

**ENCLOSURE 4**

**Regulatory Exemptions**

**Public**



# Kemmerer Power Station Unit 1

## Regulatory Exemptions

US SFR Owner, LLC, a wholly owned subsidiary of TerraPower, LLC



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## TABLE OF CONTENTS

1	HIGH-ASSAY LOW-ENRICHED URANIUM FUEL .....	4
1.1	Introduction.....	4
1.2	Regulatory Requirements.....	4
1.3	Exemption Request .....	5
1.4	Basis for Exemption.....	5
1.5	Conclusion.....	7
2	ECCS ANALYSIS.....	7
2.1	Introduction.....	7
2.2	Regulatory Requirements.....	7
2.3	Exemption Request .....	8
2.4	Basis for Exemption.....	8
2.5	Conclusion.....	9
3	MAINTENANCE RULE.....	10
3.1	Introduction.....	10
3.2	Regulatory Requirements.....	10
3.3	Exemption Request .....	10
3.4	Basis for Exemption.....	11
3.5	Conclusion.....	13
4	FINANCIAL QUALIFICATIONS.....	13
4.1	Introduction.....	13
4.2	Regulatory Requirements.....	13
4.3	Exemption Request .....	15
4.4	Basis for Exemption.....	16
4.5	Conclusion.....	18
5	REFERENCES.....	19
6	ACRONYMS.....	20

US SFR Owner, LLC (USO), a wholly owned subsidiary of TerraPower, LLC, has identified four exemption requests associated with 10 CFR 50 regulations that are required to support the Kemmerer Unit 1 construction permit application (CPA) based on the Natrium design. In accordance with 10 CFR 50.12(a)(1), the requested exemptions are authorized by law, will not present an undue risk to the public health and safety, and are consistent with common defense and security. In accordance with 10 CFR 50.12(a)(2), one or more special circumstances are present that directly relate to each requested exemption. The technical bases for these exemption requests are supported, in part, by the preliminary safety analysis report (PSAR) provided in Enclosure 2 of the USO CPA. The following exemption requests are included in this enclosure:

- High-Assay Low-Enriched Uranium (HALEU) Fuel (10 CFR 50.68(b)(7))
- Emergency Core Cooling System (ECCS) Analysis (10 CFR 50.34(a)(4) and 10 CFR 50.34(b)(4))
- Maintenance Rule (10 CFR 50.65(b))
- Financial Qualifications (10 CFR 50.33(f) and 10 CFR 50 Appendix C)

## 1 HIGH-ASSAY LOW-ENRICHED URANIUM FUEL

### 1.1 Introduction

The Natrium design includes HALEU fuel with uranium enrichment that is higher than that specified in 10 CFR 50.68(b)(7). See PSAR Section 7.1.1 and Topical Report NAT-2806 (Reference 1) for a description of the reactor fuel. This exemption request would increase the nominal U-235 enrichment identified in 10 CFR 50.68(b)(7) from 5 weight percent to less than 20 weight percent to account for the use of HALEU fuel. An increase of the nominal U-235 enrichment does not alter the underlying purpose of 10 CFR 50.68(b) for the Natrium design.

### 1.2 Regulatory Requirements

The regulations of 10 CFR 50.68(b) require compliance with certain regulatory provisions in lieu of maintaining a criticality monitoring system:

*10 CFR 50.68(b): Each licensee shall comply with the following requirements in lieu of maintaining a monitoring system capable of detecting a criticality as described in 10 CFR 70.24:*

*(1) Plant procedures shall prohibit the handling and storage at any one time of more fuel assemblies than have been determined to be safely subcritical under the most adverse moderation conditions feasible by unborated water.*

*(2) The estimated ratio of neutron production to neutron absorption and leakage ( $k$ -effective) of the fresh fuel in the fresh fuel storage racks shall be calculated assuming the racks are loaded with fuel of the maximum fuel assembly reactivity and flooded with unborated water and must not exceed 0.95, at a 95 percent probability, 95 percent confidence level. This evaluation need not be performed if administrative controls and/or design features prevent such flooding or if fresh fuel storage racks are not used.*

