**Enclosure 1**

**Presentation Materials for Kairos Power Pre-Submittal Meeting on the Hermes site Environmental Review Overview**

**(Non-Proprietary)**

(Note that the enclosed information is preliminary and pre-decisional and is subject to change during detailed planning and project execution. It is provided for planning and familiarization purposes in support of pre-application discussions with the NRC Staff.)

Kairos Power

# Environmental Report Overview

AUGUST 19, 2021

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Kairos Power's mission is to enable the world's transition to clean energy, with the ultimate goal of dramatically improving people's quality of life while protecting the environment.

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In order to achieve this mission, we must prioritize our efforts to focus on a clean energy technology that is *affordable* and *safe*.

# Agenda

- Purpose and Need
- Site Overview
- Alternative Evaluation
- Permitting
- Kairos Power approach to Tables S-3 and S-4
- Environmental Impacts

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# Purpose and Need

- The purpose of the proposed Kairos Power test reactor facility is to test the key technologies of the Kairos Power Fluoride Salt-Cooled, High Temperature Reactor (KP-FHR) a novel advanced nuclear reactor technology that leverages TRI-structural ISOtropic particle fuel (TRISO) in pebble form combined with a low-pressure fluoride salt coolant.

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# Site Overview

- Well-characterized brownfield site helps to minimize additional data needs
- Previous site development should minimize pre-construction activities
  - Former K-33 facility footprint cleared/graded
  - Roads and utilities suitable for pre-construction activities in place or in progress as part of larger site infrastructure development/maintenance
  - Prior remediation/evaluation completed as part of turnover by DOE; confirmatory monitoring ongoing by DOE

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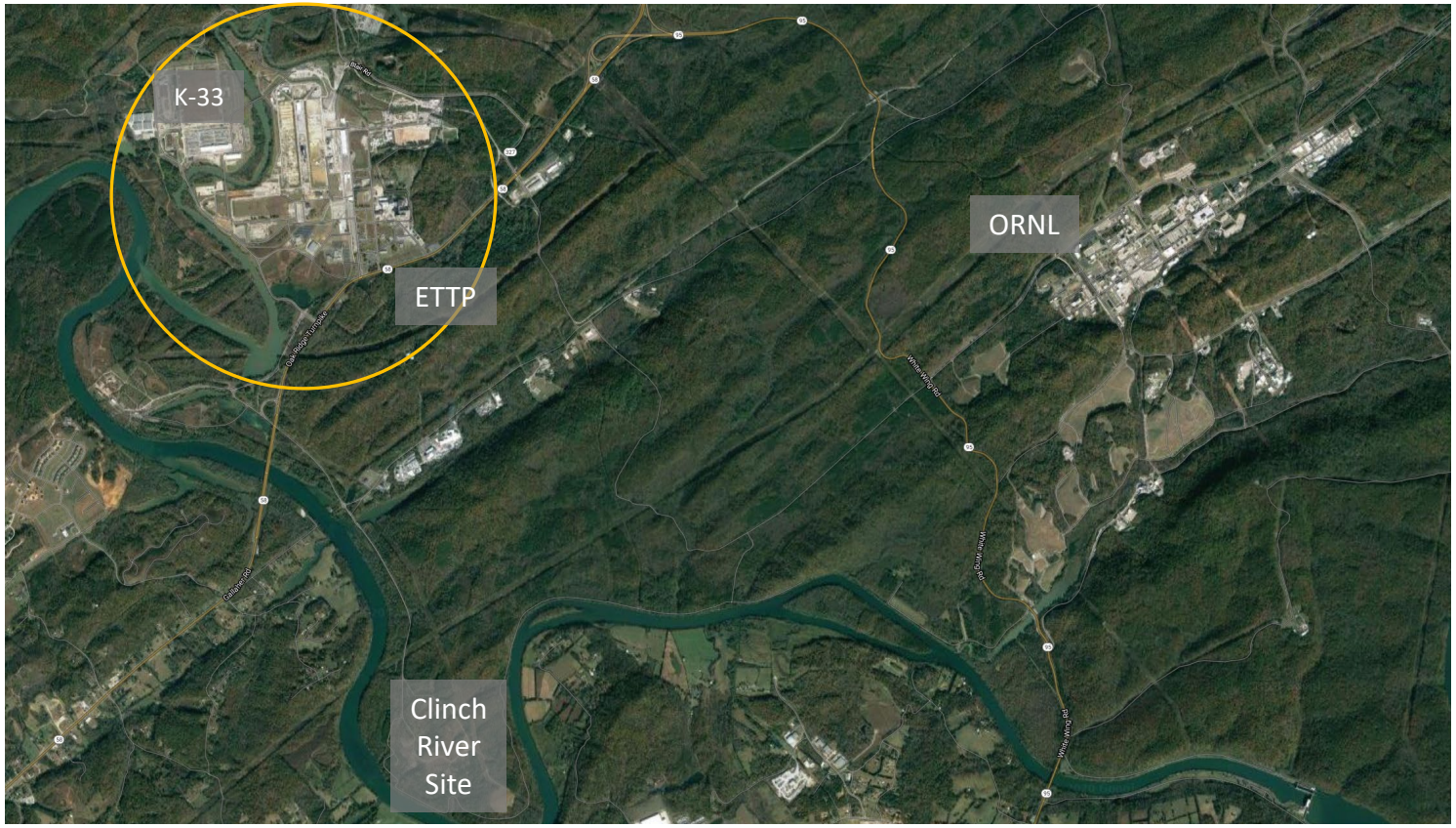
# Site Region

