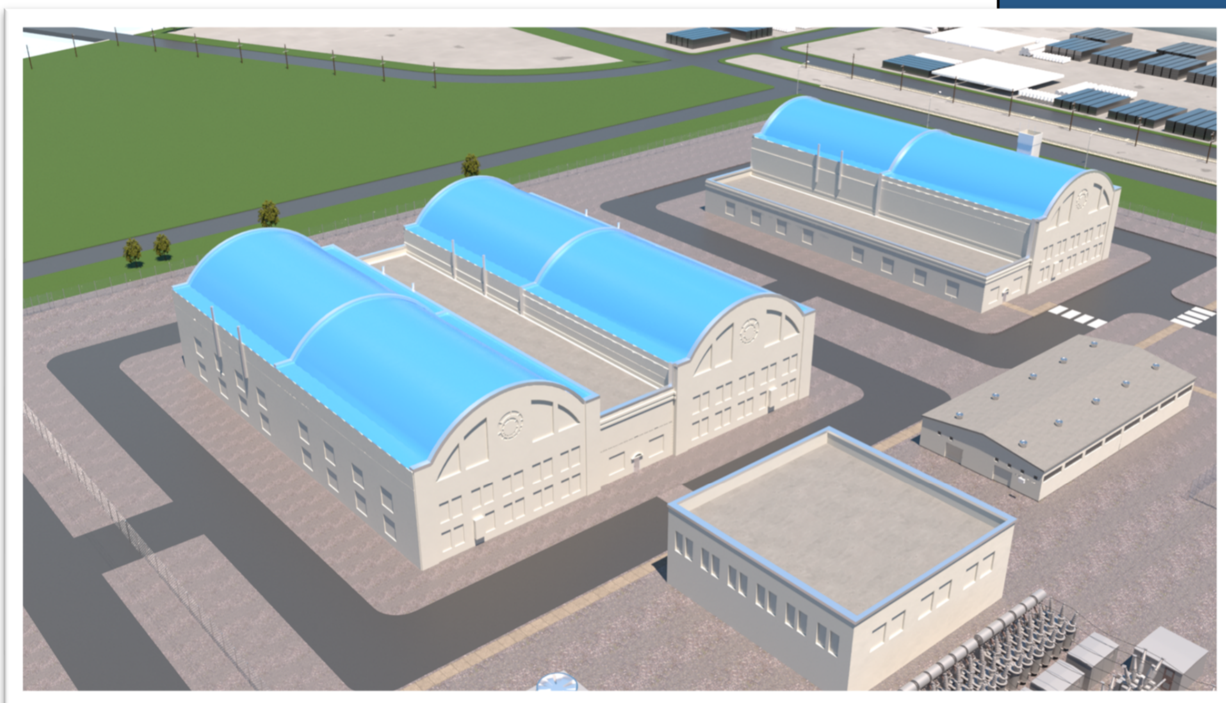
Enclosure 3

Environmental Report (Non-Proprietary)



Hermes 2 Non-Power Reactor Environmental Report

H2-ER-000001

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IMPACTS OF PROPOSED CONSTRUCTION, OPERATIONS, AND DECOMMISSIONING

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List of Acronyms

AC	alternating current
ALARA	as low as reasonably achievable
ARDP	Advanced Reactor Demonstration Program
CFR	Code of Federal Regulations
CO	carbon monoxide
CP	construction permit
CRSEC	building minimum cross sectional area
DAW	dry active waste
DHRS	decay heat removal system
DIAMTR	vent inside diameter
DOE	Department of Energy
DOT	Department of Transportation
EFPY	effective full-power years
EIS	Environmental Impact Statement
EMF	electromagnetic fields
EPA	Environmental Protection Agency
ER	Environmental Report
ETTP	East Tennessee Technology Park
EXIT	vent average velocity
FAA	Federal Aviation Administration
FEMA	Federal Emergency Management Agency
GHG	greenhouse gases
GIS	geographical information system
HBLDG	containment building height
HEATR	vent heat emission rate
HF	hydrogen fluoride
HRR	Heat rejection radiator
HSTACK	vent release height
IHTS	intermediate heat transport system
IHX	intermediate heat exchanger
INL	Idaho National Laboratory
ISG	Interim Staff Guidance
KOP	key observation point
LCD	local climatological data
LLRW	low-level radioactive waste
LOS	levels of service
LWR	light water reactor
MEI	maximally exposed individual
MGD	million gallons per day
MHA	maximum hypothetical accident
MTU	metric tons of uranium
MW	megawatts
MWth	megawatts thermal
NCDC	National Climatic Data Center

ND	no data available
NESC	National Electric Safety Code
NOx	nitrogen oxides
NRC	Nuclear Regulatory Commission
NWS	National Weather Service
OL	operating license
ORNL	Oak Ridge National Laboratory
ORR	Oak Ridge Reservation
PCB	polychlorinated biphenyl
PGS	power generation system
PHTS	primary heat transport system
PHX	primary heat exchanger
PLEV	wind sensor height
PSAR	Preliminary Safety Analysis Report
RBHVAC	Reactor Building heating, ventilation, and air conditioning system
ROI	region of influence
ROW	right of way
SLEV	wind height
TCA	Tennessee Department of Transportation
TDEC	Tennessee Department of Environment and Conservation
TDOT	Tennessee Department of Transportation
TEDE	total effective dose equivalent
TMS	tritium management system
TRISO	TRI-structural ISOtropic
UCO	uranium oxycarbide
UCOR	conversion correction factor
USACE	U.S. Army Corps of Engineers
USC	United States Code
USCB	U.S. Census Bureau
USEPA	U.S. Environmental Protection Agency

Kairos Power

Chapter 1

Introduction

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CHAPTER 1 INTRODUCTION

1.1 INTRODUCTION OF THE ENVIRONMENTAL REPORT

In accordance with the provisions of Title 10 of the Code of Federal Regulations (CFR) Part 50 “Domestic Licensing of Production and Utilization Facilities,” and supporting guidance, Kairos Power is providing this Environmental Report (ER) in support of an application to construct and operate a non-power test reactor (Hermes 2) facility within the Heritage Center Industrial Park (Heritage Center) in Oak Ridge, Tennessee.

This ER is provided with the construction permit application as required by 10 CFR 51.50(a). The ER provides information to the U.S. Nuclear Regulatory Commission (NRC) to facilitate preparation of an Environmental Impact Statement (EIS) in accordance with the provisions of 10 CFR 51 Subpart A - National Environmental Policy Act – Regulations Implementing Section 102(2). This chapter provides an introduction to the assessment of the environmental effects of construction, operation, and decommissioning of this facility on the site and surrounding areas.

This ER follows and is organized consistent with the NRC guidance provided in Final Interim Staff Guidance (ISG) Augmenting NUREG-1537, Part 1, Chapter 19, and supports the regulatory review that is performed by the NRC under 10 CFR 51. This ER relies significantly on the site and environmental information provided in the ER for the Kairos Power Hermes non-power demonstration reactor (Reference 1), which is similarly organized. This Hermes 2 ER describes the project, potential alternatives, and the methods and sources used in the environmental impact analysis where different from the Hermes ER. New and significant information identified regarding the proposed site and environment (relative to the Hermes ER) is also included.

This ER summarizes the environmental impacts of construction, operation, and decommissioning and describes any additional potential impacts not already considered in the Hermes ER (Reference 1). The purpose and need for the proposed action are provided in Subsection 1.3. A more detailed description of the proposed action is provided in Chapter 2 of this ER.

1.2 SITE HISTORY

The site history is the same as provided in the Hermes ER (Reference 1). No new and significant information regarding site history has been identified.

The proposed site for the Hermes 2 test reactor facility (facility) is the former location of Building K-33 and will be physically located north of and adjacent to the Hermes test reactor facility. A figure of the site is provided in Figure 1.1-1 of the Hermes ER (Reference 1).

1.3 PURPOSE AND NEED FOR THE PROPOSED ACTION

The proposed federal action is the issuance of a construction permit and an operating license under the provisions of 10 CFR 50, which would allow the construction and operation of a non-power test reactor facility to demonstrate the key technologies of the Kairos Power Fluoride Salt-Cooled, High Temperature Reactor (KP-FHR) for future commercial deployment. The reactor design is an advanced nuclear reactor technology that leverages TRI-structural ISOtropic (TRISO) particle fuel in pebble form combined with a low-pressure fluoride salt coolant.

Kairos Power's reactor development program, which the Hermes 2 test reactor units would support, is described in Section 1.3 of the ER for the Kairos Power Hermes non-power reactor (Reference 1). In addition to the bases outlined for the need and siting of the proposed action in the Hermes ER, the Hermes 2 reactor siting is further based on the following:

- Facilitating rapid demonstration of a multi-unit non-power reactor with shared power conversion systems in support of Kairos Power’s iterative development approach
- Reducing commercial cost uncertainty by demonstrating power conversion system and power transmission system integration and a multi-unit reactor facility
- Retaining construction workforce competency and demonstrating multi-unit construction and iteration of construction methods

This project is aligned with the DOE’s objective to demonstrate advanced nuclear reactors, with a goal of designing and developing safe and affordable reactor technologies that can be licensed and deployed over the next 10 to 14 years.

The environmental factors and impacts related to the electrical power transmission system of this proposed action are addressed in the Appendix of this report.

1.4 REGULATORY PROVISIONS, PERMITS, AND REQUIRED CONSULTATIONS

Information regarding regulatory provisions, permits, and required consultations is the same as provided in the Hermes ER (Reference 1).

No new and significant information regarding regulatory provisions, permits, or required consultations concerning the Hermes 2 facility has been identified.

1.5 REFERENCES

1. Kairos Power LLC, “Environmental Report for the Kairos Power Fluoride Salt-Cooled, High Temperature Non-Power Reactor (Hermes),” Revision 1, March 2023.

Kairos Power

Chapter 2

Proposed Action

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CHAPTER 2 PROPOSED ACTION

2.1 PROPOSED ACTION

The Proposed Federal Action is issuance of a Construction Permit (CP) and subsequent Operating License (OL) for a two-unit non-power reactor facility (Hermes 2) to test and demonstrate the key technologies, design features, and safety functions of the Kairos Power Fluoride Salt-Cooled High Temperature Reactor (KP-FHR) technology. The facility would also provide data that may be used for the validation of safety analysis tools and computational methodologies used for the designing and licensing future KP-FHR reactors.

The applicant for this CP and the OL and owner of the facility is Kairos Power LLC, (Kairos Power). Information about Kairos Power is provided with the Preliminary Safety Analysis Report (PSAR). As the owner and licensee, Kairos Power has the necessary authority and control related to the construction and operation of the facility once the CP and the OL are approved.

Kairos Power is requesting NRC review and approval of the CP application to support construction of safety-related structures, systems, and components anticipated to begin as early as mid-2025. The earliest projected dates for completion of construction is mid-2027 for unit 1 and mid-2028 for unit 2. The facility is expected to have an 11-year operational license. Therefore, decommissioning activities would be expected to be initiated after the operational phase for unit 1 ends and is anticipated to begin in 2039.

The construction requirements for each unit are expected to be similar to the requirements necessary for the Hermes non-power demonstration reactor facility as described in the Hermes Environmental Report (ER) (Reference 1). The Hermes and Hermes 2 reactors will generally be constructed sequentially (some construction activities may be done in parallel or shared across the site) and will share a construction workforce. Additional materials necessary for construction but not already listed in the Hermes ER are given in Table 2.1-1.

The construction phase of this project is estimated to require an average of 424 onsite workers (850 at peak times) and a monthly average of 426 truck deliveries and eight offsite shipments of construction debris. Table 2.1-1 shows estimates for materials that would be consumed. Additionally, approximately 63,600 gallons of diesel fuel (as a bounding assumption, fuel is assumed to be diesel) is assumed to be consumed on an average monthly basis. These estimates are conservatively estimated to be twice those proposed for the single unit Hermes reactor facility. Construction activities are estimated to affect an estimated 138 acres of land, of which an estimated 30 acres would be permanently disturbed for operation of the facility. Almost all of this permanently disturbed area is coincident to the permanently disturbed area identified for the Hermes facility (Reference 1).

Staffing, material, and waste disposal requirements for each unit during pre-operation and operation are expected to be similar the Hermes reactor (Reference 1). A low-pressure, molten salt coolant, i.e., Li_2BeF_4 (Flibe) and the intermediate coolant 57NaF:43BeF_2 (BeNaF) would be shipped to the site prior to startup. Flibe is estimated to be delivered in 40 shipments of 1 ton each prior to startup. An additional 40 shipments of Flibe (approximately one ton each) are estimated to be delivered to the facility before the end of the first two years of operation. These shipment estimates are conservatively estimated to be twice those proposed in the single unit Hermes ER. BeNaF is estimated to be delivered in 32 shipments of approximately 9 tons each prior to startup.

During operations, an estimated average of 59 workers per weekday (101 full-time positions) are required for staffing. Operational activities will require an estimated monthly average of 30 truck deliveries and eight offsite waste shipments. 32 shipments per year of BeNaF (9 tons each) will be delivered to the facility for the duration of operations. Hazardous materials that would be stored onsite in small quantities include new Flibe, BeNaF, and anhydrous hydrogen fluoride. A bounding value of approximately 43,110 gallons of diesel fuel for the standby diesel generator would be contained in onsite storage tanks. These estimates are either scaled or conservatively estimated to be twice those proposed for the single unit Hermes reactor facility.

It is estimated that post-operational decommissioning information and requirements are identical to those detailed for the Hermes reactor (Reference 1) as the Hermes 2 units will be decommissioned in series.

2.1.1 References

1. Kairos Power LLC, “Environmental Report for the Kairos Power Fluoride Salt-Cooled, High Temperature Non-Power Reactor (Hermes),” Revision 1, March 2023.

Table 2.1-1: Estimated Materials Consumed During Construction Phase Material

Material	Amount
Concrete	58,000 cubic yards
Structural Steel	980 tons
Steel Sheet Pilings	1,040 tons
Precast Piles	18,600 tons
Precast Panels (12” thick)	8,800 tons
Asphalt	9,000 cubic yards
Stone	26,000 cubic yards
Roofing/Siding	250,000 square feet
Temporary Structure (Tent)	306,000 square feet

2.2 SITE LOCATION AND LAYOUT

2.2.1 Project Site Location

The overall site (Figure 2.2-1) and location, nearby facilities, and sensitive populations are the same as described in Section 2.2.1 of the Hermes ER (Reference 1). The site encompasses approximately 185 acres and is located within the East Tennessee Technology Park (ETTP) on the sites of the Former K-33 Facility and Former K-31 Facility. The reactor facility would be located at approximately 35° 56’ 19.1” latitude, and -84° 24’ 11.6” longitude.

Table 2.2-1 supplements the list of nearby federal facilities, industrial facilities, transportation, and residential facilities that were identified in the Hermes ER (Reference 1). No additional new and significant information regarding the project site location was identified.

2.2.2 Site Layout

Figure 2.2-1 shows the planned layout of major structures for the facility. It is assumed that approximately 30 acres would be permanently disturbed for operations of the facility. Some onsite structures are shared with the Hermes facility (e.g., Administration Building, Maintenance and Storage Building, and Security building) and are not shown on this figure. The following additional site structures for the Hermes 2 facility are shown in Figure 2.2-1:

- Reactor Buildings
- Auxiliary Systems Building
- Turbine Building
- Switchyard

2.2.3 Chemical, Diesel Fuel, and Hazardous and Radioactive Material Receipt, Holding, Storage Areas, and Utilities

Information regarding chemical, diesel fuel, and hazardous and radioactive material receipt, holding, storage areas, utilities, and monitoring stations for Hermes 2 is identical to the descriptions in Sections 2.2.3 through 2.2.5 of the Hermes ER (Reference 1) with the exception that some monitoring stations, such as radiological monitors along the site boundary, may be shared between Hermes and Hermes 2. No additional new and significant information regarding chemical, diesel fuel, and hazardous and radioactive material receipt, holding, storage areas, utilities, and monitoring stations was identified.

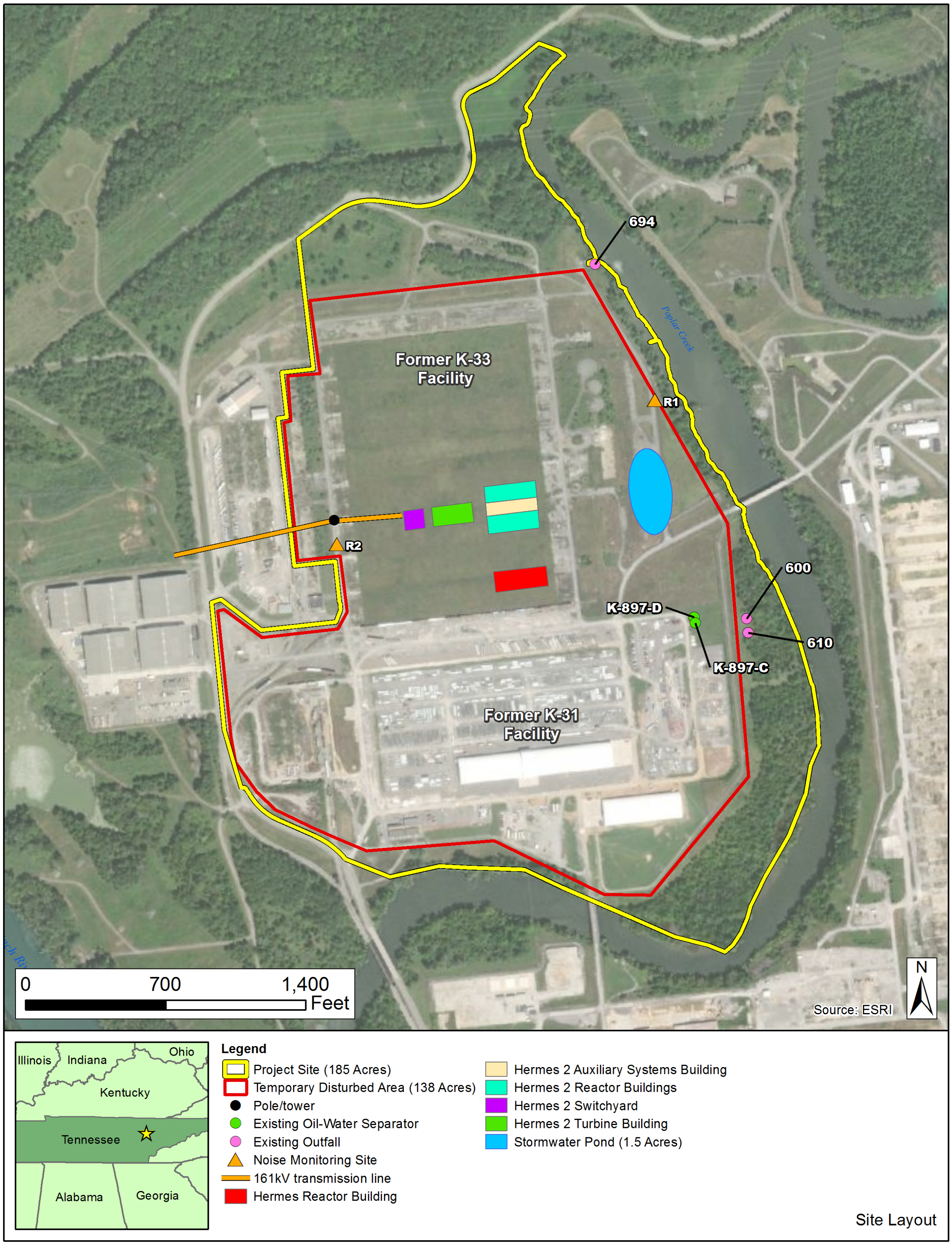
2.2.4 References

1. Kairos Power LLC, “Environmental Report for the Kairos Power Fluoride Salt-Cooled, High Temperature Non-Power Reactor (Hermes),” Revision 1, March 2023.

Table 2.2-1: Nearby Facilities Supplement

Project Name	Summary of Project	Location (from Reactor Building)	Status	Potentially Affected Resource(s)
Kairos Power Hermes Facility	Non-power nuclear demonstration reactor facility	Within site boundary	Proposed	Land use, water resources, socioeconomics, human health, transportation

Figure 2.2-1: Hermes 2 Reactor Site



2.3 NON-POWER REACTOR

The design of the Hermes 2 reactor is identical to the Hermes reactor as described in section 2.3 of the Hermes ER (Reference 1), with some exceptions. Hermes 2 will produce electricity, but is categorized as a non-power reactor under the provisions of 10 CFR 50.22, as not more than 50 percent of the annual cost of owning and operating the facility is devoted to the production of materials, products, or energy for sale or commercial distribution, or to the sale of services, other than research and development or education or training. The facility will contain two units, each with a maximum thermal power of 35 megawatts (MW) thermal (MWth) and intermediate heat transport system (IHTS) loops which reject heat via a steam superheater to a shared traditional power generation system (PGS). A heat rejection radiator (HRR) is provided in the primary heat transport system (PHTS) to reject heat directly to the atmosphere when the PGS is not in service. The purpose of the facility will be to demonstrate the design features and safety functions of the technology as well as demonstrate electrical power generation using the technology. Figure 2.3-1 shows the process flow diagram for the reactor units and their primary and intermediate heat transport systems. Figure 2.3-2 shows the process flow diagram for the shared power generation system.

The reactor vessel, internal structures, and moderator/reflector are designed to last the life of the facility.

The required start-up fissile inventory is estimated to be no greater than 25 kilograms (kg) ^{235}U per unit or 50 kg ^{235}U total.

No other additional new and significant information has been identified from the Hermes ER (Reference 1).

2.3.1 References

1. Kairos Power LLC, “Environmental Report for the Kairos Power Fluoride Salt-Cooled, High Temperature Non-Power Reactor (Hermes),” Revision 1, March 2023.