*(3) If optimum moderation of fresh fuel in the fresh fuel storage racks occurs when the racks are assumed to be loaded with fuel of the maximum fuel assembly reactivity and filled with low-density hydrogenous fluid, the  $k$ -effective corresponding to this optimum moderation must not exceed 0.98, at a 95 percent probability, 95 percent confidence level. This*

*evaluation need not be performed if administrative controls and/or design features prevent such moderation or if fresh fuel storage racks are not used.*

*(4) If no credit for soluble boron is taken, the  $k$ -effective of the spent fuel storage racks loaded with fuel of the maximum fuel assembly reactivity must not exceed 0.95, at a 95 percent probability, 95 percent confidence level, if flooded with unborated water. If credit is taken for soluble boron, the  $k$ -effective of the spent fuel storage racks loaded with fuel of the maximum fuel assembly reactivity must not exceed 0.95, at a 95 percent probability, 95 percent confidence level, if flooded with borated water, and the  $k$ -effective must remain below 1.0 (subcritical), at a 95 percent probability, 95 percent confidence level, if flooded with unborated water.*

*(5) The quantity of SNM, other than nuclear fuel stored onsite, is less than the quantity necessary for a critical mass.*

*(6) Radiation monitors are provided in storage and associated handling areas when fuel is present to detect excessive radiation levels and to initiate appropriate safety actions.*

*(7) The maximum nominal U-235 enrichment of the fresh fuel assemblies is limited to five (5.0) percent by weight.*

*(8) The FSAR is amended no later than the next update which § 50.71(e) of this part requires, indicating that the licensee has chosen to comply with § 50.68(b).*

### 1.3 Exemption Request

Pursuant to 10 CFR 50.12, USO requests an exemption to increase the U-235 enrichment identified in 10 CFR 50.68(b)(7) to less than 20 percent by weight as follows:

*(7) The maximum nominal U-235 enrichment of the fresh fuel assemblies is limited to less than twenty (20) percent by weight.*

### 1.4 Basis for Exemption

The fuel, with nominal U-235 enrichment of less than 20 percent by weight as stated in Topical Report NAT-2806, does not create the potential for accidental criticality. As discussed in PSAR Section 3.14, a criticality analysis of the Natrium design will demonstrate fuel storage and handling to be safely subcritical in compliance with the calculational analytical methods required by 10 CFR 50.68(b)(2) through (4).

This exemption request is consistent with Alternative 3 of the “Increased Enrichment of Conventional and Accident Tolerant Fuel Designs for Light-Water Reactors Regulatory Basis” (Reference 2) because the requested exemption preserves safety through continued compliance with 10 CFR 50.68(b)(2) and (b)(4)  $k_{\text{eff}}$  limits.

This exemption request is consistent with proposed paragraph 10 CFR 53.440(m)(2)(i) of SECY-23-0021 (Reference 3) and SRM-SECY-23-0021 (Reference 4) which state that criticality accident requirements may be satisfied by “[d]emonstrating the sub-criticality of SNM, except when it is inside the reactor and the reactor is being operated, by maintaining  $k$ -effective below 0.95 at a 95 percent probability, 95 percent confidence level, under conditions that maximize

reactivity for the applicable storage and handling configurations,” consistent with the requirements of 10 CFR 50.68(b)(2) and 10 CFR 50.68(b)(4).

As discussed in PSAR Section 5.3, Principal Design Criterion (PDC) 62 requires that criticality in the fuel storage and handling system be prevented by physical systems or processes, preferably by the use of geometrically safe configurations. The design of the structures, systems, and components (SSCs) that provide fuel handling and storage comply with PDC 62 as discussed in PSAR Chapter 7.

