NUCLEAR REGULATORY COMMISSION

Docket No. 50-613

US SFR Owner, LLC.;

Kemmerer Power Station Unit 1;

Exemptions

I. Background

By letter dated March 28, 2024, TerraPower, LLC (TerraPower), on behalf of its wholly-owned subsidiary US SFR Owner, LLC (USO), submitted a construction permit (CP) application including a preliminary safety analysis report (PSAR) to the NRC staff for a reactor facility pursuant to part 50 of title 10 of the *Code of Federal Regulations* (10 CFR), "Domestic Licensing of Production and Utilization Facilities," and section 103 of the Atomic Energy Act of 1954, as amended. The proposed facility, referred to as Kemmerer Power Station Unit 1 (Kemmerer 1), if approved, would be built in Lincoln County, Wyoming and utilize TerraPower and General Electric-Hitachi Natrium sodium fast reactor technology. Supplements to the application were submitted on May 2, 2024, and May 9, 2024. On May 21, 2024, the NRC staff accepted USO's CP application for docketing (89 FR 47997).

The licensing approach in the Kemmerer 1 CP application follows Nuclear Energy Institute (NEI) 18-04, Revision 1, "Risk-Informed Performance-Based Technology Inclusive Guidance for Non-Light Water Reactor Licensing Basis Development," which was endorsed by the NRC in Regulatory Guide (RG) 1.233, "Guidance for a Technology-Inclusive, Risk-Informed, and Performance-Based Methodology to inform the Licensing Basis and Content of Applications for Licenses, Certifications, and Approvals for non-light-water Reactors." The NRC staff is currently conducting a detailed review of the Kemmerer 1 CP application.

TerraPower Topical Report (TR) NATD-LIC-RPRT-0001-A, Revision 0, "Regulatory Management of Natrium Nuclear Island and Energy Island Design Interfaces," discusses TerraPower's approach to decouple the proposed Natrium energy island (EI) and nuclear island (NI). The TR states that the independence of operation between NI and EI systems represents a key aspect of the Natrium design philosophy. It includes a summary of the proposed Natrium reactor plant design, interfaces, safety features, and basic plant transient analysis that support the decoupling strategy. As noted in the TR, certain aspects of the plant design, such as the thermal storage system that insulates the NI from EI transients, are key aspects of the plant for EI-NI independence. The TR also stated that the failure of certain NST EI SSCs could cause a reactor scram. On September 28, 2023, the NRC staff found TR NATD-LIC-RPRT-0001-A, Revision 0 acceptable for referencing in licensing actions to the extent specified and under the limitations and conditions delineated in the final safety evaluation (SE) of the TR. Although the TR discussed the possibility of requesting an exemption from 10 CFR 50.10(a)(1)(iv), in the SE approving that TR, the NRC staff stated that it was not "taking a position . . . on any prospective exemption request the NRC might receive."

By letter dated September 9, 2024, TerraPower submitted, on behalf of USO, an exemption request for the proposed Kemmerer 1. The requested exemptions were from the definitions of construction in 10 CFR 50.10(a), "Definitions," and 10 CFR 51.4, "Definitions," and would have excluded all non-safety-related with no special treatment (NST) EI structures, systems, and components (SSCs) from the scope of construction as defined in these regulations. By letter dated February 28, 2025, TerraPower submitted, on behalf of USO, a new request that superseded the September 9, 2024 request and requested an exemption with a more limited scope, discussed in the following section. The April 29, 2025 supplement to the February 28, 2025 request further limited the scope of the exemption request by withdrawing the 10 CFR 51.4 portion of the

exemption.