Figure 2.3-1: Hermes 2 Reactor Process Flow Diagram for the Primary Heat Transport System and Intermediate Heat Transport System

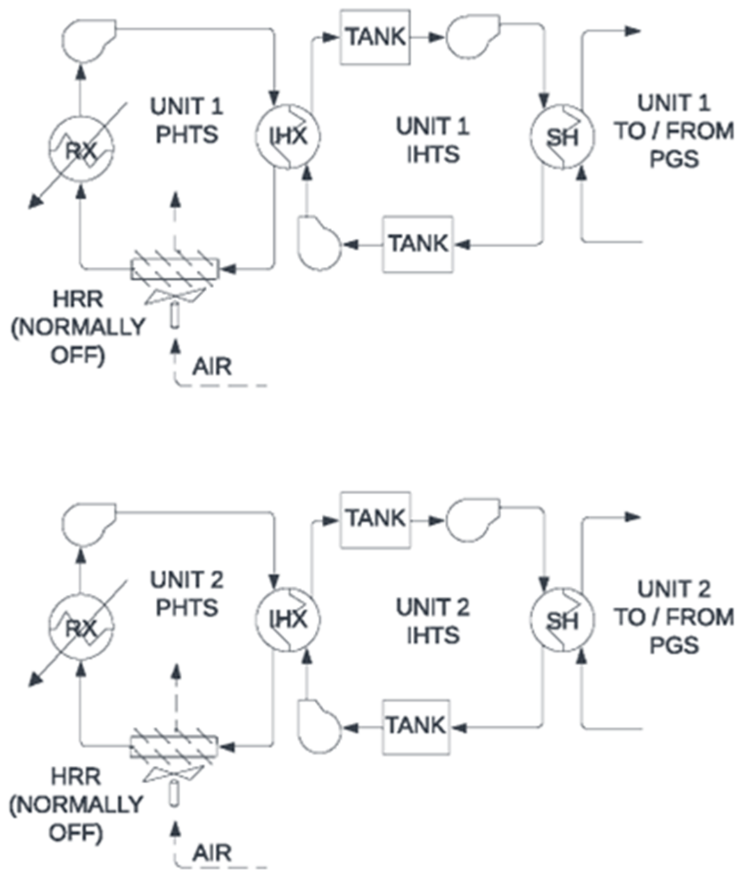
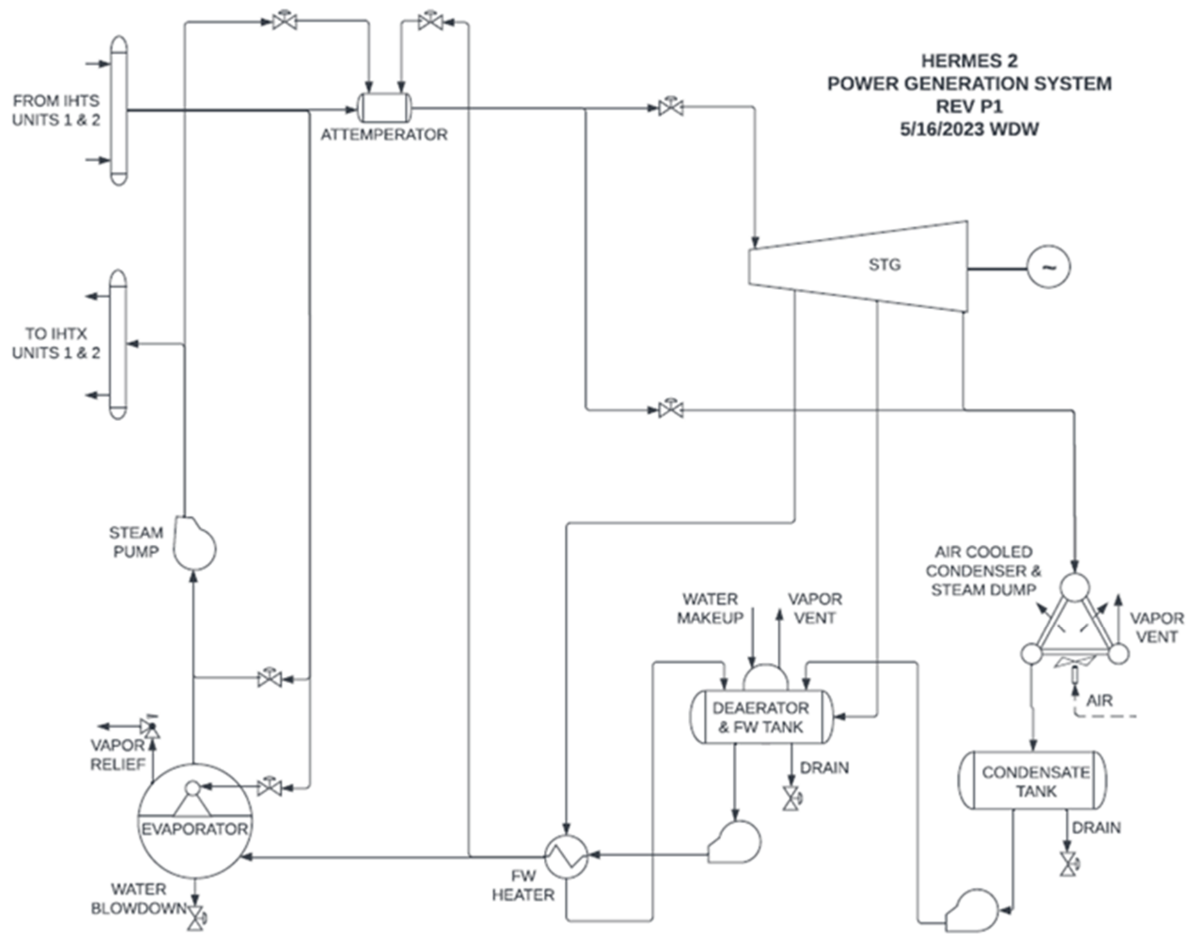


Figure 2.3-2: Hermes 2 Reactor Process Flow Diagram for the Power Generation Systems



2.4 WATER CONSUMPTION AND TREATMENT

Details concerning water sourcing, treatment, consumption, and discharge per-unit for the Hermes 2 facility will generally not differ from the water sourcing, treatment, consumption, and discharge described for the Hermes facility (Reference 1) with the exception of an increase in total water sourcing, consumption, and discharge to account for two units and the balance of plant systems.

Service water required for the chilled water system is estimated to be approximately 68 gallons per minute (gpm) or 0.1 million gallons per day (MGD). Service water required for the potable water and bathrooms is estimated to be approximately 32 gpm or 0.04 MGD. Sanitary wastewater would be discharged to the Rarity Ridge Wastewater Treatment Plant at an estimated rate of approximately 32 gpm (0.04 MGD). Demineralized (treated) water required for the DHRS is estimated to be approximately 2 gpm (less than 0.01 MGD). This flow would offset the estimated evaporation rate from the DHRS. Treated water would also be used to provide makeup water to the spent fuel cooling system, component cooling water system, and chilled water system, each at a flow rate of less than 1 gpd. Treated water for these systems would be demineralized and treated onsite using municipal water. treated water for the DHRS may be shipped to the site and stored onsite as needed. The size of the treated water tank is expected to be no larger than 75,000 gallons and the tank is expected to be located outside the Reactor Buildings.

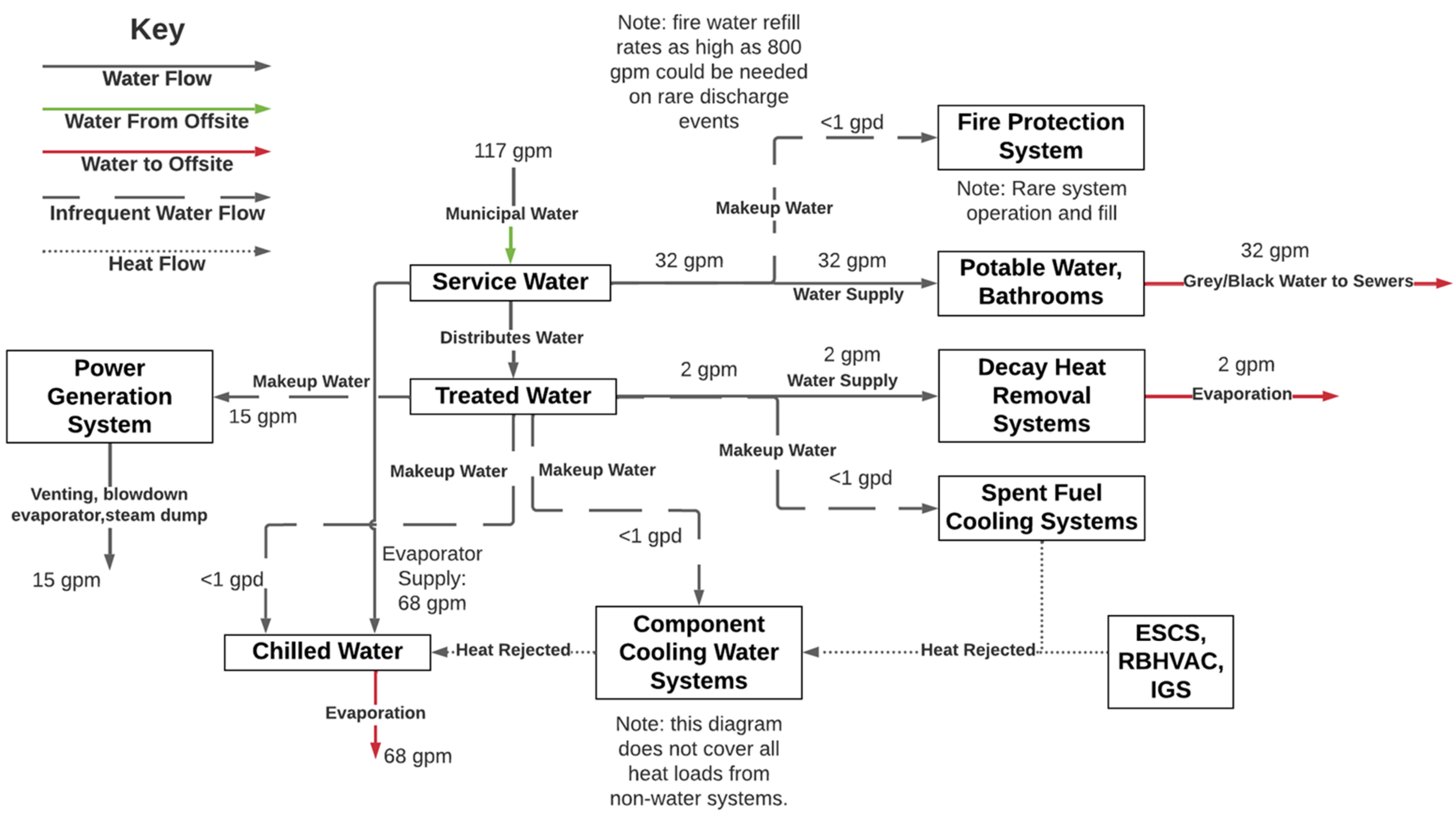
Figure 2.4-1 shows a water balance diagram for the Hermes 2 facility. In addition to water needs per unit detailed in Figure 2.4-1 of the Hermes ER (Reference 1), the Hermes 2 facility would require additional municipal water at a rate of 15 gpm (0.02 MGD) to provide make up water for the shared power generation systems' evaporative losses. Water for the power generation systems would be treated onsite. While the volume of stored fire protection system water is approximately 2,880 cubic meters to account for two units, the discharge and refill rates and times are identical to the Hermes facility (Reference 1).

No other new and significant information regarding water sourcing, treatment, consumption, and discharge was identified.

2.4.1 References

1. Kairos Power LLC, "Environmental Report for the Kairos Power Fluoride Salt-Cooled, High Temperature Non-Power Reactor (Hermes)," Revision 1, March 2023.

Figure 2.4-1: Water Balance Diagram



2.5 COOLING AND HEAT REMOVAL SYSTEMS

Details concerning cooling and heat removal systems for the Hermes 2 reactor generally do not differ from the details provided for the Hermes reactor in section 2.5 of the Hermes ER (Reference 1). Each unit will include a decay heat removal system (DHRS). The Hermes 2 reactor design includes an intermediate heat transport system (IHTS) in addition to the primary heat transport system (PHTS) detailed in the Hermes ER (Reference 1).

The PHTS would be responsible for transferring the required, normal-operating heat load from the reactor through the intermediate heat exchanger (IHX) to the intermediate heat transport system (IHTS). The IHTS is responsible for transferring the required, normal-operating heat load to the power generation system through superheaters. Fractions of the heat load not used by the shared power generation system are rejected to air-cooled condensers and subsequently the surrounding atmosphere, which would be the ultimate heat sink. This heat load would include all normal steady operating loads and would be approximately 55 MWth (up to 70 MWth with no power conversion). The PHTS also includes a heat rejection radiator (HRR) that is used during plant startup and normal shutdown for residual heat removal that may be required when the power generation systems are offline. If the PHTS, IHTS, power conversion systems, or HRR were to be unavailable when residual heat removal is required, the DHRS will be utilized instead. The air-cooled condensers are expected to be located near the turbine building.

No other new and significant information regarding cooling and heat removal systems was identified.

2.5.1 References

1. Kairos Power LLC, “Environmental Report for the Kairos Power Fluoride Salt-Cooled, High Temperature Non-Power Reactor (Hermes),” Revision 1, March 2023.

2.6 WASTE SYSTEMS

Waste generated at the Hermes 2 facility during the phases of construction, operation, and decommissioning is qualitatively no different from the waste system information described in Section 2.6 and Table 2.6-1 of the Hermes ER (Reference 1) except for waste streams unique to Hermes 2 such as the used intermediate coolant. The quantities of each waste stream are increased from the amounts presented in the Hermes ER (Reference 1) to account for both units. Additional estimated quantities of the radioactive waste specific to the Hermes 2 reactor design are described in the following section and are provided in Table 2.6-1.

After removal of the intermediate salt from its circulating system, it would be collected in storage containers and allowed to cool and solidify during storage. The intermediate salt would then be disposed in solid form.

The handling, packing, storage, and shipping areas for waste systems will be shared between units.

The tritium management system (TMS) described in Section 2.6.1.2.3 of the Hermes ER (Reference 1) has the addition functions of tritium separation from argon in the IHTS cover gas and tritium separation from dry air in heat rejection radiator (HRR) enclosure. The TMS would also produce an additional waste stream of high specific activity tritium on molecular sieve.

Operation of the facility is estimated to generate approximately 776,000 used pebbles between the two units over the 10 effective full-power years (EFPY) of the 11-year operating life. The onsite spent fuel pebble canister storage system will have sufficient storage capacity for 10 EFPY of licensed reactor operation.

Radiation dose to the public from nuclear reactor facilities near the facility includes contributions from the Kairos Power Hermes non-power reactor in addition to facilities discussed in Section 2.6.3.2 of the Hermes ER. The Kairos Power Hermes non-power reactor is planned to be constructed adjacent to the Hermes 2 Facility. This facility is discussed in more detail in Section 4.13.

The pollution prevention program is expected to be similar to the program described in the Hermes ER (Reference 1).

No other new and significant information regarding waste systems was identified.

2.6.1 References

1. Kairos Power LLC, “Environmental Report for the Kairos Power Fluoride Salt-Cooled, High Temperature Non-Power Reactor (Hermes),” Revision 1, March 2023.

2. Pacific Northwest National Laboratory. 2020. “Environmental Impacts from Transportation of Fuel and Wastes to and from Non-LWRs.” PNNL-29365. September 2020.

3. Atomic Energy Commission. 1972. “Environmental Survey of Transportation of Radioactive Material to and from Nuclear Power Reactors.” WASH-1238. December 1972.

Table 2.6-1: Estimated Type and Quantity of Radioactive Wastes

Description	Matrix	10 CFR 61.55 Waste Class	Contents	Volume/year	No. of Shipments/year	Destination
IGS Capture Materials	Solid	B	Zr-Based Getter Alloy, H-3	20 ft^3	1	Waste Control Specialists
IHTS Capture Materials	Solid	B	Molecular Sieve, H-3	20 ft^3	1	Waste Control Specialists
HRR Enclosure Capture Materials	Solid	B	Molecular Sieve, H-3	20 ft^3	1	Waste Control Specialists
Reactor Cell Capture Materials	Solid	B	Molecular Sieve, H-3	1,320 ft^3	8	Waste Control Specialists
Flibe	Solid	B or C	Be, H-3, C-14, Activation, Fission, and Transmutation Products	-	Only shipped at decommissioning (6 shipments)	Waste Control Specialists
BeNaF	Solid	A or B	H-3	5,090 ft^3	16	Energy*Solutions* or Waste Control Specialists
Dry Active Waste (DAW)	Solid	A	PPE, filters etc.	< 6,422 ft^3 [(a)]	< 19 [(b)]	Energy*Solutions* or Waste Control Specialists
Liquid Waste	Liquid	A	Activated water or maintenance liquids (i.e., cleaners)	This value is not expected to be significant.	This value is not expected to be significant.	Energy*Solutions*
Spent Fuel	Solid	-	-	77,600 fuel pebbles in approximately 36 canisters	Shipped at decommissioning or for fuel qualification testing	Federal Facility

[(a)] Based on 46 55-gallon drums per shipment.
[(b)] The total LLRW waste shipments per unit would be bounded by 46 annual shipments, the number of shipments from an 880 MWe reference reactor (Reference 2, Reference 3).

2.7 STORAGE, TREATMENT, AND TRANSPORTATION OF RADIOACTIVE AND NONRADIOACTIVE MATERIALS

The sourcing, storage, treatment, and transportation of radioactive and nonradioactive materials for the Hermes 2 facility on a per-unit basis will generally not differ from the storage, treatment, and transportation of radioactive and nonradioactive materials for the Hermes facility as described in Section 2.7 of the Hermes ER (Reference 1).

2.7.1 New and Irradiated Fuel

Fuel shipments during operations for the Hermes 2 facility would continue over an estimated 11-year license period. The spent fuel storage area, the storage pool, and the air-cooled cavity will be as described for the Hermes facility in the Hermes ER for each unit. The total storage capacity between both units is sufficient for 10 EFPY of the 11 years of licensed reactor operation of both units.

No other new and significant information regarding new or irradiated fuel was identified.

2.7.2 Low-level Radioactive Waste

An estimated 240 drums of Flibe waste would be generated over the assumed 11-year licensed life of the facility. The waste would require a Type B shipping cask. The capacity of a Type B cask is dependent on the shielding necessary. Assuming a minimum of six drums per cask, 240 drums would require 40 cask shipments. Alternatively, Type B drums could be used likely resulting in more drums per shipment and fewer shipments.

During operations, BeNaF salt used to transfer heat from the intermediate heat exchanger (IHX) to the steam generator would be pumped through the IHTS. The BeNaF salt would be approximately 57 percent NaF and 43 percent BeF_2 by mol. Used radioactive BeNaF salt would be pumped into storage containers and allowed to cool prior to being shipped to Waste Control Specialists for Class B LLRW disposal or to Energy*Solutions* for Class A LLRW disposal. These destinations represent bounding transportation distances for the respective LLRW Classes. No other treatment would be required. Based on an estimated 295 tons of BeNaF salt shipped to the site annually, an average of 16 truck shipments per year would be required to ship an equivalent amount of salt waste. Waste containers would not require radiation shielding.

In addition to the Class B tritium capture waste streams noted in the Hermes ER (Reference 1), the TMS would separate tritium from the IHTS cover gas and the HRR enclosure. This waste will be handled, stored, and transported in the same manner as the other TMS waste streams described in the Hermes ER (Reference 1).

The total number of LLRW shipments has not been calculated. The total number of LLRW shipments would be expected to be bounded by the 46 annual shipments of LLRW per unit provided for an 880 MWe reference reactor described in NRC guidance (Reference 2).

No other new and significant information regarding low-level radioactive waste was identified.

2.7.3 Nonradioactive Materials

Nonradioactive Flibe is anticipated to be shipped to the site in approximately 40 initial 1-ton shipments prior to startup with an additional 40 tons estimated to be shipped before the end of the first two years of operation. The Flibe would be stored in the Reactor Building. Nonradioactive BeNaF salt would be shipped to the facility at an estimated rate of 295 tons per year in approximately 32 shipments (9 tons per shipment) and stored in the intermediate salt vessel located in the Reactor Building. The facility would also receive up to twenty-four 4,000-gallon shipments of treated water each month as needed to supplement the municipal water treated onsite for the DHRS.

Anhydrous hydrogen fluoride (HF) would be shipped to the facility at no more than 200 pounds per year in approximately 2 shipments (100 pounds per shipment) and stored in the intermediate heat transport system-tritium management system located in the Reactor Building. HF disposal is included in the disposed volume of IHTS capture materials (see Table 2.6-1).

No other new and significant information regarding nonradioactive materials was identified.

2.7.4 References

1. Kairos Power LLC, "Environmental Report for the Kairos Power Fluoride Salt-Cooled, High Temperature Non-Power Reactor (Hermes)," Revision 1, March 2023.

2. Atomic Energy Commission, 1972. "Environmental Survey of Transportation of Radioactive Material to and from Nuclear Power Reactors." WASH-1238. December 1972.

Chapter 3

Description of the Affected Environment

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CHAPTER 3 DESCRIPTION OF THE AFFECTED ENVIRONMENT

Per the interim staff guidance issued for NUREG-1537 concerning environmental report (ER) format and content and consistent with 10 CFR 51 Appendix A (6), the description of the affected environment is included predominantly by reference. Details concerning the affected environment are nearly identical to the details provided in the Hermes ER for the Kairos Power Hermes non-power reactor facility to be constructed on the same property (Reference 1). Impacts on these details were given in Chapter 4 of the Hermes ER and were categorized exclusively as SMALL (Reference 1). Only descriptions which vary from those given in the Hermes ER are presented here. Size-specific Hermes facility information (e.g., the total municipal water used by the facility daily) is doubled for the Hermes 2 facility unless otherwise stated. No other new and significant information has been identified aside from that presented below.

3.1 REGIONAL CLIMATOLOGY

Area temperatures and precipitation averages for Oak Ridge presented in the Hermes ER (Reference 1) have been updated to reflect the availability of more recent data. In January, the normal daily maximum temperature is about 48 degrees Fahrenheit (°F) with a normal daily minimum temperature of about 30°F, based on 30 years of data. In July, the normal daily maximum temperature is about 89°F, while the normal daily minimum temperature is about 69°F based on 30 years of data (1991-2020) from the National Climatic Data Center (NCDC) (Reference 3). These updated temperatures differ from the values presented in the Hermes ER (Reference 1) by approximately 1°F. Relative humidity in the region averaged 71 percent based on a 30-year period of record from the Knoxville local climatological data (1991-2020) from the NCDC (Reference 4) compared to 73 percent as reported in the Hermes ER (Reference 1). The site is located in Tennessee Climate Division 1, also known as the East Tennessee Climate Division.

Precipitation averages about 56 inches annually (Reference 3) compared to about 51 inches as reported in the Hermes ER (Reference 1). Late winter (January – March) is usually the wettest season, with more than about 16 inches, compared to about 14 inches as reported in the Hermes ER (Reference 1). The late summer–early autumn (August – October) is the driest season, with more than 10 inches, compared to less than 10 inches as reported in the Hermes ER (Reference 1).

Regional climatology and severe weather analyses given the Hermes ER (Reference 1) have been updated to reflect the availability of more recent data covering 1950-2022 (Reference 4). Meteorological database references used to support the Hermes ER have been examined for updates (Reference 5 and Reference 6). Only new information is presented here.

In 2021 two tropical systems passed within a 50-mile radius of the site. Both were tropical depressions when they passed through the area. In 2022 a system which had been classified as a hurricane came within a 50-mile radius of the site, but by the time it reached the area, it was downgraded to a tropical depression, and dissipated over eastern Tennessee.

Review of the NCDC storm events database for the period of January 1, 1950, through December 31, 2022, shows that there was only one tropical storm on September 16, 2004, near Roane County, and it caused minimal damage. This storm was associated with Hurricane Ivan, as reported in the Hermes ER (Reference 1).

In nearby Knox County, severe hail (3/4 inch in diameter or larger) has been reported 94 times during 1950–2022 (Reference 4), compared to 93 times as reported in the Hermes ER (Reference 1).

Thunderstorms are common in the Oak Ridge region with a normal range of 34-65 days with thunderstorms based on data collected from 2001-2021 at the ORR (Reference 7). This range of days is identical to the range reported in the Hermes ER (Reference 1).

A review of cloud-to-ground lightning strike data from a 10-year period from 2011-2019 at the site indicates that 7 of the 10 years had a lightning strike occurring within 500 hundred feet of the site or beside the site (Reference 8). One of these years, 2012, was a year with an exceptionally high number of cloud-to-ground lightning strikes. Eleven lightning strikes occurred within the site boundary with several more strikes occurring within 500 hundred feet of the site (Reference 9).

With respect to the information presented in the Hermes ER (Reference 1), the updated data described above for regional climatology information reflect small differences and do not noticeably affect conclusions drawn in Chapter 4.

3.1.1 References

1. Kairos Power LLC, "Environmental Report for the Kairos Power Fluoride Salt-Cooled, High Temperature Non-Power Reactor (Hermes)," Revision 1, March 2023.
2. National Climatic Data Center, Data Tools: 1991-2020 Normals for Oak Ridge, TN, Chattanooga, TN, Knoxville, TN, and Nashville, TN, Website: https://www.ncdc.noaa.gov/cdo-web/datatools/normals, accessed March 2023.
3. National Climatic Data Center, 1991-2020 Annual Local Climatological Data (LCD) for Knoxville, TN, accessed March 2023.
4. National Climatic Data Center, Storm Events Database, Retrieved from: http://www.ncdc.noaa.gov/stormevents, accessed March 27, 2023.
5. National Weather Service Climate NOWData website. Daily/Monthly 1991-2020 Normals for Knoxville, TN and Chattanooga, TN, https://www.weather.gov/wrh/climate?wfo=mrx, accessed March 2023.
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7. ORNL Thunderstorm Days 2001-2021. Oak Ridge National Laboratory, Oak Ridge Reservation Meteorology – Climate Data, Normals, and Extremes – Severe Weather Statistics – Oak Ridge Area, Retrieved from: https://metweb.ornl.gov/~krbirdwell/web/TStorms_ORNL_2021.pdf. Accessed May 16, 2023.
8. Heritage Center Annual Lightning Strikes Archive. Oak Ridge National Laboratory, Oak Ridge Reservation Meteorology – Climate Data, Normals, and Extremes – Severe Weather Statistics – Oak Ridge Area, Retrieved from https://metweb.ornl.gov/~krbirdwell/web/Lightning/. Accessed May 16, 2023.
9. 2012 East Tennessee Technology Park Lightning Strikes. Oak Ridge National Laboratory, Oak Ridge Reservation Meteorology – Climate Data, Normals, and Extremes – Severe Weather Statistics – Oak Ridge Area, Retrieved from https://metweb.ornl.gov/~krbirdwell/web/Lightning/2012%20All%20strikes%20ETTP.jpg. Accessed May 16, 2023.

Table 3.1-1: Regional Precipitation Extremes

Station	Period of Record (years)	Normal Annual Rainfall (inches)	Normal Annual Snowfall (inches)
Oak Ridge NWS Station	30[a]	55.53	5.7
Knoxville NWS Station[b]	30	51.93	4.6
Chattanooga NWS Station[b]	30	55.00	3.6
Nashville NWS Station[b]	30	50.51	4.7

[a] (Reference 2)
[b] (Reference 3, Reference 5, and Reference 6)

3.2 WATER RESOURCES

Area water resource descriptions presented in the Hermes ER (Reference 1) have been updated as applicable to reflect the location and fire protection requirements of the facility.

