

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

COMMISSIONERS:

Christopher T. Hanson, Chair
David A. Wright
Annie Caputo
Bradley R. Crowell

In the Matter of

KAIROS POWER LLC

(Hermes 2 Test Reactor Facility)

Docket Nos. 50-611-CP
50-612-CP

CLI-24-03

MEMORANDUM AND ORDER

In this uncontested proceeding, we consider the sufficiency of the NRC Staff's review of the application of Kairos Power LLC (Kairos) for construction permits for the Hermes 2 non-power test reactor facility.¹ As discussed below, we find that the Staff's review was sufficient to support the regulatory findings. We authorize issuance of the construction permits.

I. BACKGROUND

A. Proposed Action

The construction permits would allow construction of two 35-megawatt thermal test reactor units that share a common power generation system on an approximately 185-acre brownfield site adjacent to the Hermes test reactor (Hermes 1) within the East Tennessee

¹ See Kairos Power LLC; Notice of Hearing, 89 Fed. Reg. 74,303, 74,304 (Sept. 12, 2024) (Hearing Notice).

Technology Park in Oak Ridge, Tennessee.² The NRC issued Kairos a construction permit for Hermes 1 on December 14, 2023.³ Like Hermes 1, each Hermes 2 unit would be licensed for operation under 10 C.F.R. § 50.21 with a Class 104c. license. The Hermes 2 facility would be built on the same site as Hermes 1, and each Hermes 2 reactor unit would be of similar size and design as Hermes 1.⁴ The Hermes 2 facility would produce a combined electrical power output of 20 megawatts electric for a licensed lifetime of 11 years.⁵ Construction of the Hermes 2 facility would allow Kairos to demonstrate key elements of the Kairos Power Fluoride Salt-Cooled, High Temperature Reactor technology for possible future commercial deployment.⁶

The Staff conducted a safety review of the application to determine whether it complies with the Atomic Energy Act of 1954, as amended (AEA), and the NRC's regulations.⁷ The Advisory Committee on Reactor Safeguards (ACRS) provided an independent assessment of the safety aspects of the application.⁸ The ACRS recommended that the construction permits be

² Ex. NRC-004, "Safety Evaluation Related to the Kairos Power LLC Construction Permit Application for the Hermes 2 Test Reactor Facility Dockets 50-611 & 50-612" (July 2024), at 1-12 (ADAMS accession no. ML24284A190) (Safety Evaluation). The proposed location of the Hermes 2 facility is the site of the former Oak Ridge Gaseous Diffusion Plant and was restored to a brownfield by the U.S. Department of Energy. *Id.*

³ See "Kairos Power LLC; Docket No. 50-7513; Hermes Test Reactor; Construction Permit" (Dec. 14, 2023) (ML23338A258).

⁴ Ex. NRC-004, Safety Evaluation, at 1-2.

⁵ The Staff will confirm at the operating license stage that the Hermes 2 facility satisfies applicable Class 104c. license requirements. Ex. NRC-004, Safety Evaluation, at 1-12; see AEA § 104c., 42 U.S.C. 2134(c).

⁶ Ex. NRC-005, "Environmental Assessment and Finding of No Significant Impact for the Construction Permits and Environmental Review Exemptions for the Kairos Hermes 2 Test Reactors; Final Report" (Aug. 2024), at 1-4 (ML24284A191) (EA and FONSI).

⁷ See Ex. NRC-004, Safety Evaluation.