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# East Tennessee Technology Park


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# Hermes Site

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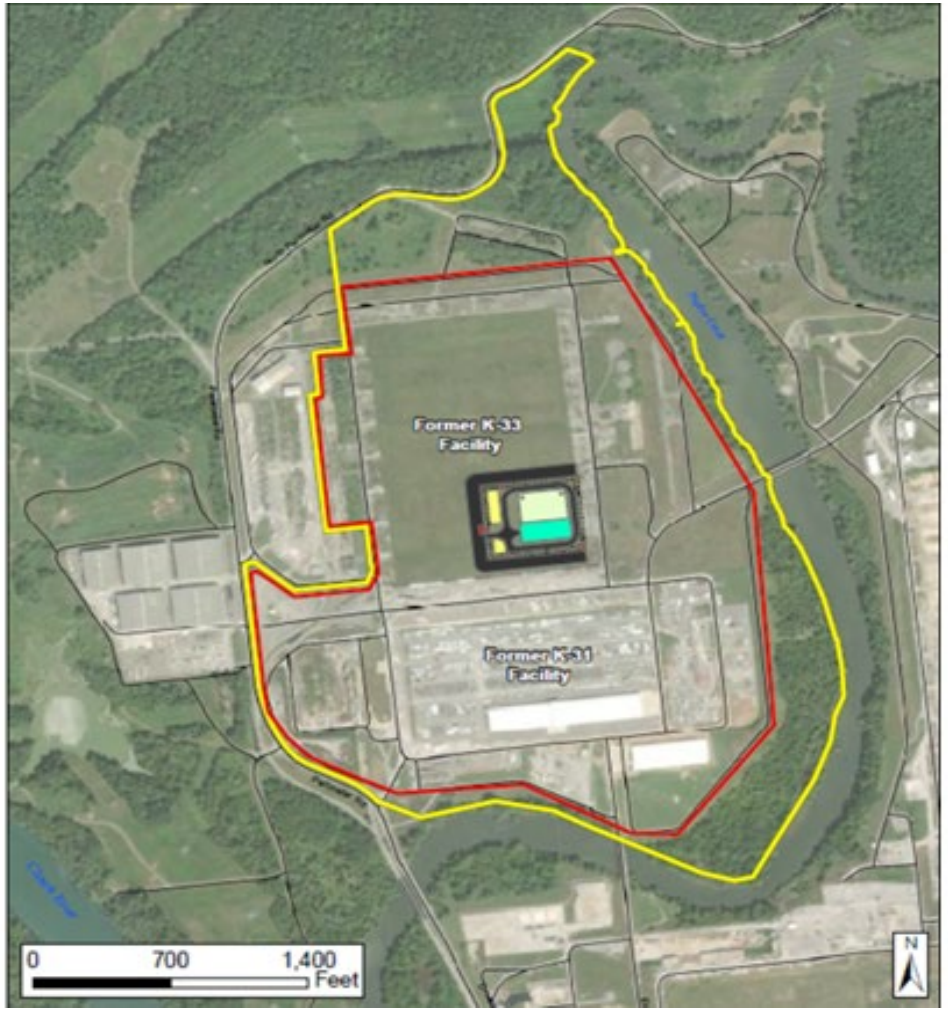
# Hermes Proposed Location

- Yellow Line – Property Boundary
- Red Line – Temporarily Disturbed Area

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# Alternatives Evaluation

- Identification of Technological Alternatives
  - The purpose of the Hermes test reactor is to demonstrate the key technologies of the Kairos Power Fluoride Salt-Cooled, High Temperature Reactor (KP-FHR).
    - TRI-structural ISOtropic particle fuel (TRISO) in pebble form
    - Low-pressure fluoride salt coolant
  - No technological alternatives exist that satisfy this purpose
    - No-action alternative would not satisfy Kairos Power technology demonstration objective
    - Cost-benefit analysis of alternative technologies is not applicable

