Enclosure 3
Exemption Request to Portions of 10 CFR 55.31(a)(5)
(Non-Proprietary)

Exemption Request to Portions of 10 CFR 55.31(a)(5)

1 BACKGROUND

Kairos Power LLC (Kairos Power) requests an exemption from certain requirements of 10 CFR 55.31(a)(5). The current regulation requires the operator applicants to have five reactivity manipulations for operator experience and for the reactivity manipulations to be conducted on either the facility or a plant reference simulator. The requested exemption would allow a non-power KP-FHR facility (Facility) to appropriately determine the number of reactivity manipulations to demonstrate proficiency in reactivity manipulations. The requested exemption would also allow the Facility to conduct reactivity manipulations on a Commission-approved simulator in place of the facility or a plant referenced simulator.

The underlying purpose of this requirement is for the regulator to "establish uniform conditions" across all applicants for testing, consistent with the Atomic Energy Act of 1954, as amended (AEA) (Reference 1). In the Nuclear Waste Policy Act of 1982, as amended, Section 306, Congress directed the NRC to "establish simulator training requirements" for power reactors (Reference 2). In response, the NRC amended 10 CFR 55 to account for power reactor simulator training requirements. Special considerations were given to the research and test reactors; specifically, wording was added in 10 CFR 55.45(b) to permit research and test reactors licensees "to be exempted from submitting a plan for the use of a simulation facility that is other than a plant-reference simulator" (Reference 3). These special considerations were based on the small scope of research and test reactors that allows them to use their own facilities rather than a simulation facility to administer the operating test, in accordance with 10 CFR 55.45(b)(3). The similarities in designs of research and test reactors led to the special considerations that allow these facilities to use similar facilities for training requirements, specifically reactivity manipulations, for facilities under construction.

KP-FHR technology has a simple, automated operating interface; and relies on passive safety design features that results in reduced reliance on operators when compared to the current operating LWR fleet. This reduced reliance on operators results in KP-FHRs being characterized as self-reliant mitigation facilities. While NRC staff have considered the concept of self-reliant mitigation facilities as part of their draft 10 CFR 53 rulemaking, Kairos Power defines this concept for KP-FHRs as:

1. KP-FHRs do not rely on operator actions to mitigate the consequences of postulated events to ensure that the dose at the site boundary meets regulatory limits.
2. The KP-FHR plant designed response to postulated events relies on safety features and characteristics that will perform their safety function independent of credible human errors of commission or omission and do not require manual human operation in response to equipment failures.
3. The KP-FHR design relies on functional containment, which includes multiple barriers, to prevent the release of radioactive material at risk for release. The primary functional containment barriers are the coating layers of the TRISO fuel, and the secondary functional containment barrier is the reactor coolant. The inherent design features that support the functional containment approach include a near-atmospheric operating pressure, a robust fuel form with radionuclide retention capabilities in transient conditions, and a primary coolant design with a high boiling point that is operated at near-atmospheric pressures preventing energetic releases.

These design features do not rely on operator actions and will perform their safety function independent of credible commission or omission of operator actions.

2 REGULATORY REQUIREMENT

The regulation in 10 CFR 55.31(a)(5) requires that the applicant both provide evidence of a minimum of five reactivity manipulations and conduct the reactivity manipulations on either the facility or a plant reference simulator:

> *(5) Provide evidence that the applicant, as a trainee, has successfully manipulated the controls of either the facility for which a license is sought or a plant-referenced simulator that meets the requirements of § 55.46(c). At a minimum, five significant control manipulations must be performed that affect reactivity or power level. Control manipulations performed on the plant-referenced simulator may be chosen from a representative sampling of the control manipulations and plant evolutions described in § 55.59(c)(3)(i)(A-F), (R), (T), (W), and (X) of this part, as applicable to the design of the plant for which the license application is submitted. For licensed operators applying for a senior operator license, certification that the operator has successfully operated the controls of the facility as a licensed operator shall be accepted;*

3 EXEMPTION SOUGHT

Consistent with 10 CFR 55.11, Kairos Power requests NRC approval of an exemption from 10 CFR 55.31(a)(5), specifically the requirement to both provide evidence "[a]t a minimum, five" of reactivity manipulations and to use "either the facility for which a license is sought or a plant-referenced simulator" to perform reactivity manipulations.