II. Request/Action

TerraPower's request on behalf of USO in a letter dated February 28, 2025, as supplemented by letters dated April 7, and April 29, 2025, is to modify the definition of construction in 10 CFR 50.10(a)(1)(iv) from "SSCs whose failure could cause a reactor scram or actuation of a safety-related system" to "SSCs whose failure could cause a reactor scram or actuation of a safety-related system, excluding Natrium EI SSCs classified as non-safety-related with no special treatment (NST)." This specific exemption would allow USO to proceed with the driving of piles, subsurface preparation, placement of backfill, concrete, or permanent retaining walls within an excavation, installation of foundations, or the in-place assembly, erection, fabrication, or testing of SSCs classified as NST the failure of which could cause the reactor to scram or actuation of a safety-related system that are located on the proposed EI without a limited work authorization while the NRC staff continues its review of the Kemmerer 1 CP application. Issuing this exemption would not constitute a commitment by the NRC to issue a CP for Kemmerer 1. USO would install the SSCs assuming the risk that its CP application may later be denied.

III. Discussion

Pursuant to 10 CFR 50.12, "Specific exemptions," the Commission may, upon application by any interested person or upon its own initiative, grant exemptions from the requirements of 10 CFR part 50 when: (1) the exemptions are authorized by law, will not present an undue risk to the health and safety of the public, and are consistent with the common defense and security; and (2) special circumstances are present. Section 50.12 also states that for exemptions permitting the conduct of activities prior to the issuance of a CP prohibited by 10 CFR 50.10, the Commission may grant the exemption upon considering and balancing the following factors: (1)

whether conduct of the proposed activities will give rise to a significant adverse impact on the environment and the nature and extent of such impact, if any; (2) whether redress of any adverse environment impact from conduct of the proposed activities can reasonably be effected should such redress be necessary; (3) whether conduct of the proposed activities would foreclose subsequent adoption of alternatives; and (4) the effect of delay in conducting such activities on the public interest, including the power needs to be used by the proposed facility, the availability of alternative sources, if any, to meet those needs on a timely basis and delay costs to the applicant and to consumers.

A. Exemption is Authorized by Law

Section 50.12 allows the NRC staff to grant exemptions from the requirements in 10 CFR part 50 provided that certain conditions listed therein are met. As discussed in this section of the evaluation all of the conditions listed in 10 CFR 50.12 are met. Further, the exemption criterion in 10 CFR 50.12(b) states that the Commission may grant the exemption upon considering and balancing four factors related to environmental considerations. The NRC staff has determined that granting the proposed exemption will not result in a violation of the Atomic Energy Act of 1954, as amended, the National Environmental Policy Act, other applicable statutes, the NRC's regulations, or other applicable law. Accordingly, the NRC staff finds that the exemption is authorized by law.

B. Exemption would not Present an Undue Risk to Public Health and Safety

As noted previously, TerraPower TR NATD-LIC-RPRT-0001-A identified that the failure of certain SSCs on the EI could cause the reactor to scram, meeting the 10 CFR 50.10(a)(1)(iv) criterion. The NRC staff's SE agreed with that assessment. Scramming the reactor would involve the actuation of some safety-related systems. Therefore, those SSCs meet the criteria in 10 CFR 50.10(a)(1)(iv), meaning the driving of piles,

subsurface preparation, placement of backfill, concrete, or permanent retaining walls within an excavation, installation of foundations, or the in-place assembly, erection, fabrication, or testing of those SSCs would be considered construction. Per 10 CFR 50.10(c), construction of these EI SSCs cannot begin without the issuance of a CP, an early site permit, a combined license, or a limited work authorization. The proposed exemption would allow USO to proceed with the driving of piles, subsurface preparation, placement of backfill, concrete, or permanent retaining walls within an excavation, installation of foundations, or the in-place assembly, erection, fabrication, or testing of SSCs classified as NST the failure of which could cause the reactor to scram or actuation of a safety-related system that are located on the proposed EI while the NRC staff continues its review of the Kemmerer 1 CP application without receiving a limited work authorization.