Consistent with the discussion in “Criticality Accident Requirements Final Rule” (Reference 5) and “Criticality Accident Requirements Direct Final Rule” (Reference 6), the underlying purpose of 10 CFR 50.68(b) is to establish a set of reactor fuel conditions that preclude the need for criticality monitoring; that is, conditions that avoid the potential for inadvertent criticality. This is consistent with current rulemaking efforts (Reference 2) which states: “[t]he safety basis for allowing for this alternative compliance method [10 CFR 50.68(b)] is to passively maintain the special nuclear material storage area at an appropriately low keff [the ratio of neutron production to neutron absorption and leakage] to ensure sufficient margin to sub-criticality.” An increase of the U-235 enrichment, specified in 10 CFR 50.68(b)(7), to less than 20 percent by weight, can be accomplished without creating the potential for accidental criticality. The Natrium design prevents inadvertent criticality with sufficient margin to sub-criticality as specified in 10 CFR 50.68(b); therefore, the underlying purpose of 10 CFR 50.68(b) is met.

#### 1.4.1 Criteria of 10 CFR 50.12, Specific Exemptions

The exemption is authorized by law. The exemption is not inconsistent with the Atomic Energy Act of 1954 as amended or the Energy Reorganization Act of 1974 as amended. The language of the regulation was adopted at the discretion of the Nuclear Regulatory Commission, consistent with its statutory authority, and was not mandated by statute. The NRC has authority under 10 CFR 50.12 to grant exemptions from the requirements of this regulation.

The exemption will not present an undue risk to the public health and safety. The increase in nominal U-235 enrichment to less than 20 percent by weight will not create the potential for inadvertent criticality. A criticality analysis of the fuel, based on bounding assumptions, will demonstrate fuel storage and handling to be safely subcritical with sufficient margin to sub-criticality as specified in 10 CFR 50.68(b).

The requested exemption is consistent with the common defense and security. The requested exemption allows USO to demonstrate that there is no credible potential for accidental criticality instead of maintaining a criticality monitoring system, as such, the exemption does not affect the design, function, or operation of structures or plant equipment that are necessary to maintain the secure status of the plant. The requested exemption does not impact USO compliance with the requirements of 10 CFR 73, as such, the proposed exemption has no impact on plant security or safeguards procedures.

Special circumstances are present in that application of the regulation is not necessary to achieve the underlying purpose of the rule. The underlying purpose of 10 CFR 50.68(b) is to establish a set of reactor fuel assembly conditions that preclude the need for criticality monitoring; that is, conditions that avoid the potential for accidental criticality. An increase of



the U-235 enrichment to less than 20 percent by weight does not create the potential for accidental criticality within the Natrium design. This exemption request does not change the underlying purpose of 10 CFR 50.68(b).

Special circumstances are present in that compliance with the regulation would result in undue hardship. As described in SECY-21-0109 (Reference 7), for applicants that choose to adopt increased fuel enrichments, the requirements of 10 CFR 50.68 “could potentially provide for significant additional licensee burden without a comparable increase in [...] nuclear power plant (NPP) safety.”

## 1.5 Conclusion

The nominal U-235 enrichment identified in 10 CFR 50.68(b)(7) can be increased to a nominal U-235 enrichment of less than 20 percent by weight for the Natrium design and still meet the underlying purpose of 10 CFR 50.68(b). On this basis, and the details described above, USO requests an exemption from the requirement of 10 CFR 50.68(b)(7) as stated in Section 1.3.

## 2 ECCS ANALYSIS

### 2.1 Introduction

The requirements of 10 CFR 50.34(a)(4) and 10 CFR 50.34(b)(4) to perform an analysis and evaluation of ECCS cooling performance in accordance with 10 CFR 50.46 cannot be performed because the Natrium design is a sodium-cooled fast reactor (SFR), and the requirements of 10 CFR 50.46 are specific to light-water reactors (LWRs). This exemption request would remove the requirement to perform an analysis and evaluation in accordance with 10 CFR 50.46. Removal of this requirement does not alter the underlying purpose of 10 CFR 50.34(a)(4) and 10 CFR 50.34(b)(4) for the Natrium design.

