reactor Control and Shutdown System and the natural circulation flow path.

This supplement is applicable to the Hermes 2 CPA. No changes are required to the Hermes 2 PSAR because the PSAR markups included with the response to this RAI have been incorporated into the Hermes 2 PSAR.

- Kairos Power Response to NRC Request for Additional Information 350, dated September 1, 2022 (Reference 7)

This supplement provided responses to requests for additional information for questions regarding air ingress.

This supplement is applicable to the Hermes 2 CPA. No changes are required to the Hermes 2 PSAR because the PSAR markups included with the response to this RAI have been incorporated into the Hermes 2 PSAR.

- Kairos Power Transmittal of Response to NRC Question on DHRS Testing from PSAR Section 6.3 Audit on Hermes Preliminary Safety Analysis Report, dated September 1, 2022 (Reference 8)

This supplement provided a response to NRC audit question regarding Decay Heat Removal System testing.

This supplement is applicable to the Hermes 2 CPA.

- Kairos Power Additional Information Related to Construction Permit Application – PSAR Chapter 1, dated November 15, 2022 (Reference 9)

This supplement provided a copy of a letter from the US Department of Energy to Kairos Power regarding contract discussions for the management of spent nuclear fuel and high level waste.

The letter contained in this supplement is only applicable to the Hermes reactor. A separate Hermes 2 supplement will be provided at a later date.

- Kairos Power Transmittal of Responses to NRC Question on Hermes Preliminary Safety Analysis Report, dated December 8, 2022 (Reference 10)

This supplement provided a response to an NRC audit question regarding the schedule for completing research and development activities listed in Hermes PSAR Section 1.3.9. Research and development activities listed in PSAR Section 1.3.9 will be completed prior to the completion of construction. For Hermes, the latest projected date for completion is December 2026.

The date for anticipated completion of construction provided in this supplement is not applicable to Hermes 2. However, The research and development activities listed in Hermes 2 PSAR Section 1.3.9 will be completed prior to the completion of construction of the Hermes 2 facility. As stated in Enclosure 1 to letter “Submittal of the Preliminary Safety Analysis Report for the Hermes 2 Kairos Power Fluoride Salt-Cooled, High Temperature Non-Power Reactor (Hermes 2), Revision 0,” dated July 14, 2023 (Reference 13), the latest projected completion date for the first unit is July 2027.

- Kairos Power Transmittal of Changes to Preliminary Safety Analysis Report Chapter 6 and Response to NRC Question on DHRS Testing, KP-NRC-2212-003, dated December 19, 2022 (Reference 11)

This supplement provided a response to a follow up NRC audit question on additional Decay Heat Removal System performance phenomena testing.

This supplement is applicable to the Hermes 2 CPA. No changes are required to the Hermes 2 PSAR because the PSAR markups included with this supplement have been incorporated into the Hermes 2 PSAR.

#### **Impact on Licensing Document:**

This response has no impact on the content of Hermes 2 PSAR.

#### **References:**

1. Safety Evaluation, Nuclear Regulatory Commission, “Safety Evaluation Related to the Kairos Power LLC Construction Permit Application for the Hermes Test Reactor,” June 2023 (ML23158A268)
2. Letter, Kairos Power LLC to Document Control Desk, “Transmittal of Responses-to NRC Questions 2.3-1 and 2.3-2 on the Hermes Preliminary Safety Analysis Report,” February 3, 2022 (ML22041A337)
3. Letter, Kairos Power LLC to Document Control Desk, “Response to NRC Questions 2.4-1, 2.4-2, and 2.4-3 for PSAR Section 2.4 on Hermes Construction Permit Application,” February 8, 2022 (ML22040A141)
4. Letter, Kairos Power LLC to Document Control Desk, “Response to NRC Questions 2.5-1, 2.5-2, 2.5-3, and 2.5-4 for PSAR Section 2.5 on Hermes Construction Permit Application,” February 9, 2022 (ML22040A336)

5. Letter, Kairos Power LLC to Document Control Desk, "Transmittal of Responses to NRC Requests for Confirmation of Information Hermes Preliminary Safety Analysis Report, Section 9.1, August 19, 2022 (ML22231B228)
6. Letter, Kairos Power LLC to Document Control Desk, "Response to NRC Request for Additional Information 348 and 339," August 31, 2022 (ML22243A247)
7. Letter, Kairos Power LLC to Document Control Desk, "Response to NRC Request for Additional Information 350," September 1, 2022 (ML22252A149)
8. Letter, Kairos Power LLC to Document Control Desk, "Transmittal of Response to NRC Question on DHRS Testing from PSAR Section 6.3 Audit on Hermes Preliminary Safety Analysis Report," September 1, 2022 (ML22244A235)
9. Letter, Kairos Power LLC to Document Control Desk, "Additional Information Related to Construction Permit Application – PSAR Chapter 1," November 15, 2022 (ML23019A360)
10. Letter, Kairos Power LLC to Document Control Desk, "Transmittal of Responses to NRC Question on Hermes Preliminary Safety Analysis Report," December 8, 2022 (ML22342B282)
11. Letter, Kairos Power LLC to Document Control Desk, "Transmittal of Changes to Preliminary Safety Analysis Report Chapter 6 and Response to NRC Question on DHRS Testing," December 19, 2022 (ML22353A625)
12. Letter, Kairos Power LLC to Document Control Desk, "Transmittal of Changes to Maximum Hypothetical Accident Dose Results in Hermes Construction Permit Application," March 1, 2022 (ML22060A272)
13. Letter, Kairos Power LLC to Document Control Desk, "Submittal of the Preliminary Safety Analysis Report for the Hermes 2 Kairos Power Fluoride Salt-Cooled, High Temperature Non-Power Reactor (Hermes 2), Revision 0," July 14, 2023 (ML23195A122)