3.2.1 Hydrology

3.2.1.1 Surface Water

The facility is not located within a Federal Emergency Management Agency (FEMA) 100-year floodplain (see Figure 3.2-1)

3.2.2 Facility Water Use

The total amount of water used by the facility is given in Section 2.4. The fire protection system would infrequently use 3,170 gpm (4.56 MGD), of water from approximately 2,880 cubic meters of stored fire protection system water which services both units. The infrequent use rate of the fire protection system water is identical to the rate reported in the Hermes ER (Reference 1). The volume of stored fire protection system water presented in the Hermes ER (Reference 1) is 1,440 cubic meters. The makeup requirement for one unit is approximately 800 gpm (1.15 MGD) to satisfy the required 8-hour limit on the fire protection system refill period. The makeup requirement rate of the fire protection system water is identical to the rate reported in the Hermes ER (Reference 1). Municipal water is supplied by the City of Oak Ridge and has a capacity of 12 MGD of water, as mentioned in the Hermes ER (Reference 1, Reference 2, and Reference 3).

With respect to the information presented in the Hermes ER (Reference 1), the updated data described above for water resource information reflect small differences and do not noticeably affect conclusions drawn in Chapter 4.

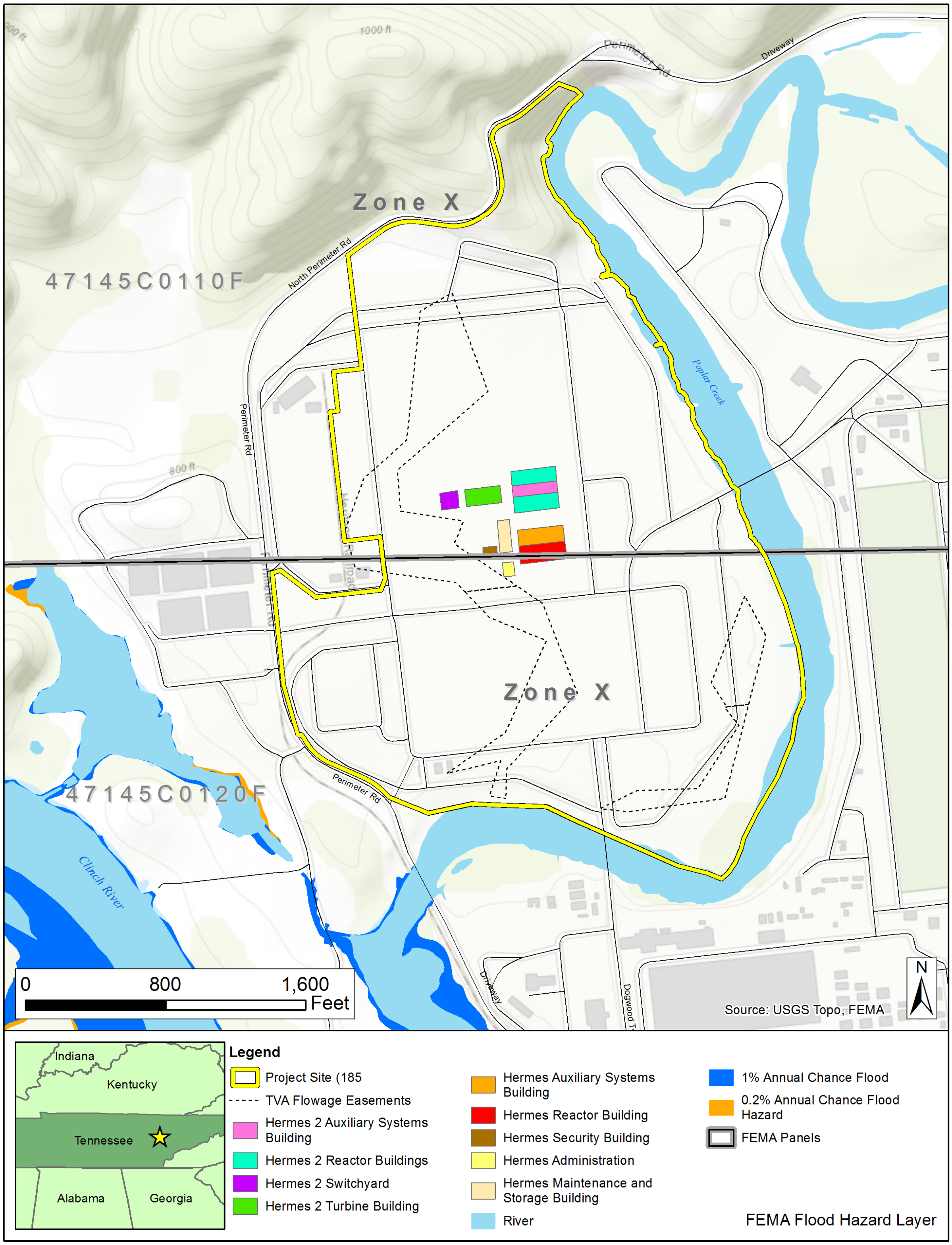
3.2.3 References

1. Kairos Power LLC, “Environmental Report for the Kairos Power Fluoride Salt-Cooled, High Temperature Non-Power Reactor (Hermes),” Revision 1, March 2023.

2. City of Oak Ridge Tennessee, Operations, Website: http://www.oakridgetn.gov/department/PublicWorks/Divisions/Services, accessed August 31, 2021

3. Smith, D., “Officials break ground on new $78.3M water plant for the city,” Oak Ridger, October 20, 2022. Retrieved from https://www.oakridger.com/story/news/2022/10/21/officials-break-ground-on-new-78-3m-water-plant-for-city/69573126007/, accessed on April 27, 2023.

Figure 3.2-1: FEMA Flood Hazard



3.3 SOCIOECONOMICS

Socioeconomic information presented in the Hermes ER (Reference 1) has been updated to reflect the availability of more recent data where applicable.

3.3.1 Demography

3.3.1.1 Resident Population

Population data was gathered using 2017-2021 American Community Survey 5-year estimates. The Hermes ER (Reference 1) uses 2015-2019 American Community Survey 5-year estimates and changes in estimates reported below from the Hermes ER (Reference 1) are less than 7 percent.

3.3.1.1.1 Resident Population of Communities in Region of Influence

Table 3.3-1 shows the historic resident population estimates for counties in the region of influence (ROI) and the State that differ from the values provided in Table 3.7-1 of the Hermes ER (Reference 1). Between 1990 and 2021, population in the ROI increased 36.2 percent overall, from 499,781 to 680,789. Rates of growth varied from 12.4 percent (Anderson County) to 73.9 percent (Loudon County). During the same period, population grew 40.6 percent in the State, from 4,877,185 to 6,859,497 (Reference 2, Reference 3, Reference 4, and Reference 5).

In 2021, the City of Oak Ridge, Tennessee located in Anderson and Roane Counties approximately 8.9 miles southwest of the site, had population of 31,087. The City of Knoxville, Tennessee, located in Knox County approximately 26.5 miles west of the site, had a population of 189,339 (Reference 5).

With respect to the information presented in the Hermes ER (Reference 1), the updated data described above for resident population information reflect small differences and do not noticeably affect conclusions drawn in Chapter 4.

3.3.1.1.2 Region of Influence Resident Population Growth Projection

Table 3.4-2 shows projected population in the ROI and the State. Population is projected to increase 5.3 percent (from 680,125 to 716,615) between 2021 and 2026 in the ROI. Growth is projected in all counties. Roane County is projected to grow the least (1.3 percent); Loudon County is projected to grow the most (9.0 percent). During the same period, the State is projected to grow 5.4 percent (from 6,859,497 to 7,231,338) (Reference 5 and Reference 7).

Population growth of 9.0 percent is projected in the ROI between 2026 and 2040. As shown in Table 3.3-2, ROI population is projected to increase from 716,615 to 780,903 by 2040. Growth is projected for all ROI counties during this period, with the exception of Roane County, which is projected to decrease 2.6 percent. Loudon County is projected to grow the most (12.9 percent). During the same period, the State is projected to grow 9.1 percent (from 7,231,338 to 7,888,046) (Reference 5 and Reference 7).

The years used in the ROI population growth projections reported in the Hermes ER (Reference 1) are 2019-2026 and 2026-2031. With respect to the information presented in the Hermes ER (Reference 1), the updated data described above for ROI population projection information reflect small differences and do not noticeably affect conclusions drawn in Chapter 4.

3.3.1.1.3 Race and Ethnicity of the Resident Population in the Region of Influence

As shown in Table 3.3-3, in 2021 the minority population in the ROI was 16.2 percent, less than the State (27.1 percent) and the nation (40.6 percent). Knox (18.6 percent) and Loudon (13.4 percent) Counties had the largest proportion of minority populations within the ROI. Roane County had the smallest minority population (7.7 percent). The largest minority groups within the ROI included African American (6.7 percent) and Hispanic/Latino groups (4.5 percent) (Reference 8). With respect to the information presented in the Hermes ER (Reference 1), the updated data described above for the race and ethnicity of the resident population reflect small differences and do not noticeably affect conclusions drawn in Chapter 4.

3.3.2 Community Characteristics

3.3.2.1 Economy

Economic data was gathered using 2017-2021 American Community Survey 5-year estimates and the Bureau of Economic Analysis. The Hermes ER (Reference 1) uses 2015-2019 American Community Survey 5-year estimates and the Bureau of Economic Analysis. Changes in income estimates reported below differ from the Hermes ER (Reference 1) by less than $7,000. Changes in labor force, unemployment rates, and poverty rates reported below differ from the Hermes ER (Reference 1) by less than 2.4 percent.

3.3.2.1.1 Income (Population and Household)

As shown in Table 3.4-4, per capita income for 2021 within the ROI ranged from $23,436 (Morgan County) to $36,450 (Knox County). During the same period, the state's per capita income ($32,908) was within the range of the ROI values. The nation's per capita income was greater than the ROI and the State ($37,638) (Reference 9).

In 2021, median household income for the ROI ranged from $45,133 (Morgan County) to $66,151 (Loudon County). The United States had higher median household income ($69,021) than the ROI, while the value for Tennessee ($58,516) fell within the ROI range (see Table 3.3-4) (Reference 9).

3.3.2.1.2 Labor Force and Unemployment

Table 3.3-5 shows unemployment rates and the number of individuals in the labor force in 2021. Unemployment rates for Morgan (8.6 percent) county was higher than both the State (5.3 percent) and the nation (5.5 percent) while Knox (4.1 percent) and Loudon (3.3 percent) counties had lower rates of unemployment (Reference 9). Anderson (5.2 percent) and Roane (5.3 percent) had similar rates to the State and nation (Reference 9). Table 3.3-6 shows the total number of people employed as well as the types of employment. In the State, health care/social assistance (10.3 percent) and government (10.6 percent) categories comprised the highest percentage of jobs. This is also reflected in the United States data. Within the ROI government jobs are the highest percentage in Morgan (27.5 percent) and Roane (13.3 percent) counties with Anderson (9.9 percent), Knox (10.4 percent), and Loudon (9.2 percent) counties reflecting similar percentages to that of the State. The manufacturing sector provided the highest percentage of jobs in Anderson County (25.5 percent) and Loudon County (15.3 percent). In Knox County health care and social assistance provided the highest number of jobs with 12.5 percent of the labor force employed in the sector (Reference 10).

3.3.2.1.3 Poverty Rates

As shown in Table 3.3-7, in 2021 the low-income population in the ROI was 13.3 percent, representing the percentage of the individuals with income below the poverty level. During the same period, the poverty rate was 14.3 percent and 12.6 percent in the State and nation respectively. In 2021, the percentage of families with income below the poverty level in the ROI was 8.4 percent. During the same period, the poverty rate was 10.0 percent and 8.7 percent in the State and nation respectively (Reference 11).

3.3.2.1.4 Economic Summary

With respect to the information presented in the Hermes ER (Reference 1), the updated data described above for economic information reflect small differences and do not noticeably affect conclusions drawn in Chapter 4.

3.3.2.2 Housing

Table 3.3-8 shows the total number of housing units (302,880) in the ROI in 2021. The total number of housing units in 2019 was 298,372 as reported in the Hermes ER (Reference 1). The number of occupied and vacant units was 273,734 and 29,146 respectively, compared to 267,055 and 31,317 respectively, as reported in the Hermes Er (Reference 1). The rental vacancy rate for the ROI was 9.6 percent, lower than Tennessee (11.5 percent) and the nation (11.2 percent). The rental vacancy rate reported in the Hermes ER (Reference 1) for the ROI was 10.5 percent, lower than Tennessee (12.4 percent) and the nation (12.1 percent). Rental vacancy rates ranged from 8.3 percent (Knox County) to 16.9 percent (Roane County), compared to 8.9 percent to 18.5 percent as reported in the Hermes ER (Reference 1). The median home value for the ROI ranged from $104,300 - $238,100 while the State's median home value was $193,700 and the nation's median home value was $244,900 (Reference 2). The median home value for the ROI reported in the Hermes ER (Reference 1) ranged from $102,000 - $222,500 while the State's median home value was $167,200 and the nation's median home value was $217,500 (Reference 2).

With respect to the information presented in the Hermes ER (Reference 1), the updated data described above for available housing units reflect small differences and do not noticeably affect conclusions drawn in Chapter 4.

3.3.2.3 Transportation

A Traffic Assessment was completed in July 2021 and the results of this assessment are provided in the Hermes ER (Reference 1). Based on the projections for this study, existing roadways volumes can grow by 2 percent annually and still be at less than 25 percent of capacity for planning level of service (LOS) grade C roads by 2025 per Table 3.7-12 of the Hermes ER (Reference 1). As explained in the Hermes ER (Reference 1), 2 percent is a conservative estimate of traffic growth within the ETTP complex.

3.3.2.4 Tax Payment Information

Property taxes are also collected either by the county or local government. As the facility is located within Roane County, a property tax rate of $2.34 per $100 assessed value would apply (Reference 12). The estimated county property tax reported in the Hermes ER (Reference 1) is $2.26 per $100 assessed value. Added to this would be the City of Oak Ridge property tax of 2.32 percent, for a total of $4.66 per $100 of assessed value (Reference 13), compared to $4.57 per $100 of assessed value as reported in the Hermes ER (Reference 1). Overall, city funding represents approximately 25.16 percent of total school revenues, providing $18,694,146 for fiscal year 2022 (Reference 14) and $18,077,939 for fiscal year 2021 (Reference 1).

With respect to the information presented in the Hermes ER (Reference 1), the updated data described above for tax payment information reflect small differences and do not noticeably affect conclusions drawn in Chapter 4.

3.3.2.5 Public Services

Potable water for the site is supplied by the City of Oak Ridge Public Works Department (Reference 15). The current system regularly supplies a total of 6 to 8 MGD with a regularly deliverable maximum of 12 MGD. The replacement facility discussed in the Hermes ER (Reference 1) has a maximum capacity of 16 MGD is expected to be completed in 2025 (Reference 16).

3.3.3 References

1. Kairos Power LLC, “Environmental Report for the Kairos Power Fluoride Salt-Cooled, High Temperature Non-Power Reactor (Hermes),” Revision 1, March 2023.

2. National Bureau of Economic Research, 1900 Census U.S. Decennial County Population Data, 1900-1990, Website: https://www.nber.org/research/data/census-us-decennial-county-population-data-1900-1990, accessed July 23, 2021.

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6. U.S. Census Bureau. Tennessee - Combined Statistical Areas (CSAs) and Counties. 2021. Website: https://www.census.gov/geographies/mapping-files/time-series/geo/cartographic-boundary.html , accessed March 7, 2023

7. Tennessee State Data Center. 2021- Boyd Center for Business and Economic Research, Boyd Center Population Projections. Website: https://tnsdc.utk.edu/estimates-and-projections/boyd-center-population-projections/, accessed March 7, 2023

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zaWZpY2F0aW9uIiwiTkFJQ1MiXSxbInN0YXRlIixbIjQ3MDAwIl1dLFsiQXJlYSIsWyI0NzAwMCIsIjQ3MDAxIiwiNDcwOTMiLCI0NzEwNSIsIjQ3MTI5IiwiNDcxNDUiXV0sWyJTdGF0aXN0aWMiLCItMSJdLFsiVW5pdF9vZl9tZWFzdXJlIiwiTGV2ZWxzIl0sWyJZZWFyIixbIjIwMjEiXV0sWyJZZWFyQmVnaW4iLCItMSJdLFsiWWVhcl9FbmQiLCItMSJdXX0=, accessed March 7, 2023

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13. City of Oak Ridge Tennessee, Tax Rates, Website: https://www.oakridgechamber.org/incentives-taxes#:~:text=Oak%20Ridge%20Property%20Taxes,Tennessee%20counties%3A%20Anderson%20and%20Roane, accessed April 20, 2023.

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Table 3.3-1: Historic Population and Growth Rates of ROI Counties

County	1990	2000	2010	2021	Percent Change 1990 - 2021
Anderson	68,250	71,330	75,129	76,683	12.4
Knox	335,749	382,032	432,226	475,286	41.6
Loudon	31,255	39,086	48,556	54,349	73.9
Morgan	17,300	19,757	21,987	21,158	22.3
Roane	47,227	51,910	54,181	53,313	12.9
Total ROI	499,781	564,115	632,079	680,789	36.2
Tennessee	4,877,185	5,689,283	6,346,105	6,859,497	40.6
Sources: (Reference 2, Reference 3, Reference 4, and Reference 5)					

Table 3.3-2: Projected Population and Growth Rates of ROI Counties

County	2021	Projected 2026	Projected 2039	Percent Change 2021 - 2026	Percent Change 2026 - 2039
Anderson	76,683	79,416	81,792	3.6	3.0
Knox	475,286	502,133	557,494	5.6	11.0
Loudon	54,349	59,243	66,914	9.0	12.9
Morgan	21,158	21,842	22,119	3.2	1.3
Roane	53,313	53,981	52,585	1.3	-2.6
Total ROI	680,789	716,615	780,903	5.3	9.0
Tennessee	6,859,497	7,231,338	7,888,046	5.4	9.1
Sources: (Reference 5 and Reference 7)					

Table 3.3-3: Demographic (Race and Ethnicity) Characteristics of ROI Counties (Page 1 of 2)

County	Total Population	White		Minority		Black or African American		American Indian and Alaska Native	
		Total	%	Total	%	Total	%	Total	%
Anderson County	76,683	67,575	88.1%	9,108	11.9%	2,395	3.1%	215	0.3%
Knox County	475,286	387,046	81.4%	88,240	18.6%	39,875	8.4%	497	0.1%
Loudon County	54,349	47,084	86.6%	7,265	13.4%	640	1.2%	42	0.1%
Morgan County	21,158	19,269	91.1%	1,889	8.9%	1,162	5.5%	43	0.2%
Roane County	53,313	49,191	92.3%	4,122	7.7%	1,586	3.0%	188	0.4%
Total ROI	**680,789**	**570,165**	**83.8%**	**110,624**	**16.2%**	**45,658**	**6.7%**	**985**	**0.1%**
Tennessee	6,859,497	5,002,855	72.9%	1,856,642	27.1%	1,120,548	16.3%	10,292	0.2%
United States	329,725,481	196,010,370	59.4%	133,715,111	40.6%	40,196,302	12.2%	1,936,842	0.6%
Source: (Reference 8)									

Table 3.3-3: Demographic (Race and Ethnicity) Characteristics of ROI Counties (Page 2 of 2)

County	Asian		Native Hawaiian and Other Pacific Islander		Other Race		Hispanic or Latino		Two or More Races	
	Total	%	Total	%	Total	%	Total	%	Total	%
Anderson County	1,069	1.4%	57	0.1%	323	0.4%	2492	3.2%	2,557	3.3%
Knox County	10,741	2.3%	233	0.0%	1,614	0.3%	21,823	4.6%	13,457	2.8%
Loudon County	461	0.8%	-	-	223	0.4%	5084	9.4%	815	1.5%
Morgan County	35	0.2%	11	0.1%	-	-	312	1.5%	326	1.5%
Roane County	385	0.7%	19	0.0%	52	0.1%	1107	2.1%	785	1.5%
Total ROI	**12,691**	**1.9%**	**320**	**0.0%**	**2,212**	**0.3%**	**30,506**	**4.5%**	**17,614**	**2.6%**
Tennessee	124,495	1.8%	3,518	0.1%	19,258	0.3%	395,967	5.8%	182,564	2.7%
United States	18,554,697	5.6%	555,712	0.2%	1,208,267	0.4%	60,806,969	18.4%	10,456,322	3.2%

Source: (Reference 8)

Table 3.3-4: Median Household and Per Capita Income Levels in ROI Counties

	Anderson County	Knox County	Loudon County	Morgan County	Roane County	Tennessee	United States
Median Household Income (dollars)	55,414	62,911	66,151	45,133	60,044	58,516	69,021
Per Capita Income (dollars)	30,544	36,450	36,308	23,436	34,366	32,908	37,638
Source: (Reference 9)							

Table 3.3-5: Civilian Labor Force and Unemployment Rates

	Anderson County	Knox County	Loudon County	Morgan County	Roane County	Total ROI	Tennessee	United States
Civilian Labor Force	34,578	248,118	25,053	7,824	24,434	340,007	3,380,708	166,672,597
Unemployment Rate	5.2%	4.1%	3.3%	8.6%	5.3%	NA	5.3%	5.5%

Source: (Reference 9)
NA - Not applicable, as only rates reported by official sources are reported.

Table 3.3-6: Employment by Industry

	Anderson County		Knox County		Loudon County		Morgan County		Roane County		Tennessee		United States	
	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%
Total employment (number of jobs)	53,000	-	334,026	-	25,928	-	5,489	-	26,835	-	4,248,764	-	201,142,600	-
Farm employment	444	0.8	942	0.3	1,034	4.0	444	8.1	538	2.0	74,724	1.8	2,588,000	1.3
Construction	2,587	4.9	20,479	6.1	1,848	7.1	382	7.0	NA	NA	256,215	6.0	11,673,300	5.8
Manufacturing	13,523	25.5	14,601	4.4	3,963	15.3	375	6.8	1,115	4.2	365,296	8.6	13,081,600	6.5
Retail trade	4,420	8.3	37,309	11.2	3,779	14.6	389	7.1	2,457	9.2	423,358	10.0	19,120,800	9.5
Health care and social assistance	4,959	9.4	41,637	12.5	1,713	6.6	557	10.1	2,038	7.6	436,136	10.3	22,880,500	11.4
Accommodation and food services	3,300	6.2	26,337	7.9	1,795	6.9	173	3.2	1,423	5.3	312,784	7.4	13,554,000	6.7
Other services (non-government)	2,493	4.7	18,164	5.4	1,695	6.5	425	7.7	1,275	4.8	248,168	5.8	10,963,000	5.5
Government and government enterprises	5,229	9.9	34,677	10.4	2,377	9.2	1,510	27.5	3,580	13.3	448,490	10.6	24,048,000	12.0

Source: (Reference 10)
NA – Not shown to avoid disclosure of confidential information; estimates are included in higher-level totals.

Table 3.3-7: Percent of Individuals and Families Living Below the Census Poverty Threshold in ROI Counties

	Anderson County	Knox County	Loudon County	Morgan County	Roane County	Total ROI	Tennessee	United States
Percentage of Individuals whose Income in the Past 12 Months is below Poverty Level	15.4	12.7	12.2	21.8	13.7	13.3	14.3	12.6
Percentage of Families whose Income in the Past 12 Months is below Poverty Level	10.4	7.3	9.7	18.4	9.7	8.4	10.0	8.7
Source: (Reference 11)								

Table 3.3-8: Housing Utilization

	Anderson County	Knox County	Loudon County	Morgan County	Roane County	Total ROI	Tennessee	United States
Total housing units	35,139	209,529	24,241	8,559	25,412	302,880	3,011,124	139,647,020
Occupied housing units	30,973	192,077	21,801	7,110	21,773	273,734	2,664,791	124,010,992
Vacant housing units	4,166	17,452	2,440	1,449	3,639	29,146	346,333	15,636,028
Vacancy Rate	11.9%	8.3%	10.1%	16.9%	14.3%	9.6%	11.5%	11.2%
Median Home Value	$161,400	$208,900	$238,100	$104,300	$162,900	NA	$193,700	$244,900
Source: (Reference 17) NA - Not applicable, as only rates reported by official sources are reported.								

3.4 ENVIRONMENTAL JUSTICE

A total of 11 census block groups located within a 5 mile radius of the site were evaluated for potential environmental justice impacts. Table 3.4-1 identifies thresholds for each county for the identification of minority and low-income communities within the 5-mile radius traversing the counties.