### 2.2 Regulatory Requirements

The regulations of 10 CFR 50.34(a)(4) and 10 CFR 50.34(b)(4) require an analysis and evaluation of ECCS cooling performance in accordance with 10 CFR 50.46:

*10 CFR 50.34(a)(4): A preliminary analysis and evaluation of the design and performance of structures, systems, and components of the facility with the objective of assessing the risk to public health and safety resulting from operation of the facility and including determination of the margins of safety during normal operations and transient conditions anticipated during the life of the facility, and the adequacy of structures, systems, and components provided for the prevention of accidents and the mitigation of the consequences of accidents. Analysis and evaluation of ECCS cooling performance and the need for high point vents following postulated loss-of-coolant accidents must be performed in accordance with the requirements of § 50.46 and § 50.46a of this part for facilities for which construction permits may be issued after December 28, 1974.*

*10 CFR 50.34(b)(4): A final analysis and evaluation of the design and performance of structures, systems, and components with the objective stated in paragraph (a)(4) of this section and taking into account any pertinent information developed since the submittal of the preliminary safety analysis report. Analysis and evaluation of ECCS cooling performance following postulated*

*loss-of-coolant accidents shall be performed in accordance with the requirements of § 50.46 for facilities for which a license to operate may be issued after December 28, 1974.*

### 2.3 Exemption Request

Pursuant to 10 CFR 50.12, USO requests an exemption from the requirements of 10 CFR 50.34(a)(4) and 10 CFR 50.34(b)(4) to perform an analysis and evaluation of ECCS cooling performance in accordance with 10 CFR 50.46. The 10 CFR 50.34(a)(4) requirement to perform an evaluation of the need for high point vents as well as the first sentences of both 10 CFR 50.34(a)(4) and 10 CFR 50.34(b)(4) would not be impacted by the exemption request. The requested exemption would change the requirements of 10 CFR 50.34(a)(4) and 10 CFR 50.34(b)(4) for the Natrium design to read as follows:

*10 CFR 50.34(a)(4) exemption text: A preliminary analysis and evaluation of the design and performance of structures, systems, and components of the facility with the objective of assessing the risk to public health and safety resulting from operation of the facility and including determination of the margins of safety during normal operations and transient conditions anticipated during the life of the facility, and the adequacy of structures, systems, and components provided for the prevention of accidents and the mitigation of the consequences of accidents. Analysis and evaluation of the need for high point vents must be performed in accordance with the requirements of § 50.46a of this part for facilities for which construction permits may be issued after December 28, 1974.*

*10 CFR 50.34(b)(4) exemption text: A final analysis and evaluation of the design and performance of structures, systems, and components with the objective stated in paragraph (a)(4) of this section and taking into account any pertinent information developed since the submittal of the preliminary safety analysis report.*

### 2.4 Basis for Exemption

The regulations of 10 CFR 50.34(a)(4) and 10 CFR 50.34(b)(4) require, in part, an analysis in accordance with 10 CFR 50.46. The regulations of 10 CFR 50.46 provide acceptance criteria for ECCS analyses for LWRs. The LWR technology-specific regulations of 10 CFR 50.46 are not applicable to the Natrium design. The Natrium design removes heat from the core without reliance on injection of coolant into the reactor. Safety-related (SR) systems that provide core cooling functions include the Primary Heat Transport System (PHT) and the Reactor Air Cooling System (RAC) as described in PSAR Sections 7.1.3 and 7.2.1, respectively. Alternative means of core cooling are provided by systems such as the Intermediate Heat Transport System (IHT) and the Intermediate Air Cooling System (IAC) as described in PSAR Sections 7.1.4 and 7.2.2, respectively. The PSAR provides an analysis and evaluation of the design and performance of SSCs, in accordance with the first sentence of 10 CFR 50.34(a)(4) and 10 CFR 50.34(b)(4), which includes an analysis and evaluation of the core cooling systems performance.