⁸ See Ex. NRC-006A, Letter from Walter L. Kirchner, Chair, ACRS, to Christopher T. Hanson, Chair, NRC, "Safety Evaluation of the Kairos Non-Power Reactor Hermes 2 Construction Permit Application" (July 17, 2024) (ML24284A192) (ACRS Letter). The ACRS is a committee of

issued.⁹ The Staff also performed an environmental review, in accordance with the National Environmental Policy Act of 1969, as amended (NEPA), that evaluated the environmental impacts of constructing, operating, and decommissioning the Hermes 2 facility.¹⁰ Based on its safety and environmental reviews, the Staff recommended that the Commission issue the construction permits to Kairos.¹¹

B. The Hearing Process

Section 189a. of the AEA requires that we hold a hearing on an application to construct a testing facility.¹² In February of this year, the Staff was tasked with identifying efficiencies in the mandatory hearing process that would enable the Commission to fulfill its statutory obligations while promoting the responsible stewardship of time and resources.¹³ In April of this year, the Staff presented options to the Commission to reform the agency's mandatory hearing process.¹⁴ After reaching a decision based on the options presented in the Staff paper, beginning with this

technical experts charged with reviewing and reporting on safety studies and applications for construction permits and facility operating licenses.

⁹ Ex. NRC-006A, ACRS Letter, at 2.

¹⁰ See Ex. NRC-005, EA and FONSI; 42 U.S.C. § 4321 et seq.

¹¹ Ex. NRC-001, "Staff's Statement in Support of the Uncontested Hearing for Issuance of Construction Permits for the Kairos Hermes 2 Test Reactor Facility," Commission Paper SECY-24-0075 (Sept. 5, 2024) (ML24284A167), at 21-22 (Staff Information Paper).

¹² AEA § 189a., 42 U.S.C. § 2239(a) ("The Commission shall hold a hearing . . . on any application under section 104c. for a construction permit for a testing facility.").

¹³ Memorandum from Christopher T. Hanson, Chair, NRC, to Brooke P. Clark, General Counsel, NRC, "Revisiting the Mandatory Hearing Process at the U.S. Nuclear Regulatory Commission" (Feb. 7, 2024), at 1 (ML24038A023).

¹⁴ "Revisiting the Mandatory Hearing Process at the U.S. Nuclear Regulatory Commission," Commission Paper SECY-24-0032 (Apr. 12, 2024) (ML24103A090).

application, the Commission is undertaking a new, more efficient process for uncontested hearings that focuses our review on the written submissions of the parties.¹⁵

After the Staff issued its final review document—in this case, the environmental assessment (EA) and Finding of No Significant Impact (FONSI)—the Staff submitted an Information Paper to the Commission outlining its determinations and recommendation regarding issuance of the construction permits.¹⁶ The Staff Information Paper serves as the Staff's primary testimony for this uncontested hearing.¹⁷ Shortly thereafter, we issued a notice for the uncontested hearing that outlined schedule milestones for the hearing and the standards for our review.¹⁸ We issued four questions on safety and environmental-related topics for the Staff and Kairos to answer in writing.¹⁹ Additionally, the Staff filed a number of exhibits related to its review of the application.²⁰

¹⁵ Staff Requirements—SECY-24-0032—Revisiting the Mandatory Hearing Process at the U.S. Nuclear Regulatory Commission (July 18, 2024) (ML24200A044) (SRM-SECY-24-0032).

There was no separate contested hearing. The Staff published a notice in the *Federal Register* and provided an opportunity for interested members of the public to request a hearing and petition for leave to intervene. Kairos Power LLC; Notice of Hearing, 88 Fed. Reg. 81,439 (Nov. 22, 2023). No hearing requests or petitions to intervene were filed.

¹⁶ See Ex. NRC-001, Staff Information Paper, at 2, 21-22.

¹⁷ *Id.* at 1.

¹⁸ Hearing Notice at 74,304. In response to the invitation included in the Hearing Notice to provide written statements, the City of Oak Ridge expressed its continued support for the Hermes 2 project. Letter from Randall W. Hemann, City Manager, to NRC Hearing Docket (Sept. 20, 2024) (ML24268A179).

¹⁹ Order of the Secretary (Transmitting Hearing Questions) (Sept. 25, 2024) (unpublished); *NRC Staff Responses to Commission Hearing Questions* (Oct. 10, 2024) (NRC Staff Responses to Commission Questions); *Kairos Power LLC Responses to Commission Hearing Questions* (Oct. 10, 2024) (Kairos Responses to Commission Questions).