3.4.1 Methodology

Data from 2017-2021 American Community Survey 5-Year Estimates, along with GIS software, were used to determine the minority and low-income characteristics of resident populations by block group. The Hermes ER (Reference 1) uses data from 2015-2019 American Community Survey 5-year Estimates. 11 block groups met these criteria and were evaluated against the thresholds shown in Table 3.4-1 (Reference 2 and Reference 3).

3.4.1.1 Minority Populations

Table 3.4-2 shows the percentage of minority populations in each block group within the 5-mile radius, and the county in which the block group is located. None of the 11 block groups met the “greater than 50 percent” minority population threshold indicating potential environmental justice populations. None of the minority percentages in any of the 11 block groups within the 5-mile radius exceeded the “20 percent greater” thresholds (23.5 percent in Roane County and 27.7 percent in Morgan County) compared to 27.3 percent and 27.9 percent as reported in the Hermes ER for each county respectively as shown in Table 3.4-1 (Reference 1 and Reference 2). Therefore, there are no minority populations subject to consideration as potential environmental justice communities of concern in a 5-mile radius of the proposed site.

Overall, the aggregate minority population of block groups in the 5-mile study area was 7.6 percent (Reference 4) compared to 6.2 percent as reported in the Hermes ER (Reference 1). As shown in Table 3.3-3, this is significantly less than the 5 county ROI (16.2 percent) and the state (27.1 percent) compared to 15.4 percent and 26.2 percent as reported in the Hermes ER (Reference 1) respectively.

3.4.1.2 Low-Income Populations

Table 3.4-3 shows the percentage of low-income populations in each block group within the 5-mile radius, and the county in which the block group is located. None of the 11 block groups met the “greater than 50 percent” low-income population threshold indicating potential environmental justice populations. None of the 11 block groups exceeded the “20 percent greater” thresholds (33.7 percent in Roane County and 41.8 percent in Morgan County) compared to 33.8 percent and 42.8 percent as reported in the Hermes ER for each county respectively as shown in Table 3.4-1 (Reference 1 and Reference 3). Therefore, there are no low-income populations subject to consideration as potential environmental justice communities of concern (Reference 3) within a 5-mile radius of the site.

Overall, the aggregate low-income population of block groups in the 5-mile study area was 8.5 percent compared to 12.6 percent as reported in the Hermes ER (Reference 1 and Reference 3). As shown in Table 3.3-7, this is less than the 5 county ROI (13.3 percent compared to 14.7 percent as reported in the Hermes ER) and significantly less than the State (14.3 percent compared to 15.2 percent as reported in the Hermes ER) (Reference 1).

With respect to the information presented in the Hermes ER (Reference 1), the updated data described above for environmental justice information reflect small differences and do not noticeably affect conclusions drawn in Chapter 4.

3.4.2 References

1. Kairos Power LLC, "Environmental Report for the Kairos Power Fluoride Salt-Cooled, High Temperature Non-Power Reactor (Hermes)," Revision 1, March 2023.
2. U.S. Census Bureau, Hispanic or Latino Origin by Race Table B03002, 2017-2021 American Community Survey 5-Year Estimates. Website: https://data.census.gov/table?q=B03002&g=010XX00US_040XX00US47_050XX00US47001,47093,47105,47129,47145_1500000US471291104003,471450301001,471450301002,471450302032,471450302061,471450302062,471450302063,471450307001,471450308022,471450309002,471459801001_160XX00US4755120&tid=ACSDT5Y2021.B03002&moe=false
3. U.S. Census Bureau, Selected Economic Characteristics - Table B17021, 2017-2021 American Community Survey 5-Year Estimates. Website: https://data.census.gov/table?q=B17021:+POVERTY+STATUS+OF+INDIVIDUALS+IN+THE+PAST+12+MONTHS+BY+LIVING+ARRANGEMENT&g=010XX00US_040XX00US47_050XX00US47001,47093,47105,47129,47145_1500000US471291104003,471450301001,471450301002,471450302032,471450302061,471450302062,471450302063,471450307001,471450308022,471450309002,471459801001&tid=ACSDT5Y2021.B17021&moe=false
4. NUREG-2183, "Environmental Impact Statement for the Construction Permit for the SHINE Medical Radioisotope Production Facility," October 2015.

Table 3.4-1: 2021 Thresholds for Identification of Minority and Low-income Environmental Justice Communities in ROI Counties

County	Minority Threshold (Rate + 20%)	Low-income Threshold (Rate + 20%)
Morgan	28.9%	41.8%
Roane	27.7%	33.7%
Source: (Reference 2 and Reference 3)		

Table 3.4-2: Minority Population Statistics for Block Groups within a 5-Mile Radius of the Site

Block Group	Total Population	Aggregate Minority Population	Percent Minority Population
Block Group 1, Census Tract 301, Roane County, Tennessee	1,917	88	4.6%
Block Group 2, Census Tract 301, Roane County, Tennessee	1,726	252	14.6%
Block Group 2, Census Tract 302.03, Roane County, Tennessee	2,264	239	10.6%
Block Group 1, Census Tract 302.06, Roane County, Tennessee	1,175	37	3.1%
Block Group 2, Census Tract 302.06, Roane County, Tennessee	1,025	23	2.2%
Block Group 3, Census Tract 302.06, Roane County, Tennessee	1,403	109	7.8%
Block Group 1, Census Tract 307, Roane County, Tennessee	870	110	12.6%
Block Group 2, Census Tract 308.02, Roane County, Tennessee	1,551	333	21.5%
Block Group 2, Census Tract 309, Roane County, Tennessee	4,292	100	2.3%
Block Group 1, Census Tract 9801, Roane County, Tennessee	0	0	0.0%
Block Group 3, Census Tract 1104, Morgan County, Tennessee	990	21	2.1%
Total Block Groups in 5-mile Radius	**17,213**	**1,312**	**7.6%**
Roane County, Tennessee	53,313	4,122	7.7%
Morgan County, Tennessee	21,158	1,889	8.9%
Source: Reference 2			

Table 3.4-3: Low-Income Population Statistics for Block Groups within a 5-Mile Radius of the Site

Block Group	Total Population	Persons Below Poverty Level	Percent of Persons Below Poverty Level
Block Group 1, Census Tract 301, Roane County, Tennessee	1,917	113	5.9%
Block Group 2, Census Tract 301, Roane County, Tennessee	1,719	0	0.0%
Block Group 2, Census Tract 302.03, Roane County, Tennessee	2,264	164	7.2%
Block Group 1, Census Tract 302.06, Roane County, Tennessee	1,175	306	26.0%
Block Group 2, Census Tract 302.06, Roane County, Tennessee	994	43	4.3%
Block Group 3, Census Tract 302.06, Roane County, Tennessee	1,403	79	5.6%
Block Group 1, Census Tract 307, Roane County, Tennessee	870	68	7.8%
Block Group 2, Census Tract 308.02, Roane County, Tennessee	1,551	154	9.9%
Block Group 2, Census Tract 309, Roane County, Tennessee	4,274	432	10.1%
Block Group 1, Census Tract 9801, Roane County, Tennessee	0	0	0.0%
Block Group 3, Census Tract 1104, Morgan County, Tennessee	990	99	10.0%
Total Block Groups in 5-mile Radius	**17,157**	**1,458**	**8.5%**
Roane County, Tennessee	52,669	7,220	13.7%
Morgan County, Tennessee	18,442	4,028	21.8%
Source: (Reference 3)			

Kairos Power

Chapter 4

Impacts of Proposed Construction, Operations, and Decommissioning

Hermes 2 Non-Power Reactor

Environmental Report

Revision 0

July 2023

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CHAPTER 4 IMPACTS OF PROPOSED CONSTRUCTION, OPERATIONS, AND DECOMMISSIONING

This chapter provides an analysis of the impacts of construction, operation, and decommissioning of the facility. Overall impact rankings are given to each environmental resource evaluated. Unless otherwise defined, criteria followed the guidance given in NRC Impact Rankings in 10 CFR 51 Subpart A, Appendix°B, Table B-1, Footnote 3 as follows:

- SMALL – Environmental effects are not detectable or are so minor that they would neither destabilize nor noticeably alter any important attribute of the resource.
- MODERATE – Environmental effects are sufficient to alter noticeably, but not to destabilize, important attributes of the resource.
- LARGE – Environmental effects are clearly noticeable and are sufficient to destabilize important attributes of the resource.

As noted in Table 4.13-2 of the Hermes ER (Reference 1), all impacts from the proposed Hermes facility were determined to be SMALL.

4.1 LAND USE AND VISUAL RESOURCES

This section assesses the impacts of construction and operation on land use and visual resources for the site and region.

4.1.1 Land Use

This section discusses the land use impacts from construction and operation of the facility.

4.1.1.1 Site and Region

The historic and industrial context of the site and region for the Hermes 2 facility is given in Section 4.1.1.1 of the Kairos Power Hermes Environmental Report (ER; Reference 1).

No additional new and significant information has been identified from the Hermes ER. Impacts to land use during construction and operations were determined to be SMALL in the Hermes ER (Reference 1). Therefore, impacts to land use during construction and operations of Hermes 2 would also be SMALL.

Uranium sourcing details for the Hermes 2 facility are similar to details given in Section 4.1.1.1 of the Hermes ER (Reference 1) with the exception of an increase in uranium usage to account for two units and additional operating life of the facility. Approximately 4.66 metric tons of uranium (MTU) would be needed over the 10 effective full-power years (EFPY) of the 11-year licensed operating life for both Hermes 2 reactor units compared to an average of 20 to 33 MTU per year for light-water power reactors.

No additional new and significant information has been identified from the Hermes ER (Reference 1). Impacts from uranium sourcing were determined to be SMALL in the Hermes ER (Reference 1). Therefore, the impacts from uranium sourcing for Hermes 2 on land use would also be SMALL.

The land use impacts to the site and near offsite areas are similar to those described in Section 4.1.1.1 of the Hermes ER (Reference 1).

No additional new and significant information has been identified from the Hermes ER. Impacts on land use to the site and near offsite areas were determined to be SMALL in the Hermes ER (Reference 1). Therefore, the impacts on land use to the site and near offsite areas for Hermes 2 would also be SMALL.

4.1.1.2 Special Land Uses

Regional special land uses for the Hermes 2 facility are those described in Section 4.1.1.2 of the Hermes ER (Reference 1).

No additional new and significant information has been identified from the Hermes ER (Reference 1). Impacts to special land use classification areas were determined to be SMALL in the Hermes ER (Reference 1). Therefore, impacts to special land use classification areas during construction and operation of Hermes 2 would be SMALL.

4.1.1.3 Agricultural Resources and Facilities

Agricultural resources and facilities near the Hermes 2 facility are those described in Section 4.1.1.3 of the Hermes ER (Reference 1).

No additional new and significant information has been identified from the Hermes ER. Direct and Indirect impacts to agricultural resources and facilities were determined to be SMALL in the Hermes ER (Reference 1). Therefore, direct and indirect impacts to agricultural resources and facilities from the construction and operation of Hermes 2 would be SMALL.

4.1.1.4 Major Population Centers and Infrastructure

Major population centers and infrastructure near the Hermes 2 facility are those described in Section 3.1 and Section 4.1.1.4 of the Hermes ER (Reference 1). Updates to population data discussed in Section 3.3 are minor and do not alter the conclusions given in the Hermes ER (Reference 1).

No additional new and significant information has been identified from the Hermes ER. Direct and Indirect impacts to major population centers were determined to be SMALL in the Hermes ER (Reference 1). Therefore, direct and indirect impacts to major population centers and infrastructure from the construction and operation of Hermes 2 would be SMALL.

4.1.1.5 Impacts from Decommissioning

Decommissioning activities and resultant land uses for the Hermes 2 facility and site are expected to be similar to those described in Section 4.1.1.5 of the Hermes ER (Reference 1) with exceptions to the licensed life of the Hermes 2 facility and the timeline of operation and decommissioning of the Hermes 2 facility. The licensed life of the facility is expected to be 11 years. The facility is expected to begin operational activities in 2028. As a result, decommissioning activities would be expected to commence in 2039.

No additional new and significant information has been identified from the Hermes ER. Direct and Indirect impacts from decommissioning were determined to be SMALL in the Hermes ER (Reference 1). Therefore, direct and indirect impacts from the decommissioning of Hermes 2 would be SMALL.

4.1.2 Visual Resources

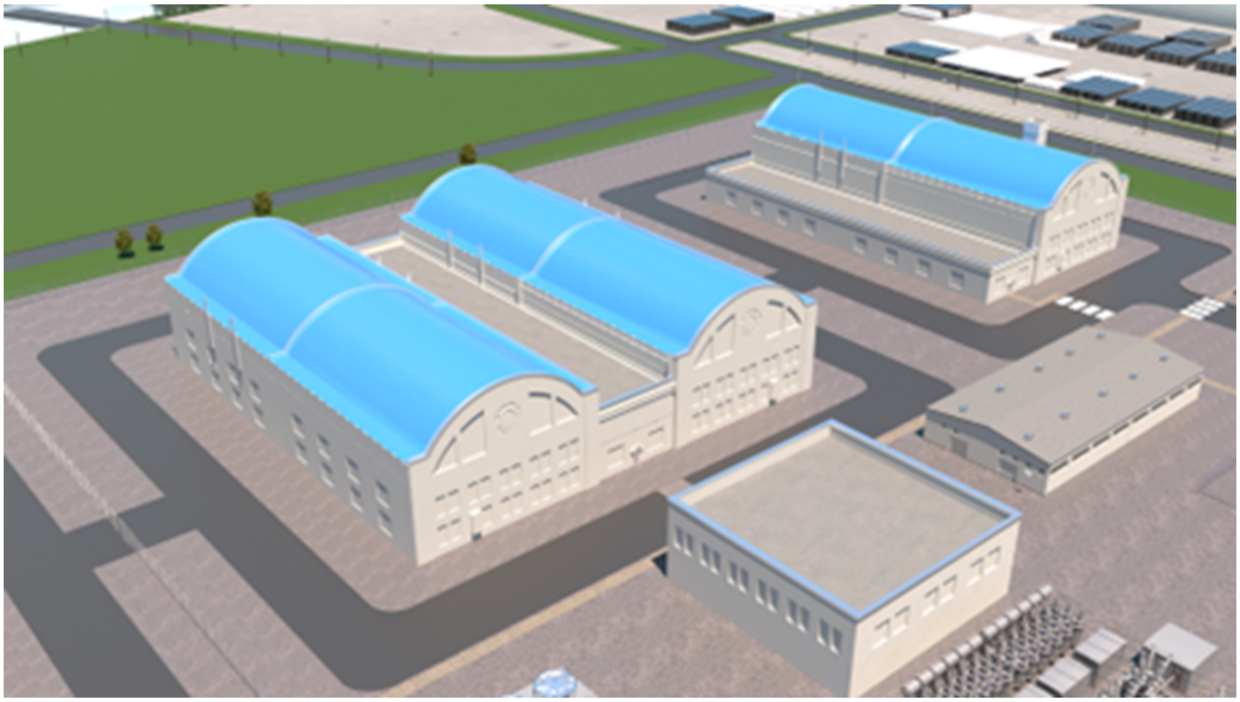
The visual resource impacts of the Hermes 2 facility are similar to those described in Section 4.1.2 of the Hermes ER (Reference 1) with the exception of facility specific dimensions. A design simulation of the proposed facility is shown in Figure 4.1-1. Approximate dimensions of the Reactor Building complex for the visual impact assessment include a height of 100 feet, a length of 260 feet, and a width of 275 feet. The Reactor Buildings would each have an approximate width of 100 feet and the Auxiliary Systems Building would have an approximate width of 75 feet, for a combined width of 275 feet. The footprint within the fenced area would be approximately 1,200 feet wide by 600 feet long. The facility’s Reactor Buildings would have ventilation stacks with a height of 100 feet.

No additional new and significant information has been identified from the Hermes ER. Impacts on visual resources due to construction and operation were determined to be SMALL in the Hermes ER (Reference 1). Therefore, the impact on visual resources due to construction and operation of the Hermes 2 facility would be SMALL.

4.1.3 References

1. Kairos Power LLC, “Environmental Report for the Kairos Power Fluoride Salt-Cooled, High Temperature Non-Power Reactor (Hermes),” March 2023.

Figure 4.1-1: Simulation of the Proposed Facility



4.2 AIR QUALITY AND NOISE

4.2.1 Air Quality

4.2.1.1 Impacts from Construction

The air quality details for the construction of the Hermes 2 facility are similar to those described in Section 4.2.1.1 of the Hermes ER (Reference 1) with the exception of an increase in duration of construction-related emissions due to the construction of both units.

Air emission estimates for the construction phase of the Hermes 2 reactor facility are provided in Table°4.2-1.

No additional new and significant information was identified from the Hermes ER. Impacts on air quality due to construction were determined to be SMALL in the Hermes ER (Reference 1). Therefore, the impacts to air quality during construction of the Hermes 2 facility would be SMALL.

4.2.1.2 Impacts from Operation

The air quality details for the operation of the Hermes 2 facility are similar to those described in Section°4.2.1.2 of the Hermes ER (Reference 1).

The design of the facility includes a cooling system that uses external mechanical air-cooled condensers but does not use open-cycle, evaporative cooling.

No additional new and significant information was identified from the Hermes ER. Impacts on air quality due to operation were determined to be SMALL in the Hermes ER (Reference 1). Therefore, the impacts to air quality during operation of the Hermes 2 facility would be SMALL.

4.2.1.2.1 Gaseous Effluents

Air emissions of nonradiological gaseous pollutants and hazardous air pollutants (HAPs) from the operation of the Hermes 2 facility would be similar to those described in Section 4.2.1.2.1 of the Hermes ER (Reference 1) with the exception of an increase to hydrocarbon combustion emissions to account for the intermediate coolant heater. Air emissions of nonradiological gaseous criteria pollutants and HAPs would be emitted during the operations phase from intermittent use of propane-fired heaters for the intermediate coolant located in the intermediate heat transport system (IHTS) during maintenance activities.

No additional new and significant information was identified from the Hermes ER. Impacts on air quality due to operation were determined to be SMALL in the Hermes ER (Reference 1). Therefore, the impacts to air quality during operation of the Hermes 2 facility would be SMALL.

4.2.1.2.2 Uranium Fuel Cycle

Air emissions details related to vehicle emissions, emissions from the uranium fuel cycle, other emissions, and release point characteristics for the Hermes 2 facility are similar to those described in Section 4.2.1.2.2 of the Hermes ER (Reference 1) with the exception of an increase in total uranium required to account for the increased life of the facility and its two units. Approximately 4.66 MTU would be needed for both units over the 10 EFPY of the 11-year licensed operating life compared to an average of 20 to 33 MTU per year for light-water power reactors.

No additional new and significant information was identified from the Hermes ER. Impacts on air quality due to mining, enrichment, and fuel fabrication activities were determined to be SMALL in the Hermes

ER (Reference 1). Therefore, the environmental impacts from air emissions generated during mining, enrichment, and fuel fabrication activities for Hermes 2 would be SMALL and are bounded by impacts described in Table S-3 of 10 CFR 51.51 which considers the impacts from a generic LWR requiring an average of 33 MTU per year.

4.2.1.3 Impacts of Decommissioning

The air quality details for the decommissioning of the Hermes 2 facility are similar to those described in Section 4.2.1.3 of the Hermes ER (Reference 1).

No additional new and significant information was identified from the Hermes ER. Impacts on air quality due to decommissioning were determined to be SMALL in the Hermes ER (Reference 1). Therefore, impacts to air quality during the decommissioning phase of Hermes 2 would be SMALL.

4.2.1.4 Required Permits

The Permit requirements for the Hermes 2 facility are similar to those listed in Table 1.4-1 and Section°4.2.1.4 of the Hermes ER (Reference 1). While there is no difference in required permits, CO_2°equivalent (CO_2e) emission estimates discussed in Section 4.2.1.4 of the Hermes ER (Reference 1) are increased to account for two units.

It is expected that during construction, the facility could produce up to 16,380 metric tons of CO_2e per year. During operation, the facility could produce up to 2,920 metric tons of CO_2e per year. Because the emissions are expected to be under 25,000 metric tpy, the facility would not be subject to GHG regulations.

No additional new and significant information was identified from the Hermes ER. Therefore, there is no change in permits required for the Hermes 2 facility from those identified in the Hermes ER.

4.2.1.5 Air Quality and Meteorological Monitoring

Air quality and meteorological monitoring information details for the Hermes 2 facility are identical to those given in Section 4.2.1.5 of the Hermes ER (Reference 1). No additional new and significant information was identified from the Hermes ER.

4.2.2 Noise

4.2.2.1 Impacts of Construction

The noises generated during the construction of the Hermes 2 facility are similar to those described in Section 4.2.2.1 the Hermes ER (Reference 1) with the exception of an increase in total noise to account for two units being constructed over a longer duration. Construction would have temporary adverse effects on noise and vibration during the likely 3-year duration of the construction between 2025 and 2028. Local noise receptors and background noise levels are described in Section 4.2.2.1 the Hermes ER (Reference 1).

No additional new and significant information has been identified from the Hermes ER. Impacts on noise due to construction equipment operation and construction-related traffic were determined to be SMALL in the Hermes ER (Reference 1). Therefore, the impact of noise from construction equipment operation and construction-related traffic for Hermes 2 on nearby residences, schools, churches, and parks would be SMALL.

4.2.2.2 Impacts of Operation

Noises generated during operation of the Hermes 2 facility are similar to those described in Section°4.2.2.2 of the Hermes ER (Reference 1) with the exception of an increase in total noise to account for two units, the use of the power generation systems including a turbine, and the use of a dry air-cooled condensers. However, the nearest resident is approximately 1.1 miles away from the project site and is separated by forest and the Black Oak Ridge, creating a sound buffer as noted in the Hermes ER (Reference 1). The power generation systems will be housed within the turbine building. The air-cooled condensers will not generate noise levels in excess of 70 dBA at 1000 ft from the condensers. The day-night average noise level will be attenuated to less than 65 dBA at the nearest resident.

NUREG-1437, Rev 1, *Generic Environmental Impact Statement for License Renewal of Nuclear Plants*, states that the Department of Housing and Urban Development uses day-night average sound levels of 55 dBA, recommended by the U.S. Environmental Protection Agency (EPA) as guidelines or goals for outdoors in residential areas. However, noise levels are considered acceptable if the day-night average sound level outside a residence is less than 65 dBA. Considering that noise levels from the air-cooled condensers and other mechanical equipment are expected to be less than 70 dBA at 1000 ft from the towers and the nearest residence is more than five times that distance, noise levels at the nearest residence are expected to be attenuated to 65 dBA or less. Given the ambient day-night sound level of 53 dBA measured at the site boundary as reported in Table 3.2-10 of the Hermes ER (Reference 1), operational impacts relative to the noise environment at the location of the nearest resident would be SMALL.

No additional new and significant information has been identified from the Hermes ER. Impacts on noise due to operation were determined to be SMALL in the Hermes ER (Reference 1). Therefore, the impact of noise from operation of the Hermes 2 facility would be SMALL.

4.2.2.3 Impacts of Decommissioning

Noises generated during decommissioning of the Hermes 2 facility are similar to those described in Section 4.2.2.3 of the Hermes ER (Reference 1) with the exception of an increase in total noise to account for two units.

No additional new and significant information has been identified from the Hermes ER. Impacts on noise due to decommissioning were determined to be SMALL in the Hermes ER (Reference 1). Therefore, the impact of noise from decommissioning the Hermes 2 facility would be SMALL.