As a result of this exemption:

1. The Facility's operator applicants perform the necessary number of manipulations to demonstrate competency in reactivity manipulations, in accordance with the rest of 10 CFR 55.31(a)(5). The number of manipulations performed may be less than five.
2. The Facility's operator applicants will provide evidence of the performed reactivity manipulations on NRC Form 398.
3. The Facility can use a Commission-approved simulator (CAS), in accordance with 10 CFR 55.46(b), for the operator applicants to gain reactivity manipulation experience.

4 JUSTIFICATION FOR EXEMPTION

The exemption requirements for operator licenses under 10 CFR 55 regulations are specified in 10 CFR 55.11 and allows the NRC to:

> *…[G]rant such exemptions from the requirements of the regulations in this part as it determines are authorized by law and will not endanger life or property and are otherwise in the public interest.*

A. The requested exemption is authorized by law

The Atomic Energy Act of 1954, as amended, requires the Commission to:

> *a. prescribe uniform conditions for licensing individuals as operators of any of the various classes of production and utilization facilities licensed in this Act;*
>
> *b. determine the qualifications of such individuals;*
>
> *c. issue licenses to such individuals in such form as the Commission may prescribe; and*
>
> *d. suspend such licenses for violations of any provision of this Act or any rule or regulation issued thereunder whenever the Commission deems such action desirable.*

Importantly, the AEA neither prescribes nor limits the number of reactivity manipulations or the tool used to perform the reactivity manipulations. Rather, the AEA leaves that choice to the discretion of the Commission. Therefore, the requested exemption is authorized by law.

B. The requested exemption will not endanger life or property

As a self-reliant mitigation facility, a non-power KP-FHR relies on passive safety features that are independent of operator interactions (including acts of commission or omission) to mitigate the consequences of postulated events. With the reduced reliance on operators, a decrease in the number of required reactivity manipulations and the use of a Commission-approved simulator would not cause operational errors endangering public health or safety.

10 CFR 55.31(a)(5) requires the use of either the facility or a plant referenced simulator to demonstrate reactivity manipulations. The Facility will need operator licenses prior to receiving the operating license of the facility and therefore cannot use the facility to demonstrate reactivity manipulations. Additionally, there are no comparable facilities to a non-power KP-FHR that would be accessible for reactivity manipulations. The Facility cannot meet the definition of a plant reference simulator in 10 CFR 55.46(c)(2)(i) prior to operation because fuel will not exist in the core to simulate “the most recent core load.” The Commission approval of the simulator provides additional assurance that the simulator is sufficient to demonstrate reactivity manipulations. The NRC exempted Vogtle 3 and 4 from using a plant reference simulator for reactivity manipulations which provides precedent that Commission-approved simulators are sufficient tools to demonstrate reactivity manipulations (Reference 4). This provides assurance that the requested exemption will not endanger life or property.

C. The requested exemption is in the public interest

Non-power KP-FHRs are a key part in the iterative development and deployment of KP-FHR technology. The commercialization of KP-FHR technology will deliver a clean, affordable, and safe energy solution. Kairos Power has an aggressive commercialization timeline to deploy KP-FHRs. Since the regulation prescribes the number of reactivity manipulations, the Facility’s operators would have to meet the requirement’s prescribed minimum number prior to submitting their applications to the NRC. This does not consider that some operators may already be qualified without reaching the prescribed minimum number of reactivity manipulations. As described in the section above, the Facility cannot use the facility or plant reference simulator to demonstrate reactivity manipulations. Therefore, the requested

exemption to use a Commission-approved simulator allows Facility operators to be licensed without using the facility or plant reference simulator, enabling a timely start-up of non-power KP-FHRs.

In the ADVANCE Act of 2024, Title V "Improving Commission Efficiency," Congress mandates the Commission to update the mission statement to include:

> *…that licensing and regulation of the civilian use of radioactive materials and nuclear energy be conducted in a manner that is efficient and does not unnecessarily limit – (1) the civilian use of radioactive materials and deployment of nuclear energy; or (2) the benefits of civilian use of radioactive materials and nuclear energy technology to society* (Reference 5).