²⁰ *NRC Staff Exhibit List* (Oct. 10, 2024).

C. Review Standards

Our review standards track the two major areas of focus for the review of a construction permit application: the Staff's safety and environmental reviews. For the safety review, we must determine whether the application satisfies the requirements in 10 C.F.R. §§ 50.35(a) and 50.40. For the environmental review, we must make the determinations outlined in 10 C.F.R. § 51.105(a).²¹ If we determine that the application meets the standards and requirements of the AEA and the NRC's regulations and that any notifications to other agencies or bodies have been duly made, we will issue a construction permit "in such form and containing such conditions and limitations" that we deem "appropriate and necessary."²²

We do not review Kairos's application de novo; rather, we consider the sufficiency of the Staff's review of the application on both safety and environmental matters.²³ In other words, we consider whether the safety and environmental record is adequate to support issuance of the construction permit and whether the Staff's findings are reasonably supported in logic and fact.²⁴ Under our regulations, we must reach our own independent determination on certain environmental findings—i.e., whether the relevant NEPA requirements have been met, what is the appropriate "final balance among conflicting factors," and whether the construction permit "should be issued, denied[,] or appropriately conditioned."²⁵ But we will not "second-guess [the

²¹ 10 C.F.R. § 51.105(a)(1)-(4); Hearing Notice at 74,304. Because this is an uncontested proceeding, 10 C.F.R. § 51.105(a)(5), which concerns only contested proceedings, does not apply.

²² 10 C.F.R. § 50.50.

²³ See *Exelon Generation Co.* (Early Site Permit for Clinton ESP Site), CLI-05-17, 62 NRC 5, 34, 38-39 (2005).

²⁴ See *id.* at 39.

²⁵ *Id.* at 45 (quoting 10 C.F.R. § 51.105 (a)(1)-(3)).

Staff's] underlying technical or factual findings" unless we find the Staff's review incomplete or inadequate or its findings insufficiently explained in the record.²⁶

II. DISCUSSION

We find that Kairos's application meets our regulatory requirements for issuance of a construction permit, but we note that our decision does not constitute approval of the design.²⁷ While we have considered the record in its entirety, we focus our discussion of the Staff's safety and environmental reviews on novel issues and site-specific considerations.²⁸

A. The Staff's Safety Review

The Hermes 1 and Hermes 2 facilities share many of the same safety characteristics. Both will use tristructural isotropic (TRISO) fuel in pebble form in a molten salt coolant known as Flibe²⁹ with graphite as a moderator. The TRISO fuel and Flibe provide functional containment, meaning that they serve as barriers to effectively limit the physical transport of radioactive materials to the environment.³⁰ In addition, the Hermes design relies on passive decay heat removal and does not require an emergency core cooling system for decay heat removal or replacement of coolant inventory.³¹ The primary heat transport systems will operate near atmospheric pressure, which precludes the type of high-energy releases associated with highly

²⁶ *Id.*

²⁷ See 10 C.F.R. § 50.35(b). Kairos did not request approval of the safety of any design feature or specification in its application. Ex. NRC-004, Safety Evaluation, at 1-3 to 1-4.

²⁸ See SRM-SECY-24-0032 at 1.

²⁹ Flibe is a lithium fluoride-beryllium fluoride mixture (2LiF-BeF₂).

³⁰ Ex. NRC-004, Safety Evaluation, at 4-1 to 4-2. The TRISO fuel particles retain most of the radioactive material at risk for release, and the Flibe coolant retains radionuclides that are not aerosolized or evaporated during an event. *Id.* at 6-2.