4.2.3 References

1. Kairos Power LLC, “Environmental Report for the Kairos Power Fluoride Salt-Cooled, High Temperature Non-Power Reactor (Hermes),” Revision 1, March 2023.
2. New York City Environmental Quality Review. Technical Manual (2021) (Table 22-1).
3. U.S. Department of Transportation. Federal Highway Administration HighwayConstruction Noise Handbook. Final Report. August 2006. [Table 7.3 and/or Table 9.1]

Table 4.2-1: Total Emissions – Construction Related Equipment and Trucks

Equipment Type	Hours (4)	Horse-power (2)	Load Factor (3)	Emissions Rate (tons)(1)							
				VOC	NO_X	CO	$PM_{2.5}$	PM_{10}	SO_2	CO_2	CH_4
Air Compressor	2,024	300	0.43	0.00	0.50	0.14	0.02	0.02	0.00	152.62	0.00
Asphalt Paving Machine	220	130	0.59	0.00	0.02	0.00	0.00	0.00	0.00	9.98	0.00
Backhoe and Loader	7,608	85	0.21	0.10	0.52	0.54	0.08	0.08	0.00	103.82	0.00
Compactor	26,826	20	0.59	0.14	1.34	0.55	0.06	0.06	0.00	205.44	0.02
Concrete Pump	2,502	181	0.43	0.04	0.50	0.12	0.02	0.02	0.00	113.78	0.00
Concrete Saw	3,476	25	0.59	0.00	0.14	0.02	0.00	0.00	0.00	33.64	0.00
Crane	7,752	335	0.43	0.08	1.42	0.34	0.06	0.06	0.00	652.88	0.00
Dozer	4,304	303	0.43	0.02	0.36	0.14	0.02	0.02	0.00	331.48	0.00
Hammer	7,644	54	0.43	0.08	0.88	0.38	0.06	0.06	0.00	115.18	0.00
Excavator	16,060	303	0.59	0.10	1.58	0.64	0.10	0.12	0.00	1,697.12	0.00
Tractor	4,722	70	0.21	0.06	0.32	0.28	0.04	0.04	0.00	53.06	0.00
Lift	25,430	64	0.21	0.22	1.54	1.04	0.14	0.14	0.00	261.34	0.00
Trucks	31,544	440	0.59	0.14	2.12	0.62	0.12	0.14	0.02	4,841.00	0.02
Welder	5,276	25	0.68	0.04	0.34	0.18	0.04	0.04	0.00	68.62	0.00
Total				1.02	11.58	4.98	0.76	0.80	0.02	8,639.96	0.04

Notes:

1. Emissions factors are estimated using MOVES3.03, Non-road module for Roane County, Tennessee
2. Guidance for horsepower: USACE Construction Equipment Ownership and Operating Expense Schedule Region IV
3. Guidance for Load Factors; USEPA Median Life, Annual Activity, and Load Factor Values for Nonroad Engine Emissions Modeling
4. Estimated number of hours for each equipment type based on Hermes 2 construction estimates

4.3 GEOLOGIC ENVIRONMENT

Potential impacts to geologic and soil resources during the construction, operation, and decommissioning of the Hermes 2 facility are similar to those described in Section 4.3 of the Hermes ER (Reference 1) with the exception of an increase in geologic material required for construction to account for two units. The estimated quantity of geologic material required for the completion of this project, exclusive of concrete acquired from commercial concrete mixing plants for construction of the buildings, would be:

- Backfill: 222,666 cubic yards around structures in main excavation (reuse of suitable material excavated onsite)
- Topsoil: 1,066 cubic yards, acquired from onsite sources
- Granular road base: 9,284 cubic yards
- Asphaltic pavement: 17,846 cubic yards
- Gravel surfacing: 1,000 cubic yards
- Underground utilities: 2,344 cubic yards for backfill (reuse of suitable material excavated onsite)
- Site grading: quantity is to be determined, and to be acquired from material excavated onsite.

No additional new and significant information has been identified from the Hermes ER. Impacts on geologic and soil resources due to construction, operation, and decommissioning were determined to be SMALL in the Hermes ER (Reference 1). Therefore, the impact on geologic and soil resources from facility construction, operation, and decommissioning of Hermes 2 would be SMALL. Actions related to dewatering of the excavated geologic environment during construction discussed in Section 4.3.2 of the Hermes ER (Reference 1) are also applicable to the Hermes 2 facility.

4.3.1 References

1. Kairos Power LLC, "Environmental Report for the Kairos Power Fluoride Salt-Cooled, High Temperature Non-Power Reactor (Hermes)," Revision 1, March 2023.

4.4 WATER RESOURCES

4.4.1 Hydrology

4.4.1.1 Surface Water

4.4.1.1.1 Facility Construction

The surface water hydrology for the Hermes 2 facility is similar to that given in Section 4.4.1.1.1 of the Hermes ER (Reference 1).

No additional new and significant information has been identified from the Hermes ER. Direct and indirect impacts on surface water hydrology due to construction were determined to be SMALL in the Hermes ER (Reference 1). Therefore, both direct and indirect impacts to surface water hydrology during construction of the Hermes 2 facility would be SMALL. Required permits and actions related to surface water hydrology discussed in Section 4.4.1.1.1 of the Hermes ER are also applicable to the Hermes 2 facility.

4.4.1.1.2 Facility Operations

The surface water hydrology for the Hermes 2 facility is similar to that given in Section 4.4.1.1.2 of the Hermes ER (Reference 1).

No additional new and significant information has been identified from the Hermes ER. Direct and indirect impacts on surface water hydrology due to operation were determined to be SMALL in the Hermes ER (Reference 1). Therefore, both direct and indirect impacts to surface water hydrology during operation of the Hermes 2 facility would be SMALL. Required permits and actions related to surface water hydrology discussed in Section 4.4.1.1.2 of the Hermes ER are also applicable to the Hermes 2 facility.

4.4.1.1.3 Facility Decommissioning

The surface water hydrology for the Hermes 2 facility is similar to that given in Section 4.4.1.1.3 of the Hermes ER (Reference 1).

No additional new and significant information has been identified from the Hermes ER. Direct and indirect impacts on surface water hydrology due to decommissioning were determined to be SMALL in the Hermes ER (Reference 1). Therefore, both direct and indirect impacts to surface water hydrology during decommissioning of the Hermes 2 facility would be SMALL. Required actions related to surface water hydrology discussed in Section 4.4.1.1.3 of the Hermes ER are also applicable to the Hermes 2 facility.

4.4.1.2 Groundwater

4.4.1.2.1 Construction, Operations and Decommissioning

Groundwater hydrology for the Hermes 2 facility is similar to that given in Section 4.4.1.2.1 of the Hermes ER (Reference 1).

No additional new and significant information has been identified from the Hermes ER. Therefore, both direct and indirect impacts to groundwater hydrology during construction, operation, and decommissioning of the Hermes 2 facility would be SMALL. Actions related to groundwater hydrology discussed in Section 4.4.1.2.1 of the Hermes ER are also applicable to the Hermes 2 facility.

4.4.2 Water Use

4.4.2.1 Surface Water

The water use for the Hermes 2 facility is similar to that described in Section 4.4.2.1 of the Hermes ER (Reference 1) with the exception of an increase in total water usage to account for two units. The average estimated water usage by the facility during operations would be 0.17 million gallons per day (MGD). As noted in Section 3.7.2.5 of the Hermes ER, the City of Oak Ridge Public Works has the capacity to produce 12 MGD and is expected to complete a new water treatment plant with a capacity of up to 16 MGD in 2024 or 2025 (Reference 1, Reference 2).

The Rarity Ridge Wastewater Treatment Plant has a 0.6 MGD treatment capacity and the facility would generate only 0.04 MGD of wastewater; therefore, the treatment plant has the capacity to manage the wastewater.

No additional new and significant information has been identified from the Hermes ER. Direct and indirect impacts on surface water use due to construction, operation, and decommissioning were determined to be SMALL in the Hermes ER (Reference 1). Therefore, direct and indirect impacts to surface water use during construction, operations, and decommissioning of Hermes 2 would be SMALL.

4.4.2.2 Groundwater

The water use for the Hermes 2 facility is similar to that given in Section 4.4.2.2 of the Hermes ER (Reference 1).

No additional new and significant information has been identified from the Hermes ER. Direct and indirect impacts on groundwater use due to construction, operation, and decommissioning were determined to be SMALL in the Hermes ER (Reference 1). Therefore, both direct and indirect impacts to groundwater use during construction, operation, and decommissioning of the Hermes 2 facility would be SMALL. Actions related to dewatering during construction and decommissioning discussed in Section°4.4.2.2 of the Hermes ER are also applicable to the Hermes 2 facility.

4.4.3 Water Quality

Potential surface water and groundwater quality impacts of site construction and operation are discussed in this section.

4.4.3.1 Surface Water

4.4.3.1.1 Facility Construction and Decommissioning

The surface water quality details for the Hermes 2 facility are similar to those described in Section°4.4.3.1.1 of the Hermes ER (Reference 1) with the exception of an increase in monthly usage of diesel fuel during construction to account for two units. It is estimated that 63,600 gallons of diesel fuel would be used on a monthly basis during construction.

No additional new and significant information has been identified from the Hermes ER. Direct and indirect impacts on surface water quality due to construction and decommissioning were determined to be SMALL in the Hermes ER (Reference 1). Therefore, direct and indirect impacts to surface water quality during construction and decommissioning of Hermes 2 would be SMALL. Required permits and actions related to surface water quality discussed in Section 4.4.3.1.1 of the Hermes ER are also applicable to the Hermes 2 facility.

4.4.3.1.2 Facility Operation

The surface water quality details for the Hermes 2 facility are similar to those described in Section°4.4.3.1.2 of the Hermes ER (Reference 1) with the exception of an increase in wastewater generation during operation to account for two units. The Rarity Ridge Wastewater Treatment Plant has a 0.6 MGD treatment capacity and the Hermes 2 facility would generate only 0.04 MGD of wastewater.

No additional new and significant information has been identified from the Hermes ER. Direct and indirect impacts on surface water quality due to operation were determined to be SMALL in the Hermes ER (Reference 1). Therefore, direct and indirect impacts to surface water quality during operation of Hermes 2 would be SMALL. Required permits and actions related to surface water quality discussed in Section 4.4.3.1.2 of the Hermes ER are also applicable to the Hermes 2 facility.

4.4.3.2 Groundwater

4.4.3.2.1 Construction, Operation, and Decommissioning

The groundwater quality details for the Hermes 2 facility are similar to those given in Section 4.4.3.2.1 of the Hermes ER (Reference 1) with the exception of an increase in onsite stored diesel fuel during operations to account for two units. During operations, the facility would include storage of approximately 43,110 gallons of diesel fuel in an onsite fuel tank for the standby diesel generator.

No additional new and significant information has been identified from the Hermes ER. Direct and indirect impacts on groundwater quality due to construction, operation, and decommissioning were determined to be SMALL in the Hermes ER (Reference 1). Therefore, both direct and indirect impacts to groundwater quality during construction, operation, and decommissioning of the Hermes 2 facility would be SMALL. Required permits and actions related to groundwater quality during construction, operation, and decommissioning discussed in Section 4.4.3.2.1 of the Hermes ER are also applicable to the Hermes 2 facility.

4.4.4 Monitoring

The water resource monitoring details for the Hermes 2 facility are given in Section 4.4.4 of the Hermes ER (Reference 1).

No additional new and significant information has been identified from the Hermes ER.

4.4.5 References

1. Kairos Power LLC, "Environmental Report for the Kairos Power Fluoride Salt-Cooled, High Temperature Non-Power Reactor (Hermes)," Revision 1, March 2023.
2. Huotari, J. "DOE awards $91 million contract for Mercury Treatment Facility at Y-12", Oak Ridge Today, December 5, 2018. Retrieved from: https://oakridgetoday.com/2018/12/05/doe-awards-91-million-contract-mercury-treatment-facility-y-12/.

4.5 ECOLOGICAL RESOURCES

This section addresses the impacts of construction, operation, and decommissioning of the Hermes 2 facility on the ecological resources and within the vicinity of the site. The impacts discussed below are based on the characterization and description of terrestrial and aquatic ecosystems from Section 3.5 of the Hermes ER (Reference 1).

4.5.1 Impacts from Construction

The ecological resource details related to the construction of the Hermes 2 facility are similar to those described in Section 4.5.1 of the Hermes ER (Reference 1) and its subsections with exceptions on the location and layout of the Hermes 2 facility within the site. Figure 2.2-1 illustrates the location of the Hermes 2 facility within the site and Figure 3.2-1 depicts the buildings of the facility proposed to be constructed on the site. Construction activities for the facility would temporarily disturb the same 138 acres of land disturbed for the Hermes facility (Reference 1).

No additional new and significant information has been identified from the Hermes ER. Impacts to ecological resources due to construction were determined to be SMALL in the Hermes ER (Reference 1). Therefore, impacts to ecological resources during construction of Hermes 2 would be SMALL. Required permits and actions related to ecological resources discussed in Section 4.5.1 of the Hermes ER and its subsections are also applicable to the Hermes 2 facility.

4.5.2 Impacts from Operations

The ecological resource details related to the operation of the Hermes 2 facility are similar to those described in Section 4.5.2 of the Hermes ER (Reference 1) and its subsections with the clarification that heat rejection will primarily be accomplished using an air-cooled condenser associated with the power generation systems. The heat rejection stack will be used during normal startup and shutdown when the air-cooled condenser is unavailable.

The principal source of operational noise is expected to be the air-cooled condenser. Data applicable to the prediction of noise effects on wildlife are limited. A study by the Federal Highway Administration (FHA) summarized information from available literature on the effects of noise on wildlife populations. The study indicated that effects of noise on birds has been studied the most. The FHA's review found that some studies indicated that birds were adversely affected by proximity to roads and their associated noise, while other studies found the opposite effect, with reports of many bird species using roadside habitats despite the noise. For mammals, the FHA's review found that studies indicate large mammals may avoid noise, but the effect seems to be small to moderate, and small mammals occur in significant numbers in highway rights-of-way and do not seem to be adversely affected by road noise (Reference 2).

A separate study found that the threshold noise level at which birds and small mammals are frightened or startled is 80 to 85 dBA (Reference 3). Noise at this level may occur at less than 1,000 ft from the air-cooled condenser. There are only small areas of potential habitat within 1,000 ft of the air-cooled condensers. Most habitat within this range is within the site boundary and of low quality, so exposure of wildlife to disturbing levels of noise during operation of the facility would be minimal. Thus, construction and operation impacts to wildlife from noise would be SMALL. Specific measures and controls would not be needed.

No additional new and significant information has been identified from the Hermes ER. Impacts on ecological resources due to operation were determined to be SMALL in the Hermes ER (Reference 1). Therefore, impacts to ecological resources during operation of Hermes 2 would be SMALL. Required actions related to ecological resources discussed in Section 4.5.2.2 and Section 4.5.2.5 of the Hermes ER are also applicable to the Hermes 2 facility.

4.5.3 Impacts from Decommissioning

The ecological resource details related to the decommissioning of the Hermes 2 facility are similar to those described in Section 4.5.3 of the Hermes ER (Reference 1).

No additional new and significant information has been identified from the Hermes ER. Impacts to ecological resources due to decommissioning were determined to be SMALL in the Hermes ER (Reference 1). Therefore, impacts to ecological resources during decommissioning of Hermes 2 would be SMALL.

4.5.4 References

1. Kairos Power LLC, “Environmental Report for the Kairos Power Fluoride Salt-Cooled, High Temperature Non-Power Reactor (Hermes),” Revision 1, March 2023.
2. Federal Highway Administration, "Synthesis of Noise Effects on Wildlife Populations," FHWA-HEP-06-016, September, 2004.
3. Golden et al. 1980: Golden, J., R. P. Ouellette, S. Saari, and P. N. Cheremisinoff, “Chapter 8: Noise” In Environmental Impact Data Book (Second Printing), Ann Arbor Science Publishers, Inc., Ann Arbor, Michigan, 1980.

4.6 HISTORIC AND CULTURAL RESOURCES

4.6.1 Construction, Operation, and Decommissioning

The historic and cultural resource details related to the construction, operation, and decommissioning of the Hermes 2 facility are similar to those described in Section 4.6 of the Hermes ER (Reference 1).

No additional new and significant information has been identified from the Hermes ER. Impacts to historical and cultural resources due to construction, operation, and decommissioning were determined to be SMALL in the Hermes ER (Reference 1). Therefore, impacts to historic and cultural resources during construction, operation, and decommissioning of Hermes 2 would be SMALL.

4.6.2 References

1. Kairos Power LLC, "Environmental Report for the Kairos Power Fluoride Salt-Cooled, High Temperature Non-Power Reactor (Hermes)," Revision 1, March 2023.

4.7 SOCIOECONOMICS

This subsection describes potential impacts to the socioeconomic environment, including transportation system impacts associated with the construction, operation and decommissioning of the Hermes 2 facility.

4.7.1 Socioeconomics Impacts

The socioeconomic details related to the construction, operation and decommissioning of the Hermes 2 facility are similar to those described in Section 4.7.1 of the Hermes ER (Reference 1) and its subsections with the exception of an increase to workforce size and public service use and duration of employ to account for two units and a licensed operating period of 11 years. The peak onsite construction phase (contractor) workforce is 850 workers (424 average), and the maximum onsite operational phase workforce is 101 workers. This analysis assumes a 36-month schedule of construction-related activities. Decommissioning is estimated to start in 2040 and the decommissioning workforce, delivery frequency, and waste shipment frequency are anticipated to be identical to those given in the Hermes ER (Reference 1) as the Hermes 2 units will be decommissioned in series.

4.7.1.1 Population Impacts

In 2021, population in the region of influence (ROI) was 680,789 (Reference 2). Growth projections show that the population in the ROI in 2026 (start of construction), 2028 (start of operations) and 2040 (decommissioning) would be approximately 716,615, 728,546, and 780,903, respectively (see Table°3.4-2) (Reference 3). Workforce estimates are based on 2020 data from the U.S. Census Bureau (USCB) County Business Patterns (Reference 4), the latest year for which this information is available.

As shown in Table 3.7-5, in 2021 the total ROI labor force was 340,007 (Reference 6). Table 4.7-1 shows the estimated number of construction workers for the major labor categories in the ROI was 27,679 in 2020. As a conservative measure, Table 4.7-1 delineates 20 percent of the construction workforce as labor available to Kairos, for an available labor pool of 5,536 workforce. These estimates show that substantially all of the peak requirement (850 construction workers) are present within the ROI labor. While there is an estimated labor force deficiency of 36 workers for the Heavy and Civil Engineering Construction occupation, the overall estimated ROI labor force in the construction trades is demonstrated to be abundant relative to construction workforce requirements, which greatly reduces the potential for large numbers of trade workers to relocate in the ROI. It is possible that some workforce may commute or temporarily relocate to the site from non-ROI counties, but these numbers would not be significant or cause a perceptible increase in the ROI's 2021 population of 680,789 (Reference 2). Therefore, the impact of the construction of the facility on population would be SMALL.

Table 4.7-1 shows the estimated number of operations workers for the major labor categories in the ROI was 24,128 in 2020. As a conservative measure, Table 4.7-1 delineates 10 percent of the construction workforce as labor available to Kairos, for an available labor pool of 2,413 workforce (Reference 4). These estimates show that substantially all of the required 101 permanent operations workers are available in the ROI. It is possible that some workforce may commute or relocate to the site from non-ROI counties to pursue job opportunities, but these numbers would not be significant or cause a perceptible increase in the ROI's population of 716,615 in 2028, the year operation of the first unit is expected to commence, and 733,342 in 2029, the year operation of the second unit is expected to commence (Reference 3). Therefore, the impact of the construction of the facility on population would be SMALL.

As shown in Table 4.7-1, the estimated number of decommissioning workers for the major labor categories in the ROI was 9,239 in 2020. As a conservative measure, Table 4.7-1 delineates 20 percent of the decommissioning workforce as labor available to Kairos, for a total of 1,506 (Reference 4). These estimates show that substantially all of the required 340 decommissioning workers are available in the ROI. It is possible that some workforce may commute or relocate to the site from non-ROI counties to pursue job opportunities, but these numbers would not be significant or cause a perceptible increase in the ROI's projected population of 780,903 in 2040 (Reference 3). Therefore, the impact of the construction of the facility on population would be SMALL.

4.7.1.2 Housing Impacts

Section 3.7.2.2 and Table 3.4-8 provide a summary of housing utilization sourced from 2017-2021 American Community Survey 5-Year Estimates.

In 2021, there were 29,146 vacant housing units in the ROI (see Table 3.4-8) (Reference 2).

The potential impacts on housing would be SMALL due to the large number of available vacant housing units in the ROI and the lack of demand related to the construction, operations and decommissioning workforce.

4.7.1.3 Public Services Impacts

At a conservatively assumed 41 gpd for each construction worker who is onsite for 8 to 12 hours per day, an average onsite workforce of 424 needs 17,384 gpd for potable and sanitary use. During peak usage, an estimated 850 construction workers would be onsite, and would need 34,850 gpd for potable and sanitary use. As discussed in Section 3.7.2.5 of the Hermes ER (Reference 1), the City of Oak Ridge Public Works has excess water capacity of 4-6 MGD. Therefore, impacts on public water supply by the onsite construction workforce would be SMALL.

4.7.1.4 Public Education Impacts

The student age cohort (age 5 to 18) accounts for 17.9 percent of the ROI total population (Reference 2) compared to 15 percent of the ROI total population as reported in the Hermes ER (Reference 1). Population increase due to construction workforce and operational workforce requirements is not expected. It is possible that some workforce may commute or temporarily relocate to the site from non-ROI counties, but these numbers would not be significant or cause a perceptible increase in the area's population or result in any perceptible change in school enrollment. Therefore, the level of impact to the local public education system would be SMALL.

4.7.1.5 Sales Taxes

The amount of sales taxes collected over a potential 11-year licensed operating period that are attributable to the facility is significant but is relatively minor when compared to the total amount of taxes collected in the region of interest.

4.7.1.6 Summary of Tax Impacts

Tax revenues related to the construction, operation, and decommissioning of the Hermes 2 facility are similar to those described in Section 4.7.1 of the Hermes ER (Reference 1).

No additional new and significant information has been identified from the Hermes ER. Tax impacts due to construction, operation, and decommissioning were determined to be SMALL in the Hermes ER (Reference 1). Therefore, total tax revenues from Kairos Power would result in SMALL positive impacts at the community level.

4.7.1.7 Socioeconomic impact determination

The socioeconomic impacts on the ROI resulting from construction, operation, and decommissioning of the facility are similar to those described in Section 4.7.1 of the Hermes ER (Reference 1).

No additional new and significant information regarding socioeconomic resource impacts has been identified from the Hermes ER. Impacts to socioeconomic resources due to construction, operation, and decommissioning were determined to be SMALL in the Hermes ER and no mitigation measures were determined to be required to minimize socioeconomic impacts. (Reference 1). Therefore, impacts to socioeconomic resources during construction, operation, and decommissioning of Hermes 2 would be SMALL and no mitigation measures are required to minimize socioeconomic impacts.

4.7.2 Transportation

The transportation details related to the construction, operation and decommissioning of the Hermes 2 facility are similar to those described in Section 4.7.2 of the Hermes ER (Reference 1) and its subsections.

Figure 4.7-1 of the Hermes ER (Reference 1) shows a graphical representation of the likely routes taken to/from the site. Route 3 is no longer available due to a bridge closure by the DOE.

No additional new and significant information has been identified from the Hermes ER. Impacts to transportation due to construction, operation, and decommissioning were determined to be SMALL in the Hermes ER (Reference 1). Therefore, socioeconomic impacts to transportation during construction, operation, and decommissioning of Hermes 2 would be SMALL.

4.7.3 Public Recreational Facilities

The public recreational facilities details related to the construction, operation and decommissioning of the Hermes 2 facility are similar to those described in Section 4.7.3 of the Hermes ER (Reference 1).

No additional new and significant information has been identified from the Hermes ER. Impacts to public recreational facilities due to construction, operation, and decommissioning were determined to be SMALL in the Hermes ER (Reference 1). Therefore, impacts to public recreational facilities during construction, operation, and decommissioning of Hermes 2 would be SMALL.

4.7.4 References

1. Kairos Power LLC, “Environmental Report for the Kairos Power Fluoride Salt-Cooled, High Temperature Non-Power Reactor (Hermes),” Revision 1, March 2023.

2. U.S. Census Bureau, Total Population - Table B01003- 2021 American Community Survey 5 Year Census - Table Results, Website: https://data.census.gov/table?text=population&g=010XX00US_040XX00US47_050XX00US47001,47093,47105,47129,47145_160XX00US4740000,4755120&tid=ACSDT5Y2021.B01003&moe=false, accessed March 2023.

3. Tennessee State Data Center. 2021- Boyd Center for Business and Economic Research, Boyd Center Population Projections. Website: https://tnsdc.utk.edu/estimates-and-projections/boyd-center-population-projections/, accessed March 7, 2023

4. U.S. Census Bureau. County Business Patterns: 2020. April 19, 2023. Website: https://www.census.gov/data/datasets/2020/econ/cbp/2020-cbp.html

5. Bureau of Economic Analysis. 2021 - CAEMP25N Total Full-Time and Part-Time Employment by NAICS Industry 1/. Website

https://apps.bea.gov/iTable/?reqid=70&step=30&isuri=1&major_area=4&area=47131&year=2018&tableid=33&category=733&area_type=4&year_end=-1&classification=naics&state=47000&statistic=-1&yearbegin=-1&unit_of_measure=levels#eyJhcHBpZCI6NzAsInN0ZXBzIjpbMSwyNCwyOSwyNSwzMSwyNiwyNywzMCwzMF0sImRhdGEiOltbIm1ham9yX2FyZWEiLCI0Il0sWyJ0YWJsZWlkIiwiMzMiXSxbImNsYXNzaWZpY2F0aW9uIiwiTkFJQ1MiXSxbInN0YXRlIixbIjQ3MDAwIl1dLFsiQXJlYSIsWyI0NzAwMCIsIjQ3MDAxIiwiNDcwOTMiLCI0NzEwNSIsIjQ3MTI5IiwiNDcxNDUiXV0sWyJTdGF0aXN0aWMiLCItMSJdLFsiVW5pdF9vZl9tZWFzdXJlIiwiTGV2ZWxzIl0sWyJZZWFyIixbIjIwMjEiXV0sWyJZZWFyQmVnaW4iLCItMSJdLFsiWWVhcl9FbmQiLCItMSJdXX0=, accessed March 7, 2023

2. U.S. Census Bureau. County Business Patterns: 2016. April 19. 2018. Website: https://www.census.gov/data/datasets/2016/econ/cbp/2016-cbp.html.