In its exemption request, TerraPower stated that the Natrium design incorporates independence of operation between the SSCs of the NI and the SSCs of the EI. The exemption request further indicated that the Kemmerer 1 CP application describes the overall configuration of Kemmerer 1 and the independence of the EI and the NI. TerraPower additionally provided information in the exemption request on the design features that enable the independence of the NI and EI. The EI is physically separate from the NI, except for an interface between the NI and EI provided at the sodium-salt heat exchangers (SHXs), which transfer heat from the NI's intermediate heat transport system (IHT) to the EI's thermal salt system (TSS). Pages 3 and 4 of the exemption request in letter dated February 28, 2025, also summarize several other features that support the independence of the NI and EI.

The NRC staff reviewed the design described in the exemption and the proposed PSAR and found it to be consistent with the design features supporting NI-EI independence discussed in NATD-LIC-RPRT-0001-A and the associated NRC staff SE.

These features include metallic fuel, primary and intermediate heat transport systems (PHT and IHT, respectively) that enable heat to be passively removed from the reactor core and provide thermal inertia that insulates the reactor core from EI transients, control and protection system functions that enable the NI to respond independently to transients, and a thermal salt storage system which provides thermal inertia to insulate the core from EI transients. As discussed in the NRC staff's SE on NATD-LIC-RPRT-0001-A, this design gives the NI "the capacity to effectively respond safely to transients, regardless of whether they are initiated on the NI or EI, using only NI systems." NATD-LIC-RPRT-0001-A and the associated NRC staff SE also clarify that most EI SSC failures would have no impact on the NI because of the salt system. Failures in the salt system would be initially observed on the NI as an increase in intermediate heat transport system temperature. The thermal inertia provided by the IHT and PHT is such that there is time to initiate a non-safety related reactor runback based on conditions on the NI. The runback automatically reduces reactor power and flow in a controlled manner, potentially avoiding a scram. The safety margins of the reactor fuel, the thermal inertia of the PHT, and the passive residual heat removal mechanisms are such that scrams are benign compared to the light water reactors that comprised the operating fleet at the time the language in 10 CFR 50.10(a)(1)(iv) was adopted. Consequently, the NRC staff determined that even though failure of EI SSCs could cause a reactor scram and, in the process, certain safety-related systems to actuate, failure of EI SSCs would not have a significant effect on the safety of the reactor. Further, there are no NST SSCs located on the EI the failure of which could cause a safety-related system to actuate outside of those that would actuate as part of the event sequence leading to a reactor scram.

As discussed in the exemption request, TerraPower used the risk-informed and performance-based process described in NEI 18-04, Revision 1 to classify SSCs

according to their safety significance. The result of this process is one of three safety classifications – safety-related (SR), non-safety-related with special treatment (NSRST), and NST. SR SSCs mitigate the consequences of design basis events and design basis accidents that only rely on SR SSCs or prevent the frequency of certain beyond design basis events from increasing above certain thresholds. NSRST SSCs are those non-SR SSCs that, among other things, are relied on to perform risk-significant functions, make significant contributions to meeting the cumulative risk metrics, or are relied on to perform functions requiring special treatment for defense-in-depth. As discussed in RG 1.233, “safety-significant SSCs include all those SSCs classified as SR or NSRST.” RG 1.233 further notes that the staff expects that SSCs that “provide essential support… for SR or NSRST SSCs will be classified in a manner consistent with the higher-level function.” Plant SSCs that are neither SR nor NSRST are NST; as such, NST SSCs do not perform safety- or risk-significant functions, do not significantly contribute to integrated risk measures, are not needed for adequate defense-in-depth, and do not provide essential support for any other SSCs that do perform those functions.