³¹ See *id.* at 6-3 ("Heat is transferred from the reactor vessel to the water-based thermosyphons through thermal radiation and convection.").

pressurized primary systems.³² The overall reactivity coefficient for both Hermes 1 and 2 is negative, which provides negative feedback when there is an increase in reactivity and supports reactivity control in normal operation and postulated events.³³ Because the design of Hermes 2 builds extensively on the design of Hermes 1, the Staff compared the preliminary safety analysis reports (PSARs) for Hermes 2 and Hermes 1 and focused on the differences.³⁴ In this way, the Staff efficiently used its resources to focus on the significant safety issues that were not already resolved during the review of the Hermes 1 construction permit application.

There are several notable differences in the design of Hermes 2 as compared to Hermes 1. Whereas Hermes 1 is a single reactor with no electrical power production capability that could operate for up to four years, Hermes 2 consists of two reactors capable of electrical power production that could operate for up to 11 years.³⁵ Each Hermes 2 test reactor has an intermediate heat transport system (IHTS)³⁶ to transfer heat from the primary heat transfer

³² *Id.* at 6-2.

³³ “Safety Evaluation Related to the Kairos Power LLC Construction Permit Application for the Hermes Test Reactor” (June 13, 2023), at 3-19, 4-32 (ML23285A161); Ex. NRC-006A, ACRS Letter, at 2.

³⁴ See Ex. NRC-004, Safety Evaluation, at 1-6 to 1-7; Ex. NRC-001, Staff Information Paper, at 10. The Staff and ACRS noted that Kairos’s identification of Hermes 2 PSAR text that had been changed from the Hermes 1 PSAR helped focus and improve the efficiency of their reviews. Ex. NRC-001, Staff Information Paper, at 4; Ex. NRC-006A, ACRS Letter, at 2. Kairos also provided a summary of information deleted from the Hermes 1 PSAR and a list of docketed and audit information from Hermes 1 that is and is not applicable to Hermes 2. Ex. NRC-001, Staff Information Paper, at 4.

³⁵ Ex. NRC-004, Safety Evaluation, at ii; Letter from Robert M. Taylor, NRR, to Scott Moore, ACRS, “Summary of Key Differences Between Kairos Hermes 1 and Hermes 2 Facility Designs and Review Schedule for Kairos Hermes 2 Construction Permit Application” (Dec. 4, 2023) (ML23325A178) (Summary of Key Differences Letter).

³⁶ The IHTS includes intermediate salt pumps, intermediate salt vessels, a superheater, and associated piping. Ex. NRC-002C, Kairos Power LLC, “Hermes 2 Non-Power Reactor Preliminary Safety Analysis Report,” rev. 1 (May 2024), at 5-9 (ML24284A172) (PSAR). The intermediate heat exchanger serves as the heat transfer interface and coolant boundary between the primary heat transfer system and the IHTS. *Id.* at 5-2. Each unit has its own IHTS with no shared components between the units. *Id.* at 5-9.

system that cools the reactor to the power generation system (PGS). Aside from the rupture disks, the IHTS components are classified as non-safety related.³⁷ The safety-related rupture disks within the intermediate inert gas subsystem of the IHTS are designed to prevent overpressure in the IHTS during a postulated superheater tube leak or rupture event.³⁸ In addition, each IHTS has a steam superheater that feeds a common turbine in the shared PGS.³⁹

Because the addition of the IHTS and PGS to Hermes 2 introduces new postulated events and transients, the Staff evaluated whether the new postulated events and transients are still clearly bounded by those evaluated for Hermes 1.⁴⁰ The Staff determined that a postulated superheater tube leak or rupture is not clearly bounded by the Hermes 1 review.⁴¹ After reviewing the Hermes 2 preliminary design information, the Staff concluded that there was still uncertainty because the final design information has not been developed and modeling or

³⁷ Ex. NRC-001, Staff Information Paper, at 10; Ex. NRC-002C, PSAR, at 5-9.