The regulations of 10 CFR 50.34(a)(4) also require, in part, analysis in accordance with 10 CFR 50.46a. The regulations of 10 CFR 50.46a require high point vents if the accumulation of non-condensable gases would cause the loss of function of core cooling systems. As described in PSAR Section 7.1.3, based on an evaluation performed in accordance with the requirements of 10 CFR 50.34(a)(4) and 10 CFR 50.46a, high point vents are not required

because the accumulation of non-condensable gases does not cause the loss of function of core cooling systems.

The requirements of 10 CFR 50.34(a)(4) and 10 CFR 50.34(b)(4) to perform an analysis and evaluation of ECCS cooling performance in accordance with 10 CFR 50.46 cannot be performed because the regulations of 10 CFR 50.46 are not applicable to the Natrium design. Consistent with the “Emergency Core Cooling Systems Revisions to Acceptance Criteria Final Rule” (Reference 8), the underlying purpose of performing a 10 CFR 50.46 analysis is to demonstrate that the core cooling system will protect the nuclear reactor core. The underlying purpose of these requirements is met for the Natrium design via compliance with the first sentence of 10 CFR 50.34(a)(4) and 10 CFR 50.34(b)(4). USO demonstrates that the core cooling system will protect the nuclear reactor core by performing an analysis and evaluation of the design and performance of the SSCs in accordance with the first sentence of 10 CFR 50.34(a)(4) and 10 CFR 50.34(b)(4).

#### 2.4.1 Criteria of 10 CFR 50.12, Specific Exemptions

The exemption is authorized by law. The exemption is not inconsistent with the Atomic Energy Act of 1954 as amended or the Energy Reorganization Act of 1974 as amended. The language of the regulation was adopted at the discretion of the Nuclear Regulatory Commission, consistent with its statutory authority, and was not mandated by statute. The NRC has authority under 10 CFR 50.12 to grant exemptions from the requirements of this regulation.

The exemption will not present an undue risk to the public health and safety. The requirements of 10 CFR 50.34(a)(4) and 10 CFR 50.34(b)(4) to perform an analysis and evaluation of ECCS cooling performance in accordance with 10 CFR 50.46 cannot be performed because the regulations of 10 CFR 50.46 are not applicable to the Natrium design. An analysis and evaluation of the design and performance of core cooling systems is performed in accordance with first sentences of 10 CFR 50.34(a)(4) and 10 CFR 50.34(b)(4).

The requested exemption is consistent with the common defense and security. The exemption does not affect the design, function, or operation of structures or plant equipment that are necessary to maintain the secure status of the plant. The proposed exemption has no impact on plant security or safeguards procedures.

Special circumstances are present in that application of the regulation is not necessary to achieve the underlying purpose of the rule. The underlying purpose of the requirement to perform an analysis and evaluation of ECCS cooling performance in accordance with 10 CFR 50.46 (i.e., to demonstrate that the core cooling system will protect the nuclear reactor core) is met for the Natrium design via compliance with the first sentence of 10 CFR 50.34(a)(4) and 10 CFR 50.34(b)(4). The requested exemption does not change the underlying purpose of 10 CFR 50.34(a)(4) and 10 CFR 50.34(b)(4) for the Natrium design.

#### 2.5 Conclusion

The requirements of 10 CFR 50.34(a)(4) and 10 CFR 50.34(b)(4) to perform an analysis and evaluation of ECCS cooling performance in accordance with 10 CFR 50.46 are not relevant to the Natrium design. An analysis and evaluation of Natrium core cooling is performed in accordance with the first sentence of 10 CFR 50.34(a)(4) and 10 CFR 50.34(b)(4). On this

basis, and the details discussed above, USO requests an exemption from portions of 10 CFR 50.34(a)(4) and 10 CFR 50.34(b)(4) as stated in Section 2.3.

