

Enclosure 2
Presentation Slides for the June 25, 2025 Pre-Submittal meeting on Hermes Criticality Accident Alarm
Exemption
(Non-Proprietary)

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




Kairos Power

PRE-SUBMITTAL MEETING ON
HERMES CRITICALITY ACCIDENT ALARM EXEMPTION

PUBLIC (OPEN SESSION)

JUNE 25, 2025



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

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

Agenda

- Introduction and Background
- Regulatory Framework
- 10 CFR 70.24 Exemption Precedent
- Exemption Basis, Structure, and Content

Introduction and Background

- Previous pre-submittal meeting held in February 2024
 - Overview of design
 - Scope of analysis
 - Methodology for analysis
- The purpose of today's meeting is to discuss the regulations applicable to the Kairos Power Hermes facility and receive NRC feedback on a planned exemption request to 10 CFR 70.24(a)

Regulatory Framework – Criticality Accident Requirements

Regulation for Criticality Accidents: 10 CFR 50.68 provides requirements for criticality accidents in power reactors, and 10 CFR 70.24 provides requirements for non-power reactors and material licensees

Compliance Options for Licensees: Licensees must comply with either 10 CFR 70.24 or the requirements in paragraph (b) of 10 CFR 50.68

Regulatory Framework – Criticality Accident Requirements (10 CFR 70.24)

10 CFR 70.24 does apply to a non-power reactor such as Hermes

- (a) Licensees with >700 g U-235 shall maintain criticality accident monitoring systems
 - (a)(1) and (a)(2) specify detection, sensitivity and coverage capabilities of the monitors required by 10 CFR 70.24
 - (a)(3) requires licensee to maintain emergency procedures for each area with SNM
- (b)(1) Licensees shall have a means to quickly identify individuals that received doses of 10 rads or more
- (b)(2) Licensee shall maintain personnel decontamination facilities, arrangements for physician and medical personnel to handle radiation emergencies, arrangements for transportation to treatment facilities outside site boundaries
- (c) Construction or operation of a nuclear reactor licensees (except critical assembly reactors) are exempt from paragraph (b) requirements for SNM
- (d)(1) Requirements of (a) through (c) don't apply to holders of construction or operating licenses for nuclear power reactors or combined licenses under part 52 if holders comply with paragraph (b) of 10 CFR 50.68
- (d)(2) States that if a licensee obtained an exemption from 70.24 and then elects to comply with requirements of paragraph (b) of 10 CFR 50.68, it does not exempt the licensee from complying with any of the requirements in 50.68

10 CFR 70.24 Exemption Precedent

- SECY-97-155, STAFF'S ACTION REGARDING EXEMPTIONS FROM 10 CFR 70.24 FOR COMMERCIAL NUCLEAR POWER PLANTS
 - Long-standing precedent for granting exemption to 10 CFR 70.24 to commercial power plants
 - Reactor facilities “significantly different” than fuel cycle facilities because of the “variety of forms of SNM and the frequency with which it is handled” in fuel facilities
 - Concludes 10 CFR 70.24 criticality monitoring requirement is not necessary as long as design and administrative controls are maintained
 - Criteria mirror the current 50.68(b) and include GDC 63
- Example: McGuire Nuclear Station Exemption
 - Safety Evaluation Report (SER) determined that procedures and design features made an inadvertent criticality in SNM handling or storage unlikely, in accordance with GDC 62. Exemption was granted in 1997.
 - Criticality parameter of k-effective remain >0.95 for spent fuel pool filled with unborated water
 - Application submitted in 2002 for revisions made to the Technical Specification addressing the spent fuel pool Boraflex degradation
 - SER mentioned that the procedures and controls are designed to prevent criticality
 - In addition, the licensee installed radiation monitors required by GDC 63 to alert personnel to excessive radiation levels
- This exemption request builds on the regulatory precedent of granting an exemption to 10 CFR 70.24 to reactor facilities

Exemption Basis, Structure, and Content

- Kairos Power will seek an exemption from 10 CFR 70.24(a), criticality accident monitoring
- Kairos Power is not seeking exemptions from 10 CFR 70.24(b), (c), or (d)
- The exemption from the requirements for criticality accident monitoring will be based on the fact that criticality is precluded by design features and administrative controls
- The detailed analysis supporting this conclusion will be provided in the non-public session

Exemption Basis, Structure, and Content (continued)

- Introduction
 - Kairos Power states applicable requirements and requests exemption based on technical basis
- Regulatory Requirements
 - Provide summary of regulatory requirements of 10 CFR 70.24 that are applicable to Hermes
- Exemption Sought
 - 10 CFR 70.24(a), criticality accident monitoring
- Effects on Regulatory Conformance
 - FSAR will not include description of criticality accident alarm system
 - FSAR will include description of design features and controls that preclude inadvertent criticality
- Justification for Exemption
 - Technical Basis
 - Include discussion of criticality safety controls for all areas with SNM
 - Regulatory Basis
 - Key aspects discussed: Authorized by law, exemption does not endanger life or property, exemption does not endanger the common defense and security, and the exemption is in the public interest

Questions / Feedback