³⁸ Ex. NRC-001, Staff Information Paper, at 10; Ex. NRC-002C, PSAR, at 5-9. The rupture disks would prevent the pressure rise associated with a superheater tube rupture from reaching the point where the tubes in the intermediate heat exchanger fail. Ex. NRC-004, Safety Evaluation, at 3-13. While the intermediate heat exchanger is non-safety related, the failure of one or more tubes could lead to unanalyzed conditions due to potential Flibe-water interactions or higher than assumed levels of BeNaF (a eutectic mixture of sodium fluoride and beryllium fluoride) ingress into the primary heat transfer system. *Id.*

³⁹ See Ex. NRC-002C, PSAR, at 5-11. The PGS consists of the steam system, turbine generator system, and feedwater and condensate system. *Id.* at 9-50. The majority of the PGS is shared between the two units, except for the unit-specific steam superheaters and associated piping and components. Ex. NRC-004, Safety Evaluation, at 1-13. The PGS does not perform any safety-related functions. *Id.* Kairos identifies all shared systems as non-safety related and the non-safety related SSCs are designed such that failures will not impact safety-related SSCs. Therefore, a malfunction or a loss of function of these shared systems would not degrade the facility's safety features. *Id.* at 1-14 to 1-15.

⁴⁰ Ex. NRC-001, Staff Information Paper, at 12.

⁴¹ *Id.*

experimental data is not available for this event.⁴² The Staff focused on two issues in its review: the safety classification of intermediate heat exchanger tubes and the design code for the safety-related rupture disks.⁴³ The Staff was unable to confirm that the intermediate heat exchanger, including the tubes, does not fall under the Hermes 2 definition of “safety-related” structures, systems, and components (SSCs).⁴⁴ To resolve this issue, as part of the operating license application, Kairos will need to demonstrate that the intermediate heat exchanger tubes either will not be classified as a safety-related SSC or that their failure is not credible.⁴⁵ With respect to safety-related rupture disks, Kairos identified a probable technical specification limiting condition for operation for IHTS pressure relief device operability and confirmed that the final design of the IHTS and the rupture disks will justify that the overpressure protection safety function will be performed reliably.⁴⁶ The Staff found the preliminary information on the design of the safety-related IHTS rupture disks to perform the safety function of mitigating the effects of a postulated superheater tube leak or tube rupture event and preventing Flibe-water interaction to be acceptable for the construction permit review stage.⁴⁷

⁴² *Id.*

⁴³ *Id.*

⁴⁴ *Id.* at 12-13.

⁴⁵ *Id.* at 13; NRC Staff Responses to Commission Questions at 6-7.

⁴⁶ Ex. NRC-001, Staff Information Paper, at 13. Although further assessment of the IHTS rupture disks is planned, the Staff does not consider these planned qualification activities to require research and development under 10 C.F.R. § 50.34(a)(8) because rupture disks are simple components with well-established codes and standards that are used in many industrial applications, including the nuclear industry. NRC Staff Responses to Commission Questions at 6; see Kairos Responses to Commission Questions at 5. Kairos confirmed that at the operating license stage, the final design of the IHTS and the safety-related rupture disks will justify that the rupture disks will reliably perform their safety function to provide overpressure protection preventing a gross failure of the intermediate heat exchanger, considering the operating environment, degradation and aging of rupture disk materials, salt vapor deposition, and redundancy and independence. NRC Staff Responses to Commission Questions at 6.

⁴⁷ Ex. NRC-001, Staff Information Paper, at 13.

After its review of Kairos's construction permit application and the Staff's Safety Evaluation, the ACRS, like the Staff, concluded that the construction permit application should be approved.⁴⁸ The maximum hypothetical accident (MHA) evaluated as part of the Hermes 1 review remains bounding for the Hermes 2 review.⁴⁹ In addition, the planned metallic materials and graphite testing will address potential corrosion and radiation damage concerns to accommodate the longer planned lifetime for Hermes 2.⁵⁰

Kairos has described the principal design features and the technology that it plans to use, but it will supply further technical and design information in the final safety analysis report, which is part of an operating license application, in accordance with 10 C.F.R. § 50.35(a)(2). The Staff identified two conditions to include in the construction permits—one relating to site characteristics and one relating to quality assurance.⁵¹ The first condition directs Kairos to perform detailed geologic mapping of excavations for safety-related engineered structures and to report on the excavations.⁵² The second requires Kairos to implement its quality assurance program for design, procurement, and construction of the Hermes reactor.⁵³ The same two

⁴⁸ Ex. NRC-006A, ACRS Letter, at 1-2; Ex. NRC-001, Staff Information Paper, at 21-22.