### 3 MAINTENANCE RULE

#### 3.1 Introduction

The USO CPA is based on the methodology described in Nuclear Energy Institute (NEI) 18-04 (Reference 9) as endorsed by Regulatory Guide 1.233, Revision 0, "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" (Reference 10). The SSC classification process identified in NEI 18-04 uses a risk-informed performance-based process to determine the safety significance of SSCs. This exemption request limits the maintenance rule scope to SR and non-safety-related with special treatment (NSRST) SSCs to align with the licensing basis of the Sodium reactor. This exemption request does not alter the underlying purpose of 10 CFR 50.65(b).

#### 3.2 Regulatory Requirements

The requirements of 10 CFR 50.65(b) define the scope of monitoring program activities for the maintenance rule:

*10 CFR 50.65(b) The scope of the monitoring program specified in paragraph (a)(1) of this section shall include safety related and nonsafety related structures, systems, and components, as follows:*

*(1) Safety-related structures, systems and components that are relied upon to remain functional during and following design basis events to ensure the integrity of the reactor coolant pressure boundary, the capability to shut down the reactor and maintain it in a safe shutdown condition, or the capability to prevent or mitigate the consequences of accidents that could result in potential offsite exposure comparable to the guidelines in Sec. 50.34(a)(1), Sec. 50.67(b)(2), or Sec. 100.11 of this chapter, as applicable.*

*(2) Nonsafety related structures, systems, or components:*

*(i) That are relied upon to mitigate accidents or transients or are used in plant emergency operating procedures (EOPs); or*

*(ii) Whose failure could prevent safety-related structures, systems, and components from fulfilling their safety-related function; or*

*(iii) Whose failure could cause a reactor scram or actuation of a safety-related system.*

#### 3.3 Exemption Request

Pursuant to 10 CFR 50.12, USO requests an exemption to exclude non-safety-related with no special treatment (NST) SSCs from the scope of the requirements of 10 CFR 50.65. The requested exemption would result in the following 10 CFR 50.65(b) requirements within the maintenance rule:

*10 CFR 50.65(b) The scope of the monitoring program specified in paragraph (a)(1) of this section shall include safety-related (SR) and non-safety-related with special treatment (NSRST)*

*structures, systems, and components, classified in accordance with NEI 18-04 "Risk-Informed Performance-Based Technology Inclusive Guidance for Non-Light Water Reactor Licensing Basis Development" as endorsed by 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."*

### 3.4 Basis for Exemption

The underlying purpose for the scoping requirements of 10 CFR 50.65(b), as described in the "Monitoring the Effectiveness of Maintenance at Nuclear Power Plants Final Rule" (Reference 11) is to include "SSCs [...] related to the protection of public health and safety." To clarify this, the discussion in the "Limited Work Authorizations [LWA] for Nuclear Power Plants Final Rule" (Reference 12) is directly applicable. The LWA final rule states that the NRC chose to base the criteria in 10 CFR 50.10(a)(1)(i) through (iv) on the scoping criteria used in 10 CFR 50.65(b). The underlying purpose for the scoping of the LWA rule is described as those SSCs "that have a reasonable nexus to radiological health and safety and/or common defense and security." The underlying purpose of the maintenance rule and the LWA rule scoping requirements are consistent, although the language of the LWA final rule provides more clarity.

The requirements of 10 CFR 50.65(b) deterministically define which SSCs have a reasonable nexus to radiological health and safety. In contrast, the SSC classification process identified in NEI 18-04 and endorsed via Regulatory Guide 1.233 uses a risk-informed performance-based process to determine the safety significance of SSCs. NEI 18-04 incorporates deterministic and PRA insights to classify which SSCs have a reasonable nexus to radiological health and safety (i.e., to classify which SSCs are safety-significant).