The proposed exemption would allow the driving of piles, subsurface preparation, placement of backfill, concrete, or permanent retaining walls within an excavation, installation of foundations, or the in-place assembly, erection, fabrication or testing of SSCs classified as NST the failure of which could cause the reactor to scram or actuation of a safety-related system that are located on the proposed EI while the NRC staff continues its review of the Kemmerer 1 CP application without receiving a limited work authorization. As discussed previously, EI SSCs classified as NST are not needed to bring the plant to a safe condition following a plant transient, whether it occurs on the EI or NI, and failure of these SSCs would not be expected to significantly affect the safety of the plant. Also, NST SSCs are not safety- or risk-significant, do not contribute significantly to integrated risk measures, are not needed for defense-in-depth purposes,

and do not provide essential support for SR or NSRST SSCs. Additionally, the Kemmerer 1 CPA includes SSC safety classifications that are currently under review by the staff. Should the NRC staff identify through the review process that the driving of piles, subsurface preparation, placement of backfill, concrete, or permanent retaining walls within an excavation, installation of foundations, or in-place assembly, erection, fabrication, or testing was conducted for any SSCs that were inappropriately classified as NST, such instances would be referred for enforcement action. In the NRC staff's engineering judgment, based on the proposed design of the EI as discussed previously, any misclassified EI SSCs would likely not be considered risk-significant and therefore would not be expected to affect this analysis or cause a cascading effect on other SSCs' classifications.

For these reasons, the staff concluded that there is no undue risk to public health and safety in allowing the driving of piles, subsurface preparation, placement of backfill, concrete, or permanent retaining walls within an excavation, installation of foundations, or the in-place assembly, erection, fabrication or testing of SSCs classified as NST the failure of which could cause a reactor scram or actuation of a safety-related system that are located on the proposed EI prior to receipt of a CP.

C. Exemption would be Consistent with Common Defense and Security

The request would exempt the driving of piles, subsurface preparation, placement of backfill, concrete, or permanent retaining walls within an excavation, installation of foundations, or in-place assembly, erection, fabrication, or testing of SSCs classified as NST the failure of which could cause a reactor scram or actuation of a safety-related system that are located on the proposed EI from the 10 CFR 50.10(a)(1)(iv) definition of construction. None of these SSCs are associated with defense or security of Kemmerer 1. Therefore, common defense and security are not impacted by this exemption. Consequently, this exemption is consistent with the

common defense and security.

D. Special Circumstances are Present in the Exemptions

Special circumstances, in accordance with 10 CFR 50.12(a)(2)(iii), are present whenever "[c]ompliance [with a regulation] would result in undue hardship or other costs that are significantly in excess of those contemplated when the regulation was adopted, or that are significantly in excess of those incurred by others similarly situated." Without this exemption, USO would not be able to proceed with the driving of piles, subsurface preparation, placement of backfill, concrete, or permanent retaining walls within an excavation, installation of foundations, or in-place assembly, erection, fabrication, or testing of SSCs classified as NST that meet the criteria in 10 CFR 50.10(a)(1)(iv) and are located on the proposed EI until the NRC staff approved a CP for Kemmerer 1, should approval of the application be the appropriate outcome of the NRC staff's review. In its supplement letter dated April 7, 2025, TerraPower stated that delay of construction of EI NST SSCs within the scope of the exemption would result in substantial schedule delays for the Natrium Demonstration Project. TerraPower further stated that a delay in the construction of EI NST SSCs within the scope of this exemption until the projected date for issuance of the CP would result in substantial costs due to the resulting delays in construction and commercial operation. Therefore, the NRC staff has determined that special circumstances exist in this case because compliance with a regulation would result in undue hardship.

E. Commission Consideration of Factors in 50.12(b)

For exemptions permitting the conduct of activities prior to the issuance of a CP prohibited by 10 CFR 50.10, the Commission may grant the exemption upon considering and balancing four factors. The NRC staff considered the balancing factors for granting such an exemption and its evaluation is documented in the environmental assessment (EA) that is associated with this exemption. The staff made a finding of no significant

impact.

F. Expiration

This exemption expires upon issuance of a construction permit to USO for Kemmerer 1.

G. Environmental Considerations

In accordance with 10 CFR 51.21, the NRC has prepared an EA that analyzes the environmental effects of the proposed action. The NRC staff determined that the granting of these exemptions will not have a significant effect on the quality of the human environment. Based on the results of the EA and in accordance with 10 CFR 51.31(a), the NRC has prepared a finding of no significant impact for the proposed exemption. That EA and FONSI were published in the Federal Register on May 7, 2025 (90 FR 19322) .