⁴⁹ Ex. NRC-004, Safety Evaluation, at 13-4 to 13-5; Ex. NRC-006A, ACRS Letter, at 1. Kairos used an MHA approach that is intended to bound all postulated events in terms of dose consequences, consistent with the guidance for non-power reactors in NUREG-1537, "Guidelines for Preparing and Reviewing Applications for the Licensing of Non-Power Reactors," Part 1, chapter 13. See Ex. NRC-004, Safety Evaluation, at 13-3. The Staff found "that subsystem or component [material at risk of release] design limits can be set such that the MHA release remains bounding, but the combined release from all subsystems and components not designed to withstand the limiting external or internal event will need to be evaluated as part of the [operating license] application when specific [material at risk of release] values are available. *Id.* at 13-16.

⁵⁰ Ex. NRC-006A, ACRS Letter, at 1; Ex. NRC-004, Safety Evaluation, at 4-8.

⁵¹ Ex. NRC-004, Safety Evaluation, at app. A, tbl.A.1.

⁵² *Id.*; Ex. NRC-001, Staff Information Paper, at 17.

⁵³ Ex. NRC-004, Safety Evaluation, at app. A, tbl.A.1; Ex. NRC-001, Staff Information Paper, at 17.

conditions were included in the construction permits for the Hermes 1 facility.⁵⁴ As it finalizes the design of its facility, Kairos will need to complete several research and development activities. The Staff identified ten ongoing research and development activities for Hermes 2, as opposed to nine for Hermes 1. The additional activity for Hermes 2 is completion of compatibility evaluations of the intermediate coolant and reactor coolant chemical interaction.⁵⁵ The Staff listed these activities in Appendix A, Section A.3 of the Safety Evaluation and will verify that they are completed prior to the completion of construction activities for Hermes 2 Unit 1, projected to be in December 2027.⁵⁶ The Staff will also track several other items listed in Appendix A, Section A.2 of the Safety Evaluation that are not necessary for issuance of a construction permit but need additional development or resolution before issuance of an operating license.⁵⁷

B. The Staff's Environmental Review

Based on the similarities between the Hermes 2 and Hermes 1 facilities, the Staff determined that it would be prudent to first prepare a draft EA to ascertain whether preparation of an environmental impact statement (EIS) would be necessary.⁵⁸ Like the EIS prepared for Hermes 1, the draft EA for Hermes 2 found that the project would not result in greater than small

⁵⁴ See *Kairos Power LLC (Hermes Test Reactor)*, CLI-23-5, 98 NRC 53, 76 (2023).

⁵⁵ See Ex. NRC-004, Safety Evaluation, at 1-9. The Staff will confirm at the operating license stage that the limitation and condition from KP-TR-003-NP-A, "Principal Design Criteria for the Kairos Power Fluoride Salt-Cooled, High Temperature Reactor," is met by demonstrating compatibility between the primary and intermediate coolants and that the intermediate coolant does not have a safety significant impact on the primary system. *Id.* at 3-4. The intermediate coolant, BeNaF, has similar characteristics to Flibe, the primary coolant salt. Summary of Key Differences Letter at 2.

⁵⁶ Ex. NRC-004, Safety Evaluation, at 1-9, app. A at A-22. Kairos projects that construction will be complete for Hermes 2 Unit 2 by the end of 2028. *Id.* at 1-9.

⁵⁷ *Id.* at 1-8.