The USO CPA is based on the methodology described in NEI 18-04 and Regulatory Guide 1.233. When applied to the Natrium design, the NEI 18-04 SR SSC classifications encompass the 10 CFR 50.2 SR SSC definition (i.e., all Natrium SSCs that are defined as SR in accordance with 10 CFR 50.2 are classified as SR via NEI 18-04 classifications). The NEI 18-04 SSC classification categories are defined as follows:

#### SR:

- SSCs selected by the designer from the SSCs that are available to perform the required safety functions (RSFs) to mitigate the consequences of design basis events (DBEs) to within the licensing basis event (LBE) frequency-consequence (F-C) Target, and to mitigate design basis accidents (DBAs) that only rely on the SR SSCs to meet the dose limits of 10 CFR 50.34 using conservative assumptions.
- SSCs selected by the designer and relied on to perform RSFs to prevent the frequency of beyond design basis events (BDBEs) with consequences greater than the 10 CFR 50.34 dose limits from increasing into the DBE region and beyond the F-C Target.

#### NSRST:

- Non-safety-related SSCs relied on to perform risk-significant functions. Risk-significant SSCs are those that perform functions that prevent or mitigate any LBE from exceeding

the F-C Target or make significant contributions to the cumulative risk metrics selected for evaluating the total risk from all analyzed LBEs.

- Non-safety-related SSCs relied on to perform functions requiring special treatment for defense-in-depth (DID) adequacy.

NST:

- All other SSCs (with no special treatment required).

Safety-significant SSCs include all those SSCs classified as SR or NSRST. None of the NST SSCs are classified as safety-significant.

In an effort to further define safety-significant SSCs, NEI 18-04 states:

The meaning of safety-significant SSC in this process is the same as that used in NRC regulations. The NRC glossary provides the following definition: "When used to qualify an object, such as a system, structure, component, or accident sequence, this term identifies that object as having an impact on safety, whether determined through risk analysis or other means, that exceeds a predetermined significance criterion."

Based on this description, it can be concluded that SSCs which are classified as safety-significant via NEI 18-04 are those SSCs which have a reasonable nexus to radiological health and safety. In other words, SSCs classified as NST do not have a reasonable nexus to radiological health and safety. USO can meet the underlying purpose of 10 CFR 50.65(b) by only including SR and NSRST SSCs within the scope of this regulation.

The SSC classification process described in NEI 18-04 "makes use of the concept of SSC safety significance that is associated with 10 CFR 50.69." Safety significant function is defined in 10 CFR 50.69 as "a function whose degradation or loss could result in a significant adverse effect on defense-in-depth, safety margin, or risk." 10 CFR 50.69 describes four Risk-Informed Safety Classes (RISCs). Table 4-1 of NEI 18-04 identifies that applying SR and NSRST SSCs to maintenance rule scope is "consistent with 10 CFR 50.69 for RISC-1 (SR) and RISC-2 (NSRST) SSCs," as 10 CFR 50.69 excludes RISC-3 and RISC-4 SSCs from maintenance rule scope.

Eliminating NST SSCs from the scope of SSCs that have a reasonable nexus to radiological health and safety is consistent with the 10 CFR Part 53 proposed rule (Reference 3 and Reference 4). The proposed 10 CFR 53.715 requirements limit the scope of the Part 53 maintenance rule program to SR and non-safety-related but safety-significant (NSRSS) SSCs. (Note that proposed Part 53 classifications of SR, NSRSS and non-safety-significant (NSS) are analogous to the NEI 18-04 classifications of SR, NSRST, and NST, respectively.) As such, under the 10 CFR Part 53 proposed rule, NST SSCs are not included in the scope of the maintenance rule.