3. Bureau of Labor Statistics. Occupational Employment and Wage Statistics. Retrieved from: https://data.bls.gov/oes/#/home, 2016.

Table 4.7-1: Projected ROI Labor Availability and Onsite Labor Requirements at Peak Month of Construction, Operations and Decommissioning Schedules

Occupation	Kairos Peak Need[(a)]	Estimate of Labor Force by Occupation in The ROI [(b)]							ROI Labor Force Deficiency [(d)]
		Anderson	Knox	Loudon	Morgan	Roane	Estimate Available for Kairos [(c)]	Total	
Construction Phase									
Heavy and Civil Engineering Construction	332	105	1,174	104	ND	98	296	1,481	36
Specialty Trade Contractors	172	1,027	7,581	388	127	158	1,856	9,281	0
Foundation, Structure, and Building Exterior Contractors	106	93	1,061	32	ND	29	243	1,215	0
Building Equipment Contractors	26	619	3,907	209	36	84	971	4,855	0
Truck Transportation	18	365	4,382	932	30	691	1,280	6,400	0
Architectural, Engineering, and Related Services	196	1,166	2,429	638	ND	214	889	4,447	0
TOTAL CONSTRUCTION PHASE	850	3,375	20,534	2,303	193	1,274	5,536	27,679	0
Operations Phase									
Professional, Scientific, and Technical Services	83	8,857	10,973	836	12	397	2,108	21,075	0
Management, Scientific, and Technical Consulting Services	18	1,629	1,273	117	ND	34	305	3,053	0
TOTAL OPERATIONS PHASE	101	10,486	12,246	953	12	431	2,413	24,128	0
Decommissioning Phase									
Commercial and Institutional Building Construction	200	305	938	51	ND	64	272	1,358	0
Heavy and Civil Engineering Construction	133	105	1,174	104	ND	98	296	1,481	0
Truck Transportation	7	365	4,382	932	30	691	1,280	6,400	0
Total DECOMMISSIONING PHASE	340	775	6,494	1,087	30	853	1,848	9,239	0

Source: (Reference 4)
a) Peak month estimated need of labor categories where need is greater than or equal to 5.
b) ROI labor force estimate from Reference 4.
c) Left column: Estimated available construction and decommissioning labor force based on 20 percent of estimated labor force; Available operational labor force based on 10 percent of estimated labor force. Right column: Total reflects the total estimated labor force available to meet the Peak Need.
d) ROI labor force deficiency determined by subtracting estimated Available Labor Force from Peak Need.
ND = No Data available

4.8 HUMAN HEALTH

The following subsections discuss the potential nonradiological and the radiological health impacts to the public and to occupational workers from construction, operation, and decommission of the Hermes 2 facility.

4.8.1 Nonradiological Impacts

Nonradiological hazards pertaining to the Hermes 2 facility are similar to those described in Section°4.8.1 of the Hermes ER (Reference 1) and its subsections with the exceptions of an increase in total nonradiological hazards onsite to account for two units, an increase in construction duration and related emissions to account for two units, and the inclusion of the intermediate coolant and anhydrous hydrogen fluoride (HF) not present in the Hermes design.

A bounding value of approximately 43,110 gallons of diesel fuel for the standby diesel generator would be contained in an onsite storage tank during operations. The bounding inventory of other major chemicals (i.e., those in excess of 1,000 pounds) used during operations at the facility is provided in Table 4.8-1.

Air emissions from the facility are estimated to be below 100 tons per year for applicable criteria pollutants (SO2, NOx, PM10, PM2.5, CO, VOCs, lead) during the 3-year construction period of the project.

Table 4.8-2 lists the general types of occupational physical hazards (physical, electrical, and chemical) that may be present at the facility during the phases of the project which are new and in addition to those listed in Table 4.8-2 of the Hermes ER (Reference 1).

During operation, quantities of BeNaF salt, in addition to Flibe, would be present onsite above the Threshold Quantity and therefore, the requirements of 29 CFR 1910.119 Process Safety Management of Highly Hazardous Chemicals apply to the facility, similar to the Hermes facility (Reference 1). Quantities of HF onsite would be maintained below the Threshold Quantity (i.e. 1,000 pounds) as given in 29°CFR°1910.119 Process Safety Management of Highly Hazardous Chemicals.

No additional new and significant information has been identified from the Hermes ER. Nonradiological impacts due to construction, operation, and decommissioning were determined to be SMALL in the Hermes ER (Reference 1). Therefore, nonradiological impacts during construction, operation, and decommissioning of Hermes 2 would be SMALL. Required actions related to surface water quality and liquid wastes discussed in Section 4.8.1 of the Hermes ER are also applicable to the Hermes 2 facility.

4.8.2 Radiological Impacts

Radiological hazards pertaining to the Hermes 2 facility are similar to those described in Section 4.8.2 of the Hermes ER (Reference 1) and its subsections. Exceptions are described below.

4.8.2.1 Layout and Location of Radioactive Material

Figure 3.2-1 depicts the physical layout of the Hermes 2 site indicating site features, structures, and designated areas. The Reactor Buildings would contain spent fuel storage facilities with a capacity sufficient for 10 EFPY for each unit.

No additional new and significant information has been identified from the Hermes ER (Reference 1). Radiological impacts to members of the due to normal operations were determined to be SMALL in the Hermes ER (Reference 1). Therefore, the radiological impacts to members of the public from normal operations of the Hermes 2 facility would be SMALL.

4.8.2.2 Characteristics of Radiation Sources and Expected Radioactive Effluents

Characteristics of radiation sources and expected radioactive effluents of the Hermes 2 facility are similar to those described in Section 4.8.2.2 of the Hermes ER and its subsections (Reference 1) with the exceptions of an additional liquid source of radiation to account for the intermediate coolant. The major liquid sources of radiation during operations would also include the liquid BeNaF salt intermediate coolant, which is cooled and solidified at the end of its life.

No additional new and significant information has been identified from the Hermes ER. Radiological impacts to members of the public due to normal operations were determined to be SMALL in the Hermes ER (Reference 1). Therefore, the radiological impacts to members of the public from normal operations of the Hermes 2 facility would be SMALL.

4.8.2.3 Baseline Radiation Levels

Baseline radiation levels for the Hermes 2 facility are similar to those described in Section 4.8.2.3 of the Hermes ER (Reference 1). DOE has estimated that the maximum radiation dose a hypothetical offsite individual could have received from DOE activities on ORR was estimated to be 0.5 mrem from air pathways, 7 mrem from water pathways, and 0.2 mrem from consumption of wildlife harvested on ORR (Reference 2). Cumulatively, this 8 mrem/yr dose is significantly less than the 310 mrem annual average dose to people in the U.S. from natural or background radiation.

No additional new and significant information has been identified from the Hermes ER. Radiological impacts to members of the public due to normal operations were determined to be SMALL in the Hermes ER (Reference 1). Therefore, the radiological impacts to members of the public from normal operations of the Hermes 2 facility would be SMALL.

4.8.2.4 Calculated Annual Total Effective Dose Equivalent, Annual Average Airborne Radioactivity Concentration, and Annual Average Waterborne Radioactivity Concentration

Calculated annual total effective does equivalent, annual average airborne radioactivity concentration, annual average waterborne radioactivity concentration, and other radiological health details for the Hermes 2 facility would be nearly identical on a per unit basis to those described in Section 4.8.2.4 of the Hermes ER and its subsections (Reference 1). This results in an increase in radioactive material released, and therefore total effective dose equivalent (TEDE), to account for two units. In addition to the conservatisms applied to the long-term TEDE calculations in the Hermes ER, the TEDE values are doubled to account for two units. Tritium generation rate is conservatively assumed to be 125,000 Curies per year for the Hermes 2 facility or 62,500 Curies per year per unit (Reference 1). Tritium release rate is assumed equal to the tritium generation rate, as was done in the Hermes gaseous radioactive effluent analysis (Reference 1). This bounding tritium emissions rate does not evaluate the anticipated retention of tritium from the reactor and engineered systems. In addition to tritium capture functions outlined in the Hermes ER (Reference 1), the Hermes 2 facility would employ molecular sieve desiccants to capture tritium from the intermediate loop cover gas and the heat rejection radiator enclosure.

Methodology and Assumptions

As mentioned in Table 4.8-13 of the Hermes ER (Reference 1), the maximum vent heat emissions rate that can be used as an input in XOQDOQ is 99,999 cal/s. The heat rejection radiator (HRR), Reactor Building heating, ventilation, and air conditioning system (RBHVAC), and power generation system blowdown evaporator (evaporator) are considered radionuclide release pathways and would each have vent heat emission rates greater than the XOQDOQ code is able to accept, as was the case in the Hermes ER analysis (Reference 1). Inputs to the model included a release height (100 feet for all stacks releasing tritium) and a representative wind height (30 meters). These inputs have not changed in the Hermes 2 design. Therefore, gaseous radioactive effluent doses for the Hermes 2 facility are assumed to be bounded by the doses calculated for the Hermes facility (Reference 1) on a per-unit basis and the dispersion values are assumed to be co-located. This is conservative because the actual maximum χ/Q values for each unit will not be co-located and no credit is taken for the additional tritium management functions present in the Hermes 2 facility.

Radiation Dose Modeling

For estimates of the total dose to the maximally exposed individual (MEI) and the nearest resident, a 2°mrem/yr external dose was conservatively assumed.

Impacts to Members of the Public

Calculated doses at the MEI location and at the nearest resident from gaseous effluent are doubled to reflect two-unit operations and are shown in Table 4.8-3. In accordance with the guidance provided in Regulatory Guide 4.20, *Constraints on Releases of Airborne Radioactive Materials to the Environment for Licensees other than Power Reactors*, the total effective dose rates at these points are compared to the 10 mrem/yr constraint on airborne emissions of radioactive material to the environment as described in 10 CFR 20.1101(d). As the maximum estimated dose rate to the MEI from all onsite reactors of 4.2°mrem/yr is less than 10 mrem/yr, the criterion is met.

As noted previously, the external dose rate to the MEI from Hermes 2 reactor operations is assumed to be 2 mrem/yr. Combining the assumed external dose rate from all onsite reactors with the total estimated dose from gaseous emissions of 4.2 mrem/yr for the MEI, the total dose would be approximately 7.2 mrem/yr. For comparison, the average background dose in Tennessee from natural sources is approximately 564 mrem/yr.

No additional new and significant information has been identified from the Hermes ER. Radiological impacts to members of the public due to normal operations were determined to be SMALL in the Hermes ER (Reference 1). Therefore, the radiological impacts to members of the public from normal operations of the Hermes 2 facility would be SMALL.

4.8.2.5 Annual Dose to Maximally Exposed Worker

Occupational radiation exposures to workers from all sources at the Hermes 2 facility would not result in a dose greater than the occupational dose limits provided in 10 CFR Part 20 limits, Subpart C, similar to the description given in Section 4.8.2.5 of the Hermes ER (Reference 1).

No additional new and significant information has been identified from the Hermes ER. Dose impacts to workers from direct radiation sources were determined to be SMALL in the Hermes ER (Reference 1). Therefore, the dose impacts to workers from direct exposure sources would be SMALL.

4.8.2.6 Radiation Exposure Mitigation Measures

Occupational and public exposures due to operations at the Hermes 2 site would be maintained ALARA by limiting exposure times, maximizing distances to sources, and/or utilizing shielding when appropriate, similar to the description given in Section 4.8.2.6 of the Hermes ER and its subsections (Reference 1).

No additional new and significant information has been identified from the Hermes ER.

4.8.3 Radiological Monitoring

Details regarding radiological monitoring such as effluent monitoring and environmental monitoring for the Hermes 2 facility would be similar to those given in Section 4.8.3 of the Hermes ER and its subsections (Reference 1).

Monitoring instrumentation and sampling equipment may be shared between the facilities where differentiation of the facility of origin is not feasible. Examples include site boundary air sampling stations, site boundary thermoluminescent dosimeters, offsite monitors, and some groundwater sampling stations.

As discussed in PSAR Section 11.1.7, a description of the environmental monitoring program for the Hermes 2 facility will be provided with the application for an Operating License consistent with 10°CFR°50.34(b)(3) and similar to the Hermes facility (Reference 1).

As noted in Section 4.8.2.4, molecular sieve desiccants would capture tritium from the intermediate loop cover gas in addition to other capture functions discussed in Section 4.8.2.4.1 of the Hermes ER (Reference 1).

The Hermes 2 facility includes two units each with a maximum thermal power of 35 MWth. The ingestion exposure pathway, its analysis, and supplemental actions are identical to those described in Section 4.8.3.2.4 of the Hermes ER (Reference 1).

No additional new and significant information has been identified from the Hermes ER. Impacts to public health from implementing monitoring were determined to be SMALL in the Hermes ER (Reference 1). Impacts to public health from implementing monitoring would be SMALL. The information gained from monitoring helps to control radiological impacts and ensures they also remain SMALL.

4.8.4 References

1. Kairos Power LLC, “Environmental Report for the Kairos Power Fluoride Salt-Cooled, High Temperature Non-Power Reactor (Hermes),” Revision 1, March 2023.

2. U.S. Department of Energy, “Oak Ridge Reservation Annual Site Environmental Report - 2021.” DOE/CSC-2514. Chapter 7. September 2022.

Table 4.8-1: Summary of Major Chemical Inventory and Quantity

Chemical	Approximate Bounding Inventory (pounds)	Chemical Group	Storage Location
Flibe	80,000	Group 9 - Solids	In-process - Reactor Building
BeNaF	2,000,000	Group 9 - Solids	In-process - Reactor Building Storage - Auxiliary Systems Building or Maintenance and Storage Building

Table 4.8-2: Additional Potential Occupational Hazards

Operations
Chemical
BeNaF Hydrogen Fluoride (Anhydrous)

Table 4.8-3: Annual Total Effective Dose Equivalent to the Public at Bounding Dose Receptors

Dose Receptor	Annual TEDE from facility (Hermes 2 Only)	Annual TEDE from site (Hermes and Hermes 2)	Annual TEDE Dose Constraint
	Gaseous Effluents		
MEI in an unrestricted area	2.8 mrem	4.2 mrem	10 mrem[(a)] (0.1 mSv)
Nearest Full-Time Resident[(c)(d)]	2.4 mrem	3.6 mrem	
	Total Dose (Combined External Dose[(e)] and Gaseous Effluent)		
MEI in an unrestricted area	4.8 mrem	7.2 mrem	100 mrem[(b)] (1.0 mSv)
Nearest Full-Time Resident[(c)(d)]	4.4 mrem	6.6 mrem	

(a) Dose constraint based on 10 CFR 20.1101(d) for airborne emissions
(b) Dose constraint based on 10 CFR 20.1301(a)(1) for licensed operations
(c) Includes ingestion of meat and vegetable prosed at the analytical nearest resident location
(d) Dose is modeled at the distance of the analytical nearest resident but in the direction of the maximum deposition
(e) The external dose was not modeled and is conservatively assumed to be 2 mrem/yr (Section 4.8.2.4.1)

Table 4.8-4: List of Inputs Applicable to the XOQDOQ Modeling

XODOQ Input Variables	Value
Wind Sensor Height (PLEV)	30 m
Conversion Correction Factor (UCOR)	-100 [1]
Lower-T Sensor Height	15 m
Upper-T sensor Height	30 m
Type of Release	Elevated
Vent Average Velocity (EXIT)	61.1 m/s
Vent Inside Diameter (DIAMTR)	0.91 m
Vent Release Height (HSTACK)	30.5 m
Containment Building Height (HBLDG)	27 m
Building Min. Cross Sectional Area (CRSEC)	862 m^2
Wind Height (SLEV)	30 m
Vent Heat Emission Rate (HEATR)[2]	99,999 cal/s

[1] UCOR set to -100 which triggers no correction to wind speed classes
[2] HEATR was calculated from the buoyancy equation solving for net heat release, q_s (cal/s)

$$q_s = \frac{(g\frac{v_s d^2}{4})}{3.7 \times 10^{-5}}\left[\frac{T - T_a}{T}\right]$$

where *g* is gravity, *T* stack temperature (323.2 K), v_s exit velocity (61.1 m/s), *d* stack diameter (0.91 m) and Ta ambient temperature (287.8 K). This resulted in a value 3.70E+05 cal/s. However, HEATR was coded to only accept a value with a maximum of 5 integers, hence the use of 99,999 cal/s.

4.9 WASTE MANAGEMENT

4.9.1 Sources and Types of Waste Created

Nonradioactive, nonhazardous, hazardous, and radioactive wastes associated with the construction, operation, and decommissioning of the Hermes 2 facility are expected to be similar to those described in Section 4.9.1 of the Hermes ER (Reference 1) and its subsections with the exception of an increase in total waste generated to account for two units, an 11-year operating license, and the use of an intermediate coolant.

Additional radioactive wastes not already identified in the Hermes ER that would be generated by the operation of the Hermes 2 facility include BeNaF salt and additional tritium capture materials as detailed in Table 2.6-1. The number of shipments of low-level radioactive waste is bounded by the estimates in WASH-1238 (Reference 2) and is equal to that given in Table 2.6-1 of the Hermes ER (Reference 1).

An estimated 77,600 pebbles, or approximately 466 kilograms of uranium, will be consumed by the Hermes 2 facility each year. Since the life of the Hermes 2 Reactor is estimated to be 10 EFPY, a total of 776,000 pebbles, or approximately 4,660 kilograms of uranium (4.66 metric tons of uranium [MTU] over 10 EFPY), would be consumed. In contrast, the amount of spent fuel discharged from a typical light water reactor operating at low burnups is about 20 MTU per year as evaluated in NUREG-2157.

No additional new and significant information has been identified from the Hermes ER. Impacts from waste generated during construction, operation, and decommissioning were determined to be SMALL in the Hermes ER (Reference 1). Therefore, impacts from all types of waste generated during construction, operation, and decommissioning of Hermes 2, including impacts on the capacity of waste management facilities, would be SMALL.

4.9.2 References

1. Kairos Power LLC, “Environmental Report for the Kairos Power Fluoride Salt-Cooled, High Temperature Non-Power Reactor (Hermes),” Revision 1, March 2023.
2. Atomic Energy Commission. “Environmental Survey of Transportation of Radioactive Material to and from Nuclear Power Reactors.” WASH-1238. December 1972.

4.10 TRANSPORTATION

Details concerning transportation of nuclear and nonnuclear materials during construction, operation, and decommissioning of the Hermes 2 facility are similar to those described in Section 4.10 of the Hermes ER and its subsection (Reference 1) with the exception of an increase in total material transported to account for two units, the use of an intermediate heat transport system, and power conversion systems.

Additional materials would include additional construction materials, additional construction and demolition wastes, BeNaF salt, HF, and additional tritium capture materials. The transportation details for the additional tritium capture materials are identical to those given in Section 4.10 of the Hermes ER (Reference 1).

The facility would receive shipments of new intermediate coolant salt. When shipped to the site, the coolant salt would be nonradioactive; however, the intermediate (for heat transfer) BeNaF salt coolant would become radioactive during operation.

The BeNaF salt coolant used to transfer heat from the reactor system to the power conversion systems would be shipped to the facility as a solid prior to startup and during routine operations. Approximately 300 tons of BeNaF salt would be needed for startup of both units. This BeNaF salt would be transported in 32 shipments, approximately 9 tons each. An additional 300 tons of BeNaF salt would be needed annually. The BeNaF salt is radioactive at the end of its useful life. Some BeNaF salt is expected to be disposed during operations (see Section 2.6).

The BeNaF salt, a combination of BeF_2 and NaF, would be shipped in accordance with DOT regulations for transportation of hazardous materials with the following designations (Reference 2, Reference 3):

- Hazard Class: 6.1, Poison (BeF_2)
- Identification Number: UN1566 (BeF_2)
- Packaging Group: II (BeF_2)

Sodium fluoride is not regulated by the Department of Transportation as dangerous goods (Reference 3). Transportation of the salt to the facility would be conducted in accordance with applicable Federal and State DOT transportation requirements.

The facility would receive shipments of new HF. When shipped to the site, the HF would be nonradioactive; however, the HF would become radioactive as it is used in the tritium management system-intermediate heat transport subsystem.

The HF would be shipped to the facility as a liquid prior to startup and during routine operations. The total quantity of HF onsite would be maintained below 1,000 pounds. This HF would be transported in approximately 2 annual shipments, approximately 100 pounds each. The HF is radioactive at the end of its useful life and is included in the intermediate heat transport system capture materials (see Table 2.6-1). HF is expected to be disposed during operations (see Section 2.6) to maintain the onsite quantity below 1,000 pounds.

HF would be shipped in accordance with DOT regulations for transportation of hazardous materials with the following designations (Reference 4, Reference 5):

- Hazard Class: 8 (6.1), Corrosive (Poison)
- Identification Number: UN1052
- Packaging Group: I

Transportation of the HF to the facility would be conducted in accordance with applicable Federal and State DOT transportation requirements.

Fuel would be transported to the facility either periodically or once per year given the relatively small quantity involved. 77,600 pebbles will be consumed by the Hermes 2 facility each year. Since the life of the Hermes 2 facility is estimated to be 10 EFPY, a total of 776,000 pebbles would be consumed. Approximately 222 containers of new fuel would be shipped each year consisting of 350 fuel pebbles per VP-55 (Reference 6). A standard highway shipping weight limit of 80,000 pounds gross weight and approximately 40,000 pounds cargo weight for a 40-foot container is maintained. Therefore, at 750°pounds per fuel container containing 350 fuel pebbles, approximately six trucks would be needed to transport a year’s supply of fuel for the facility when operating both units at 35 MWth.

Spent fuel would remain on site in the spent fuel storage facilities which would be designed to accommodate all of the spent fuel generated during the expected 11-year licensed life of the reactor with 10 EFPY. The facility would not ship spent fuel during the reactor’s expected 11-year licensed operating life and would hold all spent fuel shipments until decommissioning.

The per-shipment and annual incident-free radiological doses due to transportation of radioactive materials from the facility are summarized in Table 4.10-1 and Table 4.10-2, respectively, of the Hermes ER (Reference 1). Updates to annual incident-free radiological doses due to transportation of new nuclear fuel are given in Table 4.10-1 along with the new annual operation totals for all shipments during operations. The crew and population doses from annual incident-free radioactive material transport reported in the Hermes ER are unchanged.

No additional new and significant information has been identified from the Hermes ER. Direct and indirect impacts from transportation of radioactive, non, radioactive, hazardous, and nonhazardous materials during construction, operation, and decommissioning were determined to be SMALL in the Hermes ER (Reference 1). Therefore, direct and indirect impacts from transportation of radioactive, nonradioactive, hazardous, and nonhazardous materials during construction, operations, and decommissioning of Hermes 2 would be SMALL.

4.10.1 References

1. Kairos Power LLC, “Environmental Report for the Kairos Power Fluoride Salt-Cooled, High Temperature Non-Power Reactor (Hermes),” Revision 1, March 2023.

2. Materion, 2021. Beryllium Fluoride Safety Data Sheet, Version 05. Issued March 2021.

3. Materion, 2015. Sodium Fluoride Targets Safety Data Sheet, Version 03. Issued July 2015.

4. Honeywell, 2014. Hydrogen Fluoride (100%) Safety Data Sheet, Version 4.7. Issued March 2014.

5. Airgas, 2018. Hydrogen Fluoride Safety Data Sheet, Version 0.05. Issued November 2018.

6. Oak Ridge National Laboratory. “Advanced Reactor Safeguards: Nuclear Material Control and Accounting for Pebble Bed Reactors.” ORNL/SPR=2020/1849. January 2021.