⁵⁸ Ex. NRC-001, Staff Information Paper, at 4, 19.

environmental impacts to the affected resources.⁵⁹ Therefore, the Staff concluded that issuing a FONSI would be appropriate and that an EIS would not be necessary.⁶⁰ Because NRC regulations require preparation of an EIS before issuing a permit to construct a testing facility, the Staff also determined that exemptions from the relevant regulations in 10 C.F.R. Part 51 were required.⁶¹ The Staff evaluated the environmental impacts of granting these exemptions in the final EA and FONSI.⁶²

The Staff's environmental review included an evaluation of an alternative site and the no-action alternative, including the negative environmental impacts of not implementing the proposed action of granting the Hermes 2 construction permits.⁶³ The EA also addressed the other relevant requirements of NEPA section 102(2) and 10 C.F.R. part 51.⁶⁴ In response to our hearing question, the Staff clarified that its analysis of irreversible and irretrievable commitments of Federal resources involved in the proposed action included "capital, energy, labor, and material resources," and the Staff further noted that some of the resources committed to the Hermes 2 project may be derived from federally controlled lands, waters, and funds.⁶⁵ After

⁵⁹ *Id.*

⁶⁰ *Id.*

⁶¹ *See id.* at 8-9; 10 C.F.R. §§ 51.20(b)(1), 51.25, 51.75(a).

⁶² *See* Ex. NRC-005, EA and FONSI, at 5-1, 6-1. The Staff concluded that the proposed action of granting the exemptions would not result in significant impacts to the human environment. *Id.* at 1-1.

⁶³ *See id.* at 4-1 to 4-6.

⁶⁴ *See* 10 C.F.R. § 51.105(a)(1). On June 3, 2023, President Biden signed into law the Fiscal Responsibility Act of 2023. Pub. L. No. 118-5, 137 Stat. 10. In addition to increasing the debt ceiling and addressing other matters related to federal spending, the Act, in section 321, included amendments to NEPA. The amendments added new sections (D), (E), and (F) to section 102(2); as a result, the section 102(2)(E) referred to in 10 C.F.R. § 51.105(a)(1) is now section 102(2)(H), but the substance of the provision remains the same.

⁶⁵ NRC Staff Responses to Commission Questions at 8.

considering comments received on the draft EA and draft FONSI, the Staff made a final determination that the proposed action would not significantly affect the quality of the human environment.⁶⁶

C. Findings

We have conducted an independent review of the sufficiency of the Staff's safety and environmental findings, with particular attention to the topics discussed above. Our findings, however, are based on the record as a whole.

1. Safety Findings

Based on the evidence presented in the uncontested hearing, we find that Kairos has described the proposed design of the facility, including, but not limited to, the principal architectural and engineering criteria for the design, and it has identified major features or components incorporated therein for the protection of the health and safety of the public. Further technical or design information as may be required to complete the safety analysis has reasonably been left for later consideration and will be supplied in the final safety analysis report. Kairos has described the safety features or components that require research and development and has identified, and will establish, a research and development program reasonably designed to resolve any safety questions associated with these features or components. On the basis of the foregoing, we find that there is reasonable assurance that open safety questions will be resolved satisfactorily at or before the latest date stated in the application for completion of construction of the proposed facility. Taking into consideration the site criteria in 10 C.F.R. Part 100, the proposed facility can be constructed and operated at the proposed location without undue risk to the health and safety of the public.

In making these findings, we also conclude that: (1) there is reasonable assurance that construction of the facility will not endanger the health and safety of the public, and the

⁶⁶ Ex. NRC-005, EA and FONSI, at 6-1.

authorized activities can be conducted in compliance with the NRC's regulations, including the requirements in 10 C.F.R. Part 20;⁶⁷ (2) Kairos is technically and financially qualified to engage in the activities authorized; (3) issuance of the construction permits will not be inimical to the common defense and security or to the health and safety of the public; and (4) Kairos's application meets the standards and requirements of the AEA and the NRC's regulations. Required notifications to other agencies have been duly made.⁶⁸ Additionally, we find that the Staff's proposed permit conditions are appropriately drawn and sufficient to provide reasonable assurance of adequate protection of public health and safety.⁶⁹