IV.Conclusions

Accordingly, the Commission has determined that, pursuant to 10 CFR 50.12 the exemption is authorized by law, will not present an undue risk to the public health and safety, and is consistent with the common defense and security. Also, special circumstances are present. Therefore, the Commission hereby grants USO a one-time exemption from the definition of construction in 10 CFR 50.10(a)(1)(iv) for the proposed Kemmerer 1. Issuance of this exemption shall not be deemed to constitute a commitment to issue a CP to USO for the proposed Kemmerer 1. In addition, per 10 CFR 50.12, during the period of this exemption, any activities conducted shall be carried out in a manner that will minimize or reduce their environmental impact.

The exemption is effective on May 7, 2025.

V. Availability of Documents

The documents identified in the following table are available to interested persons through ADAMS, as indicated.

DOCUMENT DESCRIPTION	ADAMS ACCESSION NO.
Submittal of the Construction Permit Application for the Natrium Reactor Plant, Kemmerer Power Staton Unit 1 dated March 28, 2024	ML24088A059 (package)
Supplement to Construction Permit Application for the Natrium Reactor Plant, Kemmerer Power Staton Unit 1 Regarding Agreement between US SFR Owner, LLC and TerraPower, LLC, dated May 2, 2024	ML24123A242
Supplement to Construction Permit Application for the Natrium Reactor Plant, Kemmerer Power Staton Unit 1 Regarding Fitness-for-Duty and Security Clarifying Information, dated May 2, 2024	ML24123A243
Supplement to Construction Permit Application for the Natrium Reactor Plant, Kemmerer Power Staton Unit 1 Regarding Materials of Construction Clarifying Information, dated May 9, 2024	ML24130A181
Acceptance for Docketing of Kemmerer Power Station Unit 1 Construction Permit Application by US SFR Owner, LLC dated May 21, 2024	ML24135A109
Nuclear Energy Institute 18-04, Revision 1, “Risk-Informed Performance-Based Technology Inclusive Guidance for Non-Light Water Reactor Licensing Basis Development,” dated August 2019	ML19241A336
Regulatory Guide 1.233, “Guidance for a Technology-Inclusive, Risk-Informed, and Performance-Based Methodology to inform the Licensing Basis and Content of Applications for Licenses, Certifications, and Approvals for non-light-water Reactors” dated June 2020	ML20091L698
TerraPower Topical Report NATD-LIC-RPRT-0001-A, Revision 0, “Regulatory Management of Natrium Nuclear Island and Energy Island Design Interfaces,” dated January 11, 2024	ML24011A321
NRC Staff Safety Evaluation for TerraPower Topical Report NATD-LIC-RPRT-0001-A, Revision 0, “Regulatory Management of Natrium Nuclear Island and Energy Island Design Interfaces,” dated September 28, 2023	ML23257A258
Exemption Request Associated with Construction of the Natrium Energy Island dated September 9, 2024	ML24253A023
Exemption Request and Application of Topical Report NATD-LIC-RPRT-0001-A for Construction of the Natrium Energy Island at Kemmerer Unit 1 dated February 28, 2025	ML25059A093
Supplement to Exemption Request and Application of Topical Report NATD-LIC-RPRT-0001-A for Construction of the Natrium Energy Island at Kemmerer Unit 1 dated April 7, 2025	ML25097A132

Withdrawal of Exemption Request from 10 CFR 51.4 Definition of Construction for Construction of the Natrium Energy Island at Kemmerer Unit 1 dated April 29, 2025	ML25119A205
Environmental Assessment and Finding of No Significant Impact for the Exemption Request for Construction of the Natrium Energy Island at Kemmerer Unit 1	ML25119A332

Dated: May 7, 2025

For the Nuclear Regulatory Commission.

/RA/

Jeremy Bowen, Director,
Division of Advanced Reactors and
Non-power Production and Utilization
Facilities,
Office of Nuclear Reactor Regulation.