Table 4.10-1: Updates to Annual Dose and Risk Factors for Shipment of Radioactive Material

Origin	Material	Destination	Shipments	Annual Incident-free Radiation Dose Impacts			
				Crew Dose (person-rem)	Crew Risk (LCF)	Population Dose (person-rem)	Population Risk (LCF)
Richland, Washington	New fuel	Oak Ridge, Tennessee	6	4.98E-03	2.984E-06	3.62E-03	2.18E-06
Total (annual operation)			**49**	**3.16E+00**	**1.91E-03**	**2.37E+00**	**1.42E-03**

4.11 POSTULATED EVENTS

The postulated events within the design basis of the Hermes 2 facility are similar to those described in Section 4.11 of the Hermes ER and its subsections (Reference 1) with the exception of considerations for the intermediate heat transport loop and power generation systems.

The maximum hypothetical accident (MHA) that bounds the radiological consequences of the postulated events is identical to that provided in the Hermes ER (Reference 1).

No additional new and significant information regarding the MHA has been identified from the Hermes ER.

4.11.1 Event Categories

Of the eight event groups presented in the Hermes ER (Reference 1), three of these remain identical to those described in the Hermes ER (i.e., MHA, loss of forced circulation, and pebble handling events). There is no meaningful change to the insertion of excess reactivity event group, although additional events are included in the event group to address the additional heat transfer and heat removal systems in the Hermes 2 design. The event categories that include new information in consideration for the intermediate heat transport loop and the power generation systems are:

- Salt Spills
- Radioactive Release from a Subsystem or Component
- General Challenges to Normal Operation
- Internal and External Hazard Events

New information related to these event categories in comparison to the information given in the Hermes ER (Reference 1) is given below.

4.11.1.1 Salt Spills

In response to a salt spill tripping the primary pump, the intermediate salt pump would be tripped concurrently to ensure a positive pressure differential between the primary and intermediate loops. The heat rejection blower would be tripped to limit the amount of air ingress following postulated heat rejection radiator (HRR) tube breaks during low power operations.

The salt spill category consists of other salt spill events, including leaks from the intermediate heat transport system that contains a non-Flibe coolant, which may contain a non-zero amount of radionuclides, and an intermediate heat exchanger tube break or leak.

No additional new and significant information regarding salt spills has been identified from the Hermes ER.

4.11.1.2 Radioactive Release from a Subsystem or Component

Additional systems expected to accumulate radionuclides as a function of operation include the intermediate heat transport system and the power generation systems.

No additional new and significant information regarding radioactive release from a subsystem or component has been identified from the Hermes ER.

4.11.1.3 Internal and External Hazards

The internal hazard events in the design basis include a turbine missile and a high energy steam line break.

A turbine missile could be generated due to a postulated turbine generator failure. Due to the favorable orientation of the turbine generator with respect to the reactor building, SSCs associated with engineered safety features are not affected by a potential turbine missile to the extent that they could not perform their safety functions.

A break in a high energy steam line could occur due to a failure of the main steam system. Physical separation of the power generation systems from safety-related SSCs and the design of the safety-related portion of the reactor building ensures that a high energy break will not prevent safety-related SSCs from performing their safety functions.

No additional new and significant information regarding internal and external hazards has been identified from the Hermes ER.

4.11.1.4 General Challenges to Normal Operation

Grouped events include spurious trips due to control system anomalies, operator errors, and equipment failures, including the turbine generator system. This event group also includes scenarios where operators choose to manually shut down the plant. Also included are faults in the reactivity control and shutdown system, electrical system, intermediate heat transport system, and other plant systems that would challenge normal operations.

No additional new and significant information regarding grouped events has been identified from the Hermes ER.

4.11.2 References

1. Kairos Power LLC, “Environmental Report for the Kairos Power Fluoride Salt-Cooled, High Temperature Non-Power Reactor (Hermes),” Revision 1, March 2023.

4.12 ENVIRONMENTAL JUSTICE

Potential impacts to environmental justice communities from construction, operation and decommissioning of the Hermes 2 facility are similar to those described in Section 4.12 of the Hermes ER and its subsections (Reference 1). Mitigating actions for those potential impacts are likewise similar to those described in the Hermes ER (Reference 1).

No additional new and significant information has been identified from the Hermes ER. The Hermes ER reported no disproportionate effects to environmental justice communities in association with the Proposed Action (Reference 1). Human health and environmental impacts on minority and low-income populations Impacts from waste generated during construction, operation, and decommissioning were determined to be SMALL in the Hermes ER (Reference 1). Therefore, there would be no disproportionate effects to environmental justice communities in association with the Proposed Action, and human health and environmental impacts on minority and low-income populations would be SMALL.

4.12.1 References

1. Kairos Power LLC, "Environmental Report for the Kairos Power Fluoride Salt-Cooled, High Temperature Non-Power Reactor (Hermes)," Revision 1, March 2023.

4.13 CUMULATIVE EFFECTS

Potential cumulative environmental impacts associated with construction and operation activities for the Hermes 2 facility in combination with other past, present, and reasonably foreseeable actions or projects in the area are similar to those described in Section 4.13 of the Hermes ER and its subsections (Reference 1), with the exception of the potential cumulative effects of the Hermes facility and the Hermes 2 facility.

No additional new and significant information regarding the potential cumulative environmental impacts described in Section 4.13 of the Hermes ER has been identified. Cumulative impacts were determined to be SMALL in the Hermes ER (Reference 1). Therefore, only the cumulative impacts of the Hermes facility and the Proposed Action are examined here. All potential cumulative environmental impacts are determined to be SMALL, as described below.

4.13.1 Land Use and Visual Resources

Potential cumulative environmental impacts on land use and visual resources associated with construction and operation activities for the Hermes 2 facility in combination with other past, present, and reasonably foreseeable actions or projects in the area are similar to those described in Section 4.13 of the Hermes ER and its subsections (Reference 1), with the exception of the potential cumulative environmental effects of the Hermes facility and the Hermes 2 facility.

The Hermes facility is located within the site boundary of the Hermes 2 facility on the K-33 brownfield and within the east Tennessee technology center (ETTP) industrial complex. Section 4.1.1 and Section°4.1.2 of the Hermes ER (Reference 1) describes the land use and visual resource impacts of the Hermes facility as SMALL. Therefore, the cumulative impacts to land use and visual resources from construction and operation of the Hermes facility and the Hermes 2 facility are SMALL and the incremental contribution to cumulative impacts from the Proposed Action would also be SMALL.

4.13.2 Air Quality and Noise

Potential cumulative environmental impacts on air quality and noise associated with construction, operation, and decommissioning activities for the Hermes 2 facility in combination with other past, present, and reasonably foreseeable actions or projects in the area are similar to those described in Section 4.13 of the Hermes ER and its subsections (Reference 1), with the exception of the potential cumulative environmental effects of the Hermes facility and the Hermes 2 facility.

Air emission impacts as a result of concurrent construction activities are expected at both the Hermes 2 facility and the Hermes facility. Implementation of mitigation measures described in Section 4.2.1.1 of the Hermes ER (Reference 1) would minimize impacts to local ambient air quality and the nuisance impacts to the public in proximity to the project. Impacts to air quality from construction activities are expected to be minor, localized, and short-term; therefore, overlapping construction schedules are not expected to contribute significantly to cumulative effects. The projects would both be governed by new construction air permits processed through TDEC. Noise during construction of the Hermes 2 would be temporary, as noted in Section 4.2.2. Though construction of the Hermes and Hermes 2 facilities is concurrent, the equipment and workforce for the Hermes and Hermes 2 projects will largely be shared, limiting noise generation.

Section 4.2.1 and Section 4.2.2 of the Hermes ER (Reference 1) describes the air quality and noise impacts of the Hermes facility as SMALL. Therefore, the cumulative impacts to air quality and noise from construction, operation, and decommissioning of the Hermes facility and the Hermes 2 facility are SMALL and the incremental contribution to cumulative impacts from the Proposed Action would also be SMALL.

4.13.3 Geologic Environment

Potential cumulative environmental impacts on the geologic environment associated with construction, operation, and decommissioning activities for the Hermes 2 facility in combination with other past, present, and reasonably foreseeable actions or projects in the area are similar to those described in Section 4.13 of the Hermes ER and its subsections (Reference 1), with the exception of the potential cumulative environmental effects of the Hermes facility and the Hermes 2 facility.

The planned Hermes facility would be located near the Hermes 2 site. Construction, operation, and decommissioning of the proposed Hermes facility would comply with federal, state, and local environmental laws, rules, regulations, and statutes. Current plans for the approximately 360,000 square foot Hermes facility include using municipal water and wastewater systems. No site groundwater or surface water use is anticipated. Many of the same construction best management practices including separation of top-soil, reuse of excavated clean soil, and waste minimization would be anticipated at Hermes 2 and Hermes. Fill material would be stockpiled and used on-site.

Section 4.3 of the Hermes ER (Reference 1) describes the geologic impacts of the Hermes facility as SMALL. Therefore, the cumulative impacts to the geologic environment from construction, operation, and decommissioning of the Hermes facility and the Hermes 2 facility are SMALL and the incremental contribution to cumulative impacts from the Proposed Action would also be SMALL.

4.13.4 Water Resources

Potential cumulative environmental impacts on water resources associated with construction, operation, and decommissioning activities for the Hermes 2 facility in combination with other past, present, and reasonably foreseeable actions or projects in the area are similar to those described in Section 4.13 of the Hermes ER and its subsections (Reference 1), with the exception of the potential cumulative environmental effects of the Hermes facility and the Hermes 2 facility.

There are no surface water resources located on the site; therefore, there are no direct impacts as a result of alteration of streams or water bodies. Construction at the facility location represents potential sources of pollution associated with runoff from construction sites. BMPs would be used in accordance with TDEC and federal rules to prevent sediment runoff and subsequent siltation in receiving streams during construction.

During operations, potential impacts associated with hydrology are also related to stormwater management. Currently drainage patterns on the site are complex due to the areas underlying geology, past cut and fill operations, transient interactions with bounding surface water bodies, and numerous anthropogenic features, including building sumps, leaking subsurface drains and utilities, and extensive areas covered by impermeable paved surfaces and roofed buildings. Drainage patterns would change as a result of the construction at the facility. State regulations regarding stormwater management and best management practices would maintain stormwater discharges as appropriate for both facilities.

Section 4.4 of the Hermes ER (Reference 1) describes the water resource impacts of the Hermes facility as SMALL. Municipal water use and waste water generation for the operation of the Hermes and Hermes 2 facilities represents only a small fraction of total municipal capacities.

Therefore, the cumulative impacts to water resources from construction, operation, and decommissioning of the Hermes facility and the Hermes 2 facility are SMALL and the incremental contribution to cumulative impacts from the Proposed Action would also be SMALL.

4.13.5 Ecological Resources

Potential cumulative environmental impacts on ecological resources associated with construction, operation, and decommissioning activities for the Hermes 2 facility in combination with other past, present, and reasonably foreseeable actions or projects in the area are similar to those described in Section 4.13 of the Hermes ER and its subsections (Reference 1), with the exception of the potential cumulative environmental effects of the Hermes facility and the Hermes 2 facility.

Section 4.5 of the Hermes ER (Reference 1) describes the ecological impacts of the Hermes facility as SMALL. Therefore, because of the implementation of BMPs onsite during construction at the Hermes and Hermes 2 facilities, cumulative impacts to aquatic resources would be SMALL and the incremental contribution to cumulative impacts from the Proposed Action would also be SMALL.

4.13.6 Historical and Cultural Resources

Potential cumulative environmental impacts on historical and cultural resources associated with construction, operation, and decommissioning activities for the Hermes 2 facility in combination with other past, present, and reasonably foreseeable actions or projects in the area are similar to those described in Section 4.13 of the Hermes ER and its subsections (Reference 1), with the exception of the potential cumulative environmental effects of the Hermes facility and the Hermes 2 facility.

The Hermes and Hermes 2 facilities are located on the K-33 brownfield site, which was previously disturbed during the Manhattan Project. Although the Manhattan Project was historically significant, all historic structures on the site have already been demolished, and no historic properties would be impacted by the site, therefore, no additional cumulative impacts to historic and cultural resources would occur.

Section 4.6 of the Hermes ER (Reference 1) describes the historical and cultural resource impacts of the Hermes facility and the Hermes facility as SMALL. Therefore, cumulative impacts to historical and cultural resources would be SMALL and the incremental contribution to cumulative impacts from the Proposed Action would also be SMALL.

4.13.7 Socioeconomic Environment

Potential cumulative environmental impacts on the socioeconomic environment associated with construction, operation, and decommissioning activities for the Hermes 2 facility in combination with other past, present, and reasonably foreseeable actions or projects in the area are similar to those described in Section 4.13 of the Hermes ER and its subsections (Reference 1), with the exception of the potential cumulative environmental effects of the Hermes facility and the Hermes 2 facility.

Though construction of the Hermes and Hermes 2 facilities is partially concurrent, the equipment and workforce for the Hermes and Hermes 2 projects will largely be shared, limiting cumulative impacts to socioeconomic resources. During operations of the Hermes and Hermes 2 facilities, there is ample workforce available in the region of interest (ROI) and jobs would likely go to people already living in the ROI prior to any influx. By extension, the operation of the Hermes and Hermes 2 facilities would not significantly impact the school aged cohort in the ROI. As discussed in Section 4.13.4, cumulative impacts to water resources from the operations of the Hermes and Hermes 2 facilities (including both water use and wastewater generation) are expected to be SMALL.

The tax revenue for the ROI would be benefited by the construction and operation of both the Hermes and Hermes 2 facilities, but this benefit represents only a small fraction of the established tax base, as demonstrated in Section 4.7.1.9 of the Hermes ER (Reference 1). Traffic impacts to the area are not expected to be significant enough to require mitigation measures.

The Manhattan Project National Park is the only major public recreational facility nearby. The Manhattan Project National Park would be physically separated from the Hermes 2 and Hermes facilities by Poplar creek and its riparian zones and is located in the industrialized ETTP. Therefore, cumulative impacts to public recreational facilities from the Hermes and Hermes 2 facilities would be SMALL.

Section 4.7 of the Hermes ER (Reference 1) describes the socioeconomic impacts of the Hermes facility as SMALL. Therefore, the cumulative impacts to the socioeconomic environment from construction, operation, and decommissioning of the Hermes facility and the Hermes 2 facility are SMALL and the incremental contribution to cumulative impacts from the Proposed Action would also be SMALL.

4.13.8 Human Health

Potential cumulative environmental impacts on human health associated with construction, operation, and decommissioning activities for the Hermes 2 facility in combination with other past, present, and reasonably foreseeable actions or projects in the area are similar to those described in Section 4.13 of the Hermes ER and its subsections (Reference 1), with the exception of the potential cumulative environmental effects of the Hermes facility and the Hermes 2 facility.

As described in Section 4.8.2, the radiological impacts from construction and operation of the Hermes 2 reactor would be SMALL. Specifically, the estimated total body dose to the analytical nearest resident from gaseous effluents and direct radiation during operation of the Hermes 2 facility combined would be 4.4 mrem/yr (4.8 for the MEI in an unrestricted area). In consideration of the Hermes facility, the estimated total body dose to the analytical nearest resident from gaseous effluents and direct radiation during operation of the Hermes 2 facility from all onsite reactors would be 6.6 mrem/yr (7.2 for the MEI in an unrestricted area).

Operations on the ORR release small quantities of radionuclides to the environment. In the 2021 ORR Annual Site Environmental Report, detailed analysis of the effective dose received by the MEI from air pathways was determined to be 0.5 mrem/yr. The effective dose to the MEI from water, including drinking, bathing, irrigating, recreating, and fish consumption, was determined to be 7 mrem/yr. The effective dose from consumption of wildlife harvested on the ORR, including turkeys, geese, and deer, was determined to be 0.2 mrem/yr. Combined, the annual dose to the MEI in an unrestricted area from normal operations at ORR is 7.7 mrem/yr (Reference 2). This dose is approximately 1.4 percent of the average background radiation dose in Tennessee.

Section 4.8.1 and Section 4.8.2 of the Hermes ER (Reference 1) describe the nonradiological and radiological human health impacts of the Hermes facility as SMALL. Therefore, the cumulative impacts to human health from construction, operation, and decommissioning of the Hermes facility and the Hermes 2 facility are SMALL and the incremental contribution to cumulative impacts from the Proposed Action would also be SMALL.

4.13.9 Waste Management

Potential cumulative environmental impacts on waste management associated with construction, operation, and decommissioning activities for the Hermes 2 facility in combination with other past, present, and reasonably foreseeable actions or projects in the area are similar to those described in Section 4.13 of the Hermes ER and its subsections (Reference 1), with the exception of the potential cumulative environmental effects of the Hermes facility and the Hermes 2 facility.

Due to their relatively small sizes and operating staffs, the combined contribution of the Hermes 2 reactor project and the Hermes reactor project on the local (multi-county) nonradioactive and nonhazardous C&D waste and general sanitary waste (i.e., "garbage") management resources and disposal capacity would be SMALL. Most hazardous and radioactive waste generated at ORR is managed at ORR treatment and disposal facilities and does not contribute to the cumulative waste impacts. Class°A LLRW generated by Hermes is acceptable for treatment and disposal at an ORR facility.

Section 4.9 of the Hermes ER (Reference 1) describes the waste management impacts of the Hermes facility as SMALL. Therefore, the cumulative impacts to waste management from construction, operation, and decommissioning of the Hermes facility and the Hermes 2 facility are SMALL and the incremental contribution to cumulative impacts from the Proposed Action would also be SMALL.

4.13.10 Transportation

Potential cumulative environmental impacts on transportation associated with construction, operation, and decommissioning activities for the Hermes 2 facility in combination with other past, present, and reasonably foreseeable actions or projects in the area are similar to those described in Section 4.13 of the Hermes ER and its subsections (Reference 1), with the exception of the potential cumulative environmental effects of the Hermes facility and the Hermes 2 facility.

An estimated 6 shipments of new fuel to the Hermes 2 facility would occur each year with approximately 46 shipments of LLRW each year to Texas or Utah. All spent fuel would be shipped after reactor shutdown. As shown in Section 4.10, impacts from incident-free transportation associated with the transport of fuel and waste for the proposed project would be SMALL. Considering the transportation requirements of the Hermes and Hermes 2 facilities cumulatively, An estimated total of 9 shipments of new fuel to the Hermes 2 and Hermes facilities would occur each year with approximately 92 total shipments of LLRW each year to Texas or Utah.

The impacts from each individual shipment would be minimal and, when combined with the impacts associated with the site, the total impact would also be minimal.

Section 4.10 of the Hermes ER (Reference 1) describes the transportation impacts of the Hermes facility as SMALL. Therefore, the cumulative impacts to transportation from construction, operation, and decommissioning of the Hermes facility and the Hermes 2 facility are SMALL and the incremental contribution to cumulative impacts from the Proposed Action would also be SMALL.

4.13.11 Environmental Justice

Potential cumulative environmental impacts on environmental justice associated with construction, operation, and decommissioning activities for the Hermes 2 facility in combination with other past, present, and reasonably foreseeable actions or projects in the area are similar to those described in Section 4.13 of the Hermes ER and its subsections (Reference 1), with the exception of the potential cumulative environmental effects of the Hermes facility and the Hermes 2 facility.

The geographic area of analysis for evaluation of cumulative effects on environmental justice for the Hermes 2 and Hermes sites is identical. No environmental justice communities have been identified within area analyzed; therefore, disproportionate impacts on low-income or minority populations from other actions are not expected.

Section 4.12 of the Hermes ER (Reference 1) describes the environmental justice impacts of the Hermes facility as SMALL. Therefore, the cumulative impacts to environmental justice from construction, operation, and decommissioning of the Hermes facility and the Hermes 2 facility are SMALL and the incremental contribution to cumulative impacts from the Proposed Action would also be SMALL.

4.13.12 Conclusion

Table 4.13-2 summarizes the cumulative impacts in all resource areas. In conclusion, there are no significant cumulative adverse environmental impacts from the construction and operation of the

Hermes 2 facility when considered together with other past, present, and reasonably foreseeable future projects in the area.

4.13.13 References

1. Kairos Power LLC, "Environmental Report for the Kairos Power Fluoride Salt-Cooled, High Temperature Non-Power Reactor (Hermes)," Revision 1, March 2023.

2. U.S. Department of Energy, "Oak Ridge Reservation Annual Site Environmental Report - 2021." DOE/CSC-2514. Chapter 7, Dose. September 2022.

Table 4.13-1: Additional Past, Present, and Reasonably Foreseeable Projects and Other Actions Considered in the Cumulative Effects Analysis

Project Name	Summary of Project	Location (from Reactor building)	Status	Potentially Affected Resource(s)	Retained for Cumulative Effects Analysis	Basis
Industries and Manufacturing Facilities						
Kairos Power Hermes Reactor Facility	Non-power demonstration reactor deployed as part of iterative development strategy and under DOE advanced reactor demonstration program (ARDP)	Nearby on former K-33 Site	Proposed	Land use and visual resources, air quality and noise, geologic resources, water resources, ecological resources, historical and cultural resources, socioeconomics, human health, waste management, transportation, environmental justice	Y	Located on former K-33 site

Table 4.13-2: Cumulative Impacts on Environmental Resources, Including the Impacts of the Proposed Project

Resource Category	Level of Cumulative Impacts
Land Use and Visual Resources	
Land Use	SMALL
Visual Resources	SMALL
Air Quality and Noise	
Air Quality	SMALL
Noise	SMALL
Geologic Environment	SMALL
Water Resources	
Hydrology	SMALL
Water Use	SMALL
Water Quality	SMALL
Ecological Resources	
Terrestrial Ecosystems	SMALL
Aquatic Ecosystems	SMALL
Historic and Cultural Resources	SMALL
Socioeconomics	SMALL
Human Health	
Nonradiological Health	SMALL
Radiological Health	SMALL
Transportation	SMALL
Environmental Justice	SMALL

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CHAPTER 5 ALTERNATIVES

5.1 NO-ACTION ALTERNATIVE

The proposed federal action is issuance of a Construction Permit (CP) and subsequent Operating License (OL) for a two-unit test reactor facility to test and demonstrate the key technologies, design features, and safety functions of the Kairos Power Fluoride Salt-Cooled High Temperature Reactor (KP-FHR) technology, including the production of electrical power. The facility would also provide data that may be used for the validation of safety analysis tools and computational methodologies used for the design and licensing of a KP-FHR commercial power reactor. Under the No-Action Alternative, the NRC would not issue the CP or OL and there would be no subsequent construction or operation. Consistent with the guidance in the Final Interim Staff Guidance (ISG) Augmenting NUREG- 1537, Chapter 19, the environmental consequences of the No-Action Alternative are assumed to be the status quo.

If the test reactors were not constructed and operated, the adverse environmental consequences discussed in Chapter 4 would be avoided. However, as discussed in Chapter 4, the adverse impacts of construction and operation of the test reactors were concluded to be SMALL. Therefore, the benefit of avoiding those impacts would not be significant. Construction and operation of the test reactors do provide socioeconomic benefits as described in Section 4.7, including increases in tax revenues to local jurisdictions, which would not be realized if the test reactor were not constructed and operated. Furthermore, as discussed in Chapter 1, the government has expressed interest in the development and demonstration of advanced reactor technologies; therefore, if the test reactors are not constructed and operated, the benefits of this initiative would not be realized.

As discussed in Section 1.1, construction and operation of the test reactors provide a means to test the key KP-FHR technologies, design features, electric power production, and safety functions at a reduced scale relative to the anticipated commercial power reactor. These programmatic benefits would also not be realized under the No-Action Alternative. The programmatic benefits support deployment of advanced nuclear technologies that result in less reliance on carbon fuel-based forms of energy production.

5.2 REASONABLE ALTERNATIVES

The purpose of the proposed action is to demonstrate the KP-FHR technology, therefore there is no suitable alternative energy technology and only siting alternatives are considered. The analysis and evaluation of alternative site candidates relies on the analysis and evaluation of site candidates provided in the Hermes Environmental Report (ER) (Reference 1). While the two-unit Hermes 2 facility must be co-located on the same site, Hermes 2 could be located at a different site from Hermes, so the previous evaluation remains valid for Hermes 2. As the temporarily and permanently disturbed areas for the Hermes and Hermes 2 facilities are the same, use of an alternative site carries an additional impact to resources over the use of the shared site. Further, the business case for Hermes 2 being on the same site as Hermes is strengthened by utilizing the same construction resources to sequentially build the two Hermes 2 Units following the construction of Hermes. In addition, the same onsite support facilities, management teams, etc. can support both projects.