2. Environmental Findings

We have conducted an independent review of the Staff's environmental analysis in the EA and FONSI, taking into account the particular requirements of NEPA. We find that the Staff's

⁶⁷ The regulations in Part 20 "apply to persons licensed by the Commission to receive, possess, use, transfer, or dispose of byproduct, source, or special nuclear material or to operate a production or utilization facility." 10 C.F.R. § 20.1002. Kairos has neither requested approval of design information nor has applied for a license to receive, possess, use, transfer, or dispose of byproduct, source, or special nuclear material at the facility. Ex. NRC-004, Safety Evaluation, at 11-2. "Therefore, the [S]taff did not evaluate whether the requirements in 10 CFR Part 20 would be met for the construction of the Hermes 2 reactor[s]. Instead, the [S]taff assessed whether Kairos had identified the relevant requirements for an operating facility and provided descriptions of the preliminary facility design and provisions for protecting the health and safety of the public, workers, and the environment in sufficient detail to determine whether the [preliminary safety analysis report] provides an acceptable basis for the development of the radiation protection programs and radioactive waste management, and whether there is reasonable assurance that Kairos will comply with the regulations in 10 CFR Part 20 during operation of the Hermes 2 facility." *Id.* As was the case in CLI-23-5, we agree that the Staff's approach meets 10 C.F.R. § 50.40(a). See *Kairos Power*, CLI-23-5, 98 NRC at 60 n.22.

⁶⁸ See, e.g., 10 C.F.R. § 2.104(a); Ex. NRC-005, EA and FONSI, app. B; Ex. NRC-001, Staff Information Paper, at 6 (citing Memorandum from Judy Petrucelli, NRC, to Anthony Bowers, NRC, "Addendum to the U.S. Nuclear Regulatory Commission Staff Review of the U.S. Department of Homeland Security Consultation Report for Hermes Non-Power Test Reactor Construction Permit Application Submitted by Kairos Power LLC Regarding Hermes 2," (May 21, 2024) (ML24095A279)).

⁶⁹ See 10 C.F.R. §§ 50.35(b), 50.50; Ex. NRC-003A, Kairos Power LLC, Hermes 2 Test Reactor Facility, Unit 1, Draft Construction Permit (Sept. 6, 2024), at 2-3 (ML24233A071); Ex. NRC-003B, Kairos Power LLC, Hermes 2 Test Reactor Facility, Unit 2, Draft Construction Permit (Sept. 6, 2024), at 2-3 (ML24284A189).

review was reasonably supported in logic and fact and sufficient to support the Staff's conclusions. Therefore, as a result of our review of the EA, and in accordance with the notice of hearing for this uncontested proceeding, we find that the relevant requirements of NEPA section 102(2), and the applicable regulations in 10 C.F.R. Part 51, have been satisfied with respect to the construction permit application. We independently considered the final balance among conflicting factors contained in the record of this proceeding.⁷⁰ We find, after weighing the environmental, economic, technical, and other benefits against environmental and other costs, and considering reasonable alternatives, that the construction permits should be issued.⁷¹

III. CONCLUSION

We find that, with respect to the safety and environmental issues before us, the Staff's review of Kairos's construction permit application was sufficient to support issuance of the construction permits. We *authorize* the Director of the Office of Nuclear Reactor Regulation to issue the permits for the construction of the Hermes 2 Test Reactor Facility.

IT IS SO ORDERED.

For the Commission



Carrie M. Safford
Secretary of the Commission

Dated at Rockville, Maryland,
this 20th day of November 2024.

⁷⁰ See 10 C.F.R. § 51.105(a).

⁷¹ See *id.*

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)
(Mandatory Hearing))

CERTIFICATE OF SERVICE

I hereby certify that copies of the foregoing **COMMISSION MEMORANDUM AND ORDER (CLI-24-03)** have been served upon the following persons by Electronic Information Exchange.

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this 20th day of November 2024.