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# Alternatives Evaluation

- Identification of Reasonable Site Alternatives
  - Continental US was identified as project Region of Interest
  - High-level business objectives were used to narrow down the continental US to several sub-regions
    - Eastern Tennessee
    - Pacific Northwest
    - Eastern Idaho
    - Piketon, Ohio
    - Southeast United States

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# Alternatives Evaluation

- Location Selection Considerations
  - The Hermes reactor is developed and sited under a set of objectives to support its role as a demonstration and testing platform for the Kairos Power Fluoride-Cooled, High-Temperature Reactor (KP-FHR). Some of these objectives, with regard to site selection, include the following:
    - Facilitating rapid deployment of a non-power reactor in support of Kairos Power's iterative development approach;
    - Selecting a site that is, or can be, supported by sufficient high-quality site data for licensing and design
    - Supporting both near-term and future testing capabilities; this objective results in a very strong preference for close proximity to a Department of Energy (DOE) national laboratory site capable of supporting those test plans
  - Two candidate sites were selected for inclusion in comparative impact analyses
    - K-33 – Proposed Site
    - Eagle Rock (Idaho) – alternative site

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# Consultations Required for Hermes Site

*Evaluation is still in progress (some may not apply)*

| Agency | Authority | Requirement | Activity Covered |
|---|---|---|---|
| TDEC – Division of Natural Heritage and Tennessee Wildlife Resources Agency | Rare Species Protection and Conservation Act, TN Code §70-8-101 | Consultation regarding potential to adversely affect protected species | Concurrence with no adverse effect or consultation on appropriate mitigation measures |
| Tennessee Historical Commission | National Historic Preservation Act, 16 USC 470 et seq.<br><br>National Historic Preservation Act 36 CFR Part 800 | Consultation with Tennessee SHPO regarding potential to adversely affect historic resources<br><br>Section 106 Review: Consultation with SHPO to determine National Register of Historic Places listing of property | Confirm that site construction and operation activities would not affect protected historic resources or would be mitigated if unavoidable<br><br>Complete Tennessee SHPO Initial Review Request Checklist |
| TDEC – Division of Air Pollution Control | Clean Air Act, USC 42 et seq. | Consultation regarding potential adverse effects on ozone standards | Concurrence with no adverse effect or consultation on appropriate mitigation measures |

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# Preliminary Non-Power KP-FHR Permitting Plan

*Assessments of these permits is in progress (some may not apply)*

| Agency | Authority | Requirement | Activity Covered |
|---|---|---|---|
| NRC | Atomic Energy and Energy Reorganization Acts 10 CFR 50 | Construction Permit and Operating License, in addition to applicable By-Product, Source Material, and Special Nuclear Material Licenses | Site Licensing, including safety-related construction activities and operation of a nuclear power facility |
| U.S. Department of Transportation (DOT) | Hazardous Material Transportation Act 49 CFR 107 Subpart G | Certificate of Registration | Transportation of hazardous materials |
| Tennessee Department of Transportation (TDOT) | TCA 54-5-302<br><br>TCA 54-5-302 | Entrance Permits<br><br>Right-of-way (ROW) permit | If additional access points are needed<br><br>If applicable for installing utilities in highway ROWs |
| U.S. Environmental Protection Agency (EPA) and TDEC | Resource Conservation and Recovery Act, Section 3010<br><br>EPA Facility Response Plan (40 CFR 9 & 112), Hazardous Waste Contingency Plan<br><br>Spill Prevention, Control and Countermeasures (SPCC) rule (40 CFR 112) | Acknowledgement of Notification of Hazardous Waste Activity<br><br>Facility Response Plan Approval<br><br>SPCC/Integrated Pollution Prevention (IPP) Plan | Hazardous Waste Generation<br><br>Spill/Discharge Response Program<br><br>Spill/Discharge Prevention Plan |

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# Preliminary Non-Power KP-FHR Permitting Plan