#### 3.4.1 Criteria of 10 CFR 50.12, Specific Exemptions

The exemption is authorized by law. The exemption is not inconsistent with the Atomic Energy Act of 1954 as amended or the Energy Reorganization Act of 1974 as amended. The language of the regulation was adopted at the discretion of the Nuclear Regulatory Commission, consistent with its statutory authority, and was not mandated by statute. The

NRC has authority under 10 CFR 50.12 to grant exemptions from the requirements of this regulation.

The exemption will not present an undue risk to the public health and safety. NST SSCs do not have a reasonable nexus to radiological health and safety, therefore, eliminating the NST SSCs from the scope of 10 CFR 50.65(b) does not present an undue risk to the public health and safety.

The requested exemption is consistent with the common defense and security. The exemption does not affect the design, function, or operation of structures or plant equipment that are necessary to maintain the secure status of the plant. The proposed exemption has no impact on plant security or safeguards procedures.

Special circumstances are present in that application of the regulation is not necessary to achieve the underlying purpose of the rule. The underlying purpose for the scoping requirements of 10 CFR 50.65(b) is clarified in the LWA final rule (Reference 10) as those SSCs "that have a reasonable nexus to radiological health and safety and/or common defense and security." As stated above, the requested exemption is consistent with the common defense and security. Additionally, NST SSCs do not have a reasonable nexus to radiological health and safety. Therefore, the Natrium design can meet the underlying purpose of 10 CFR 50.65(b) without including NST SSCs within the scope of these regulations.

### 3.5 Conclusion

The Natrium design can meet the underlying purpose of 10 CFR 50.65(b) without incorporating NST SSCs into the scope of the maintenance rule because NST SSCs are not safety-significant and do not have a reasonable nexus to radiological health and safety. On this basis, and the details discussed above, USO requests an exemption from portions of 10 CFR 50.65(b) as stated in Section 3.3.

## 4 FINANCIAL QUALIFICATIONS

### 4.1 Introduction

The financial qualification standards of 10 CFR 50.33(f) and 10 CFR 50 Appendix C require detailed funding documentation for newly formed entities to support a CPA. This exemption request allows the use of the standard required for Part 70 applicants as described in 10 CFR 70.23(a)(5), specifically, that the applicant appears to be financially qualified. This exemption request is supported by a proposed construction permit license condition which requires that funding details are identified prior to the start of construction. This exemption request, consistent with the exemption granted within the South Texas Project (STP) Unit 3 Combined License No. NPF-097 (Reference 13), does not alter the underlying purpose of 10 CFR 50.33(f) and 10 CFR 50 Appendix C.

### 4.2 Regulatory Requirements

The financial qualification standards of 10 CFR 50.33(f) and 10 CFR 50 Appendix C require detailed funding documentation for newly formed entities, specifically:

*10 CFR 50.33(f) Except for an electric utility applicant for a license to operate a utilization facility of the type described in § 50.21(b) or § 50.22, information sufficient to demonstrate*

to the Commission the financial qualification of the applicant to carry out, in accordance with regulations in this chapter, the activities for which the permit or license is sought. As applicable, the following should be provided:

(1) If the application is for a construction permit, the applicant shall submit information that demonstrates that the applicant possesses or has reasonable assurance of obtaining the funds necessary to cover estimated construction costs and related fuel cycle costs. The applicant shall submit estimates of the total construction costs of the facility and related fuel cycle costs, and shall indicate the source(s) of funds to cover these costs.

[...]

(4) Each application for a construction permit, operating license, or combined license submitted by a newly-formed entity organized for the primary purpose of constructing and/or operating a facility must also include information showing:

(i) The legal and financial relationships it has or proposes to have with its stockholders or owners;

(ii) The stockholders' or owners' financial ability to meet any contractual obligation to the entity which they have incurred or proposed to incur; and

(iii) Any other information considered necessary by the Commission to enable it to determine the applicant's financial qualification.

[...]

10 CFR 50 Appendix C - A Guide for the Financial Data and Related Information Required to Establish Financial Qualifications for Construction Permits and Combined Licenses

[...]

## II. Applicants Which