The Hermes 2 facility is developed and sited under a set of business objectives to support its role as a demonstration and testing platform for the KP-FHR technology. These objectives, with regard to site selection, include the following:

- Facilitating rapid deployment of a multi-unit non-power reactor with shared power generation systems in support of Kairos Power’s iterative development approach

- Reducing commercial cost uncertainty by demonstrating power generation system integration and a multi-unit facility
- Retaining construction workforce competency and demonstrating multi-unit construction and iteration of construction methods

Alternatives eliminated from consideration are similar to those listed in Section 5.2 and 5.3 of the Kairos Power Hermes ER (Reference 1). While facility specific values differ, such as water use or facility life (See Chapter 1 and Chapter 2), the alternatives, the rationale and process for elimination of an alternative, and any considerations of whether alternatives may avoid or reduce adverse effects are consistent with the Hermes ER. In addition, the business case for the Hermes site is further strengthened by the close proximity to transmission lines that result in a minimal environmental impact from the added power conversion cycle. No additional new and significant information has been identified from the Hermes ER.

5.3 EVALUATION OF REASONABLE ALTERNATIVE SITE DISCUSSION

The evaluation of the reasonable alternative sites relies on the evaluation described in Section 5.3 and Section 5.4 of the Hermes ER (Reference 1). The reasonable alternative site for Hermes 2 is also the Eagle Rock site. The land use of the Eagle Rock site has not changed from that reported in the Hermes ER and is not repeated herein.

The primary difference between the Hermes and Hermes 2 designs is the power generation and electrical distribution systems. If the Hermes 2 facility were located at the Eagle Rock site, these systems would also be included. While the specific location of the facility if sited on the Eagle Rock site has not been determined, there are transmission lines adjacent to the property that would facilitate offsite electrical distribution. The environmental resource impacts from construction and operation of the Hermes 2 facility at the Eagle Rock site are identical to those impacts from the Hermes facility as given in Table 5.6-1 and Table 5.6-2 of the Hermes ER (Reference 1). Similar to the proposed action, all required permits would be obtained for the facility if constructed and operated at the Eagle Rock site.

5.4 COST-BENEFIT OF THE ALTERNATIVES

The costs and benefits of the reasonable alternative and the proposed action are similar to those given in the Hermes ER (Reference 1) for the site alternative and the proposed action, with the exception of a general increase in impacts at both sites to account for two reactor units. Therefore, the conclusions are identical to those given in Section 5.5 of the Hermes ER (Reference 1).

Updated numbers of full-time workers during construction, operation, and decommissioning of the Hermes 2 facility are given in Section 2.1. The wages earned and money spent by these workers would also stimulate the local economy over an extended duration.

No additional new and significant information has been identified from the Hermes ER (Reference 1).

5.5 COMPARISON OF THE POTENTIAL ENVIRONMENTAL IMPACTS

The comparison of the environmental impacts, costs, and benefits of the reasonable alternative and the proposed action is identical to that given in Section 5.6 of the Hermes ER (Reference 1) for the site alternative and the proposed action, noting a general increase in impacts at both sites to account for two nuclear units. The conclusions are identical to those given in Table 5.6-1 and Table 5.6-2 of the Hermes ER (Reference 1).

No additional new and significant information has been identified from the Hermes ER.

5.6 REFERENCES

1. Kairos Power LLC, "Environmental Report for the Kairos Power Fluoride Salt-Cooled, High Temperature Non-Power Reactor (Hermes)," Revision 1, March 2023.

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CHAPTER 6 CONCLUSIONS

This chapter evaluates (1) any adverse effects that cannot be avoided, (2) the relationship between local short-term uses of the environment and the maintenance and enhancement of long-term productivity, and (3) any irreversible and irretrievable commitments of resources that would be involved in the proposed action.

6.1 UNAVOIDABLE ADVERSE ENVIRONMENTAL IMPACTS

Principal unavoidable adverse environmental impacts of the Hermes 2 project, for which mitigation measures are either considered impractical, do not exist, or cannot entirely eliminate the impact, are similar to those described in Section 6.1.1 and Section 6.1.2 of the Kairos Power Hermes Environmental Report (ER) (Reference 1). The temporarily disturbed area for the construction of the Hermes 2 facility is the same as the temporarily disturbed area for the Hermes facility and no additional areas external to those 138 acres would be disturbed.

Table 6.1-1 of the Hermes ER summarizes impacts related to construction activities that would result in a measurable loss or permanent change in resources, the mitigation and control measures available to reduce those impacts, and the unavoidable adverse impacts that would remain after mitigation measures and control measures are applied (Reference 1). As indicated in Table 6.1-1 of Hermes ER (Referenced 1), most of the adverse impacts are either avoidable or negligible after mitigation and control measures are considered.

Noise levels increased by construction activities would return to ambient levels within 1 mile of the construction site.

Operations-related impacts would be SMALL, because they would either not be detectable or would be minor compared to the availability or status of the affected resource as described in Table 6.1-2 of the Hermes ER (Reference 1). Table 6.1-2 of the Hermes ER (Reference 1) summarizes operations-related impacts that would result in a measurable loss or permanent change in resources, the mitigation and control measures available to reduce these impacts, and the adverse impacts that would remain after mitigation and controls measures are applied. Table 6.1-1 updates information provided in Table 6.1-2 of the Hermes ER for two resources. As indicated in Table 6.1-2 of the Hermes ER (Reference 1) and in Table 6.1-1, all of the adverse impacts are either avoidable or negligible after mitigation and control measures are considered.

The adverse environmental impacts associated with the construction and operation of the Hermes facility were determined to be SMALL and would be further reduced through the application of mitigation and control measures described in Tables 6.1-1 and 6.1-2 of the Hermes ER (Reference 1). The adverse environmental impacts associated with the decommissioning of the Hermes facility were determined to be SMALL (Reference 1). Mitigation and control measures related to the Hermes ER are also applicable to the Hermes 2 facility.

No additional new and significant information has been identified from the Hermes ER. Therefore, the adverse environmental impacts associated with the construction, operation, and decommissioning of Hermes 2 facility would be SMALL.

Table 6.1-1: Additional Hermes 2 Operations-Related Unavoidable Adverse Environmental Impacts

Element	Adverse Impact	Mitigation Measure	Unavoidable Adverse Environmental Impacts
Land Use and Visual Resources	Visual impacts as a result of the main building and exhaust vent stack.	The majority of the structures would be less than 100 feet high and will be contained within a 16-acre area. Landscaping may be installed around the perimeter of the facility and/or parking lots.	Minor impacts to visual resources would occur; however, the area is already industrial so these would be small.
Water Resources and Water Quality	Potential impact to water supply and sanitary treatment systems.	The City of Oak Ridge Public Works Department has ample capacity to provide the balance of water required for the facility; some demineralized water may be trucked to the facility. The City of Oak Ridge Public Works Department has ample capacity to treat the volume of wastewater required for operations. Mitigation would not be required.	Unavoidable adverse environmental impacts are not anticipated.

6.2 RELATIONSHIP BETWEEN SHORT-TERM USES AND LONG-TERM PRODUCTIVITY OF THE ENVIRONMENT

Long-term productivity of and effects on the environment for the Hermes 2 facility are similar to those described in Section 6.2 of the Hermes ER and its subsections (Reference 1) with the exception of impacts related to available onsite connections to the power grid related to onsite electrical power transmission lines (see Appendix).

Construction of the facility would include the installation of electrical power transmission lines that connect the facility to the electrical transmission grid adjacent to the site. This additional infrastructure would be available and beneficial to any future use of the site after decommissioning.

No additional new and significant information has been identified from the Hermes ER. Therefore, the impacts resulting from the facility construction and operation would result in both adverse and beneficial short-term impacts. The principal short-term adverse impacts would be SMALL residual impacts (after implementing mitigation measures) to land use, visual resources, terrestrial ecology, local traffic, noise, and air quality. There would be no long-term impacts to the environment. The principal short-term benefits would be the creation of additional jobs, additional tax revenues, and improvements to local infrastructure. The principal long-term benefit is the continued availability of the improved infrastructure and potential benefits from increased tax revenues after facility decommissioning. The short-term impacts and benefits and long-term benefits do not affect long-term productive use of the site.

6.3 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

The anticipated irreversible and irretrievable commitments of environmental resources that would be used in the construction and operation of the Hermes 2 facility are similar to those described in Section 6.3 of the Hermes ER and its subsections (Reference 1). While the extent of many impacts of the Hermes 2 facility would be larger than the Hermes facility to account for the two reactor units of Hermes 2, the impacts remain SMALL.

The proposed facility would require water from the City of Oak Ridge for construction, potable water, fire protection, and facility heating and cooling. The average estimated water usage by the facility during operations is 0.14 million gallons per day (MGD). According to the City of Oak Ridge, the excess capacity of the Oak Ridge water supply system would be approximately 5 MGD.

Materials consumed during the construction phase are shown in Table 2.1-1. These materials would be irretrievable unless they are recycled at decommissioning. Approximately 63,600 gallons of diesel fuel (as a bounding assumption all fuel is assumed to be diesel) is expected to be used on an average monthly basis during construction (Section 2.1). Use of construction materials in the quantities associated with the facility would have a SMALL impact with respect to the commitment of such resources.

No additional new and significant information has been identified from the Hermes ER. Therefore, no irreversible environmental commitments are anticipated for any environmental resource except for the commitment of land resources needed for disposal of wastes generated during construction, operation, and decommissioning of the Hermes 2 facility. However, due to the relatively small scale of the project compared to other non-radiological industrial projects and the operations and decommissioning of large commercial nuclear power reactors, the volumes of waste would have a SMALL impact on the irretrievable commitment of land resources for disposal facilities.

While a given quantity of material consumed during new facility construction and operation at the site is irretrievable, the impact on their availability is SMALL.

6.4 REFERENCES

1. Kairos Power LLC, "Environmental Report for the Kairos Power Fluoride Salt-Cooled, High Temperature Non-Power Reactor (Hermes)," Revision 1, March 2023.

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APPENDIX A: HERMES 2 ELECTRICAL POWER TRANSMISSIONS SYSTEM

CHAPTER 1 INTRODUCTION

1.1 INTRODUCTION OF THE ENVIRONMENTAL REPORT

Section 1.1 of Kairos Power's (Kairos) Hermes 2 Environmental Report (ER) introduces the ER and this Appendix. This appendix provides supplemental information to the Kairos Power Hermes 2 Environmental Report specific to the facility's connection to the electric grid via the electrical power transmission system; this appendix provides supplemental information for Chapters 1-4 of the Hermes 2 Environmental Report.

1.2 SITE HISTORY

Section 1.2 of the Hermes 2 ER describes the history of the Hermes 2 project site. All new electrical transmission system components will be constructed within the site boundary shown in ER Figure 1.1-1. Transmission lines will exit the site to the west and cross private property in a new, yet to be established, right-of-way (ROW) that is not owned by Kairos Power to connect with existing transmission lines.

1.3 PURPOSE AND NEED FOR THE PROPOSED ACTION

Section 1.3 of the Hermes 2 ER describes the purpose and need of the Proposed Action which includes demonstrating power conversion system and power transmission system integration; in order to enable this demonstration, connection to the electrical grid is required.

1.4 REGULATORY PROVISIONS, PERMITS, AND REQUIRED CONSULTATIONS

As described in Section 1.4 of the Hermes 2 ER, a number of federal, state, local, and other permits and consultations are required for the construction and operation of the Hermes 2 facility. ER Table 1.4-1 lists the permits and other approvals required for construction and operation along with the current status of each. ER Table 1.4-2 lists the required consultations for construction and operation along with the current status of each. Table A1.4-1 of this Appendix provides additional permits and approval that may apply to the electrical transmission system (dependent on the final design). No additional consultations are needed that are specific to the electrical transmissions system.

Table A1.4-1: Permits and Approvals That May be Required for Construction and Operation of the Hermes 2 Electrical Transmission System

Agency	Regulatory Authority	Permit or Approval	Activity Covered	Status
FAA	Federal Aviation Act 49 USC 1501; 14 CFR 77.9 (b)	Construction Notice	Notice of erection of structures exceeding imaginary surface slope/distance requirements from airports	No notification to date
TDOT	TCA 54-5-302	ROW Permit	Required for installing utilities in highway ROWs.	No permit application to date

CFR – Code of Federal Regulations
FAA – Federal Aviation Administration
ROW – Right-of-way
TCA – Tennessee Code Annotated
TDOT – Tennessee Department of Transportation
USC – United States Code

CHAPTER 2 PROPOSED ACTION

2.1 PROPOSED ACTION

The Proposed Action described in the Hermes 2 ER (i.e., issuance of a Construction Permit and subsequent Operating License) enables the generation of electricity from the Hermes 2 reactors. The resources required for the construction, operation, and decommissioning of the electrical transmission system are considered within the estimates of workforce, equipment, transportation, materials, and waste provided for the Proposed Action in ER Section 2.1.

2.2 SITE LOCATION AND LAYOUT

The site location is described in Hermes 2 ER Section 2.2.1. The addition of the electrical transmission system adds a new switchyard, utility pole(s), and transmission line(s) to the list of features at the site. ER Figure 2.2-1provides the proposed site layout with the addition of these features. The switchyard will be located west of the Turbine Building and a new transmission line will exit the switchyard to the west and tie into existing transmission lines. The Hermes 2 transmission line will cross property immediately to the west of the site before entering the existing transmission line right-of-way (ROW).

2.3 ELECTRICAL TRANSMISSION SYSTEM

The purpose of the electrical transmission system is to provide electrical power to support internal operation of plant equipment and to distribute the electric power produced in the Hermes 2 turbine building to offsite users. During normal operations, offsite alternating current (AC) electrical power is provided either from the offsite local utility to the normal AC power system, or by onsite AC power generated from an operating turbine generator. The turbine generator provides output voltage at 13.8 kilovolts (kV).

AC power generated from the turbine generator system is provided to an onsite switchyard, via a step up transformer, for distribution to the offsite electrical grid. The AC electrical power components include the following:

- A 4.16 kV/480 V step down transformer connected to a single 4.16 kV offsite electrical power supply from the local utility
- Incoming 13.8 kV feeder from the turbine generator system and associated 13.8 kV/480 V step down transformer
- The low voltage AC electrical power distribution with nominal bus voltages of 480 V and 120 V
- A 13.8 kV/161kV transformer from the turbine generator system to the onsite electrical switchyard

The possible effects from electrical transmission systems on the public or a workforce include exposure to electromagnetic fields (EMF), electrical shock, exposure to noise, radio and television interference, and visual effects.

2.4 WATER CONSUMPTION AND TREATMENT

On-site and off-site electrical transmission infrastructure will not affect water consumption or water treatment requirements for the Proposed Action.

2.5 COOLING AND HEAT REMOVAL SYSTEMS

On-site and off-site electrical transmission infrastructure do not require cooling or heat removal systems and their construction and operation do not affect the cooling or heat removal systems of the proposed nuclear reactors.

2.6 WASTE SYSTEMS

On-site and off-site electrical transmission infrastructure do not require waste management systems and their construction and operation will not affect the waste systems of the proposed nuclear reactors.

2.7 STORAGE, TREATMENT, AND TRANSPORTATION OF RADIOACTIVE AND NON-RADIOACTIVE MATERIALS

On-site and off-site electrical transmission infrastructure will not significantly affect storage, treatment, and transportation of material necessary for the proposed action. The material storage, treatment, and transportation described in Hermes 2 ER Section 2.7 bounds the additional needs required for the electrical transmissions system.

CHAPTER 3 DESCRIPTION OF THE AFFECTED ENVIRONMENT

3.1 LAND USE AND VISUAL RESOURCES

The additional land use of the switchyard and construction of transmission lines between the switchyard and tie-in to the west will not change the general land use of the site and neighboring property. Construction and operation of the new switchyard and tie-in to the existing offsite transmission lines will be limited to lands currently designated for industrial use or existing electrical transmission ROWs. A ROW will need to be established below the transmission line(s) crossing private property not owned by Kairos Power, but this ROW will not interfere with the existing use of this property.

A transmission line pole/tower would be located on the western edge of the Kairos Power property. Due to its height, the pole/tower would be the most visible element of the electric transmission system but it will be located only a few hundred feet from towers in the existing ROW. Its function would be to keep an adequate distance between the high-voltage conductors and the surrounding area. The switchyard would also be visible from the site boundary to the south, west, and north.

3.2 METEOROLOGY, CLIMATOLOGY, AIR QUALITY, AND NOISE

There are 161 kV transmission lines adjacent to the site, but no existing transmission lines are on the site. In June 2021, the ambient noise level at the site was measured at two locations: near the eastern site boundary and Poplar Creek (location R1) and near the western site boundary near the adjacent Energy Solutions property (location R2) as shown in Figure 3.2-22 of the Hermes ER (Reference 1). Recorded noise levels are given in Table 3.2-10 of the Hermes ER (Reference 1).

Location R2 is likely potentially influenced by off-site transmission lines located west of the location.

The predicted noise impacts from additional transmission lines would likely not be perceptible (i.e., a 3-dBA or less increase over the ambient level during operation) in the nearest sensitive receptors. The nearest noise receptors around the site include:

- A greenway approximately 1 mile northeast of the site, and
- The nearest resident approximately 1.1 miles northwest of the reactor buildings, with a forest located between the site and the resident.

Therefore, there are no anticipated perceptible increases to the current ambient noise levels associated with the operation of the transmission system.

3.3 GEOLOGIC ENVIRONMENT

The geological environment associated with the transmission system construction, operation, and decommissioning is as described in Section 3.3 of the Hermes ER (Reference 1).

3.4 WATER RESOURCES

Water resources associated with Proposed Action are described in Section 3.2 of the Hermes 2 ER and Section 3.4 of the Hermes ER (Reference 1). The addition of the electrical transmission system does not alter the affected water resources.

3.5 ECOLOGICAL RESOURCES

Ecological habitats associated with the electrical transmission system construction, operation, and decommissioning are the same as those described for the construction, operation, and decommissioning of the other reactor facility structures and system as described in Section 3.5 of the Hermes ER

(Reference 1). The construction, operation, and decommissioning of the electrical transmission system will affect only industrial properties and tie into an existing ROW.

3.6 HISTORIC AND CULTURAL RESOURCES

Historic and cultural resources are described in Section 3.6 of the Hermes 2 ER. The addition of the electrical transmission system does not alter the affected environment beyond what is described in Hermes ER Section 3.6 (Reference 1).

3.7 SOCIOECONOMICS

The addition of the electrical transmission system will not expand the scope of the existing socioeconomic environment described in Section 3.3 of the ER.

3.8 HUMAN HEALTH

There are currently no transmission lines on the Kairos property but there are existing 161 kV lines located near the site boundary west and north of property. Like all transmission lines, these lines generate coupled electric and magnetic fields, referred to together as electromagnetic fields (EMFs). The voltage on the conductors of the transmission line generates an electric field that occupies the space between the conductors and other conducting objects such as the ground, transmission line structures, or vegetation. A magnetic field is generated by the current (movement of electrons) in the conductors. The strength of the magnetic field that surrounds the conductor decreases rapidly with distance.

In NUREG-1437, Rev 1, NRC indicates that the greatest electrical shock hazard from a transmission line is direct contact with the conductors and that tower designs preclude direct public access to the conductors. However, electrical shocks can occur without physical contact. Secondary shock can happen when humans make contact with either capacitively charged bodies (such as a vehicle parked near a transmission line) or magnetically linked metallic structures (such as fences near transmission lines). The shock received by the person could be painful.

The intensity of the shock would depend on the EMF strength, the size of the object, and the degree of insulation between the object, the person, and the ground. The National Electric Safety Code (NESC) is the basis for design criteria that are intended to limit the risk of shock and other hazards due to transmission lines. The NESC calls for transmission lines to be designed with minimum vertical clearances to the ground so that the short-circuit current to ground produced from the largest anticipated vehicle or object is limited to less than 5 milliamperes. In NUREG-1437, Rev. 1, NRC indicated that the electrical shock issue is of small significance for transmission lines that are operated in adherence with the NESC.

3.9 ENVIRONMENTAL JUSTICE

The addition of the electrical transmission system will not expand the scope of the existing environmental justice landscape described in Section 3.4 of the ER.

CHAPTER 4 IMPACTS OF PROPOSED CONSTRUCTION, OPERATIONS, AND DECOMMISSIONING

4.1 LAND AND VISUAL RESOURCES

The addition of the electrical transmission lines and switchyard would impact the visual resources adjacent to the site. However, the views from key observation points (KOP) described in Section 4.1 of the Hermes 2 ER would likely not include tower/poles, transmission lines, and the switchyard. The views of the proposed facility from the KOPs are blocked by existing vegetation. During the winter months, when some trees lose their leaves, the components of the electrical transmission system may be visible in the far distance. Additionally, the components could be visible from points near the exact KOP locations that were not identified in Hermes 2 ER Section 4.1. However, the visual intrusion due to construction and operation on electrical transmission system would not significantly add to the impacts described in Hermes 2 ER Section 4.1 to change the impact designation of SMALL.

4.2 AIR QUALITY AND NOISE

Impacts to air quality and noise from the electrical transmission system would not significantly add to the impacts described in Hermes 2 ER Section 4.2 to change the impact designation of SMALL.

4.3 GEOLOGICAL ENVIRONMENT

Impacts to the geological environment from the electrical transmission system would not significantly add to the impacts described in Hermes 2 ER Section 4.3 to change the impact designation of SMALL.

4.4 WATER RESOURCES

Impacts to water resources from the electrical transmission system would not significantly add to the impacts described in Hermes 2 ER Section 4.4 to change the impact designation of SMALL.

4.5 ECOLOGICAL RESOURCES

Preconstruction and construction activities have the potential to affect terrestrial and aquatic ecosystems occurring on and adjacent to the Kairos Power property. Birds can be affected by collisions with transmission towers or other tall structures, such as towers and construction cranes. However, the project site is not within a major migratory flyway and is surrounded by higher terrain with tall trees.

NUREG-1437 demonstrates that the effects of avian collisions with existing structures at nuclear power plants are small. While NUREG-1437 is not directly applicable to non-power reactors, the same conclusion is reasonable for smaller, non-power reactors, as discussed in Section 4.5.1.3 of the Hermes ER (Reference 1). Considering further the lack of concentrated numbers of birds at the site, avian collisions with man-made structures during preconstruction, construction, and operations are predicted to have a negligible effect on avian mortality and populations.

Therefore, impacts to ecological resources from the electrical transmission system would not significantly add to the impacts described in Hermes 2 ER Section 4.5 to change the impact designation of SMALL.

4.6 HISTORIC AND CULTURAL RESOURCES

Impacts to historic and cultural resources from construction, operation, and decommissioning of the electrical transmission system are not expected to occur at the project site beyond what is described in Section 4.6 of the Hermes 2 ER. Therefore, the electrical transmission system would not change the impact designation of SMALL.

4.7 SOCIOECONOMICS

Impacts from the electrical transmission system to the socioeconomics of the affected environment would not significantly add to the impacts described in Hermes 2 ER Section 4.7 or change the impact designation of SMALL.

4.8 HUMAN HEALTH

As stated in Section 3.8 of this appendix, the possible health effects from electrical transmission systems on members of the general public include exposure to EMF and electrical shock. Nuclear plant workers and members of the public who live, work, or pass near an associated operating transmission line may be exposed to EMFs. A review of the biological and physical studies of 60 hertz (Hz) EMFs completed by the NRC during preparation of the 2013 General Environmental Impact Statement for License Renewals of Nuclear Plants (NUREG-1437, Vol, 1, Rev. 1) did not find any consistent evidence that would link harmful effects with field exposures. Therefore, with application of design standards from the NESC and operation in adherence with NESC standards, human health impacts from operation of the electrical transmission system would be SMALL.

Human health impacts from the construction and decommissioning of the electrical transmission system would not be unlike those described for the remainder of the proposed Hermes 2 project and would not add significantly to the potential negative impacts and this would not change the impact designation of SMALL.

4.9 WASTE MANAGEMENT

Impacts to waste management from the transmission system are not expected to occur at the project site. On-site and off-site electrical transmission infrastructure do not require waste management systems as described in Section 4.9 of the Hermes 2 ER.

4.10 TRANSPORTATION

Impacts from the construction, operation, and decommissioning of the electrical transmission system to the affected transportation environment would not significantly add to the impacts described in Hermes 2 ER Section 4.10 or change the impact designation of SMALL

4.11 POSTULATED EVENTS

The construction, operation, and decommissioning of the electrical transmission system would not contribute the postulated events described in Hermes 2 ER Section 4.11.

4.12 ENVIRONMENTAL JUSTICE

Impacts from the construction, operation, and decommissioning electrical transmission system to the environmental justice landscape would not significantly add to the impacts described in Hermes 2 ER Section 4.12 or change the impact designation of SMALL.

4.13 CUMULATIVE EFFECTS

The addition of the electrical transmission system would not significantly contribute to the cumulative effects of the Hermes 2 project on the affected environment.

REFERENCES

1. Kairos Power LLC, “Environmental Report for the Kairos Power Fluoride Salt-Cooled, High Temperature Non-Power Reactor (Hermes),” March 2023.