*Assessments of these permits is in progress (some may not apply)*

| Agency | Authority | Requirement | Activity Covered |
|---|---|---|---|
| TDEC | Federal Clean Water Act (33 USC 1251 et seq.) and Tennessee Code Annotated (TCA) § 69-3-108: Tennessee Water Quality Control Act of 1977 | NOI for coverage under NPDES Permit for stormwater discharges for construction | Compliance with water quality standards; stormwater control measures |
| | | Stormwater Pollution Prevention Plan | Compliance with water quality standards |
| | | Aquatic Resource Alteration Permit | Wetlands and/or transitional areas |
| | | NPDES Industrial Stormwater General Permit (operation); EPA Permit to Discharge Process Wastewater and Stormwater | Cooling water, service water, and stormwater runoff discharge from plant operations |
| | | NPDES Permit (Pesticide Discharge) | Point source discharges of pesticides |
| | | Sanitary Waste Water - Portable Facilities | Portable sanitary facilities |
| | | Permanent Sanitary Waste Water | Connect to Waste Water Treatment Plant |
| | TCA §§ 69-7-301, et seq. | Water Resources Notification; Water Withdrawal Registration | Surface water or groundwater withdrawal |
| | Federal Clean Air Act, 42 USC 7401 | Title V Operating Permit; Prevention of Significant Deterioration Preconstruction Permit | Discharge of air pollutants from cooling tower(s), emergency generators, auxiliary boiler(s), and ancillary equipment |

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# Preliminary Non-Power KP-FHR Permitting Plan

*Assessments of these permits is in progress (some may not apply)*

| Agency | Authority | Requirement | Activity Covered |
|---|---|---|---|
| City of Oak Ridge | Local Ordinances | Temporary Use Permit<br><br>Site Plan Approval<br><br>Flood Encroachment/Floodplain Permit<br><br>Sanitary Sewer, Potable Water Connection<br><br>Construction Permits | Siting temporary equipment for site characterization<br><br>Coordination with the Planning Board and/or Zoning Board of Adjustment for site development<br><br>Compliance zoning requirements for floodway districts<br><br>Connection to city waste water treatment, water supply<br><br>Construction of new facilities |
| TDEC Division of Radiological Health (DRH) | TCA § 68-23-212; TDEC Rule 0400-20-10-.32 | License-for-Delivery | Transportation of radioactive waste within the State of Tennessee to a disposal/processing facility |
| Tribal Preservation Officer (TPO) | Section 106 of the National Historic Preservation Act | Consultation with TPO, and identification of potentially affected resources | Protection of archaeological and historical resources |

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# Application of 10 CFR 51.51 Table S-3

- Table S-3 is described in 10 CFR 51.51 as being applicable to “light-water-cooled nuclear power reactors”
- Table S-3 is applied to new power reactors by scaling the impacts described in the table, which are based on a 1100 MW(e) LWR, to the power output of the new reactor
- The ISG Augmenting NUREG-1537, Part 1, for non-power reactors does not provide guidance on evaluating the impacts of the uranium fuel cycle
- PNNL has developed an approach for evaluating the impacts described in Table S-3 for the fuel cycle associated with non-LWR power reactors which may utilize more modern mining and enrichment processes

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# Application of 10 CFR 51.52 Table S-4

- If an Environmental Report can demonstrate that a new light-water power reactor meets the conditions in 10 CFR 51.51(a) and Table S-4, detailed analyses of the environmental effects of transportation of fuel and waste are not necessary
- Due to enrichment and fuel form, the Kairos non-power Hermes reactor will not conform to the criteria provided in 10 CFR 51.51(a)(2)
- Kairos will prepare a detailed analysis using bounding assumptions and guidance provided in PNNL-29365, *Environmental Impacts from Transportation of Fuel and Wastes to and from non-LWRs*
- Additionally, as outlined in PNNL-29365, Kairos will utilize the RADTRAN dose/risk assessment code and WebTRAGIS routing code to calculate impacts from incident-free transportation and transportation accidents assuming truck transportation of certified transportation packages with a maximum DOT-allowable external dose rate

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# Application of 10 CFR 51.52 Table S-4

- Number of shipments
  - A new LWR evaluating the environmental effects of transportation under 10 CFR 51.51 will normalize the number of shipments to/from an 880 net MW(e) reference reactor at using a procedure described in Regulatory Guide 4.2 to determine the number of shipments
  - In lieu determining the number of shipments for the Kairos 50 MW(t) non-power reactor by normalizing to the reference reactor, Kairos will demonstrate that its estimated number of annual shipment of new fuel, spent fuel, and radioactive waste are bound by the numbers provided in Table 2 of PNNL-29365 (annual number of shipments for the reference reactor)
- Comparison of Results
  - The results of the transportation dose/risk assessment presented in the Kairos ER will be compared to the criteria is Table S-4 and other quantities as listed in PNNL-29365 (e.g., background radiation dose, non-radiological transportation accident risk, etc.)

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# Potential Impacts from Construction and Operations Considered in the ER

- Land Use
- Visual Resources
- Air Quality
- Noise
- Geologic Environment
- Water Resources
- Ecological Resources
- Historic Resources
- Cultural Resources
- Socioeconomics
- Human Health
- Waste Management
- Transportation
- Postulated Accidents
- Environmental Justice
- Cumulative Effects

- To date Kairos Power has not identified any unavoidable adverse impacts to be greater than SMALL

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