In response to Congress, the NRC updated their mission statement to "enable" the deployment nuclear technology:

> *The NRC protects public health and safety and advances the nation's common defense and security by enabling the safe and secure use and deployment of civilian nuclear energy technologies and radioactive materials through efficient and reliable licensing, oversight, and regulation for the benefit of society and the environment* (Reference 6).

Recent Executive Orders reiterate NRC's mandate to carry out its mission statement while also considering the benefits of nuclear innovation (Reference 7). Congress, the NRC, and the Executive Branch recognize the importance of efficiently deploying advanced nuclear solutions. The requested exemption would allow the Facility the ability to determine the number of reactivity manipulations and to use a Commission-approved simulator, providing relief from the prescribed regulations and limiting tools for reactivity manipulations. This relief, which is authorized by law, would remove potential future barriers to deployment of KP-FHR technology on an aggressive timeline without endangering life or property. Therefore, the requested exemption is in the public interest.

5 ENVIRONMENTAL CONSIDERATIONS

The exemption request meets the criteria for a categorical exclusion. The NRC has previously determined the list of categorical exclusions in 10 CFR 51.22(c). The requested exemption meets criteria (i)-(vi) in 10 CFR 51.22(c)(25) as further described below.

The requested exemption involves no significant hazards consideration (10 CFR 51.22(c)(25)(i)) because the exemption involves only a change in the number of reactivity manipulations and the use of a Commission-approved simulator, which is programmatic in nature, and does not introduce any new significant hazards that could impact the environment.

The requested exemption involves no significant changes in the types or significant increases in the amounts of any effluents that may be released offsite (10 CFR 51.22(c)(25)(ii)) because the exemption involves only a change in the number of reactivity manipulations and the use of a Commission-approved simulator, which is programmatic in nature, and does not involve any changes in the types or increase in the amounts of any effluents that may be released offsite.

The requested exemption involves no significant increases in individual or cumulative public or occupational radiation exposure (10 CFR 51.22(c)(25)(iii)) because the exemption involves only a change in the number of reactivity manipulations and the use of a Commission-approved simulator and does not

contribute to any significant increase in individual or cumulative public or occupational radiation exposures.

The requested exemption involves no significant construction impacts (10 CFR 51.22(c)(25)(iv)) because the exemption involves only a change in the number of reactivity manipulations and the use of a Commission-approved simulator, which is programmatic in nature, and does not involve any construction impact.

The requested exemption involves no significant increase in the potential for or consequences from radiological accidents (10 CFR 51.22(c)(25)(v)) the exemption involves only a change in the number of reactivity manipulations and the use of a Commission-approved simulator, and does not impact the potential for consequences form radiological accidents.

Lastly, the requested exemption involves the education, training, experience, qualification, requalification, or other employment suitability requirements (10 CFR 51.22(c)(25)(vi)(E)) because the exemption sought is specific to the reactivity manipulation experience requirements for operator applicants. Therefore, the requested exemption meets the criteria for categorical exclusion.

6 CONCLUSION

On the basis of the information presented, Kairos Power requests that the NRC grant an exemption from 10 CFR 55.31(a)(5) as noted above for non-power KP-FHR facility licenses.

7 REFERENCES

1. Atomic Energy Act of 1954, as amended, “Operators’ Licenses,” Section 107. April 4, 2024.
2. Nuclear Waste Policy Act of 1982, as amended, “Nuclear Regulatory Commission Training Authorization,” Section 306. March 2004.
3. Nuclear Regulatory Commission, “Operator licenses and Conforming Amendments,” Federal Register, Vol. 52, No. 57, 52 FR 9460. March 25, 1987.
4. Nuclear Regulatory Commission, “Exemption - Vogtle Electric Generating Plant Units 3 and 4,” April 8, 2016. ML16090A176.
5. Division B - ADVANCE Act of 2024, Title V, “Improving Commission Efficiency,” Section 501.
6. Nuclear Regulatory Commission, “NRC Approves Updated Mission Statement,” Office of Public Affairs, No. 25-005. January 24, 2025.
7. Executive Order. “Ordering the Reform of the Nuclear Regulatory Commission, 14300, 2025” Federal Register Vol 90, No. 102 (May 23, 2025): 22587. https://www.govinfo.gov/content/pkg/FR-2025-05-29/pdf/2025-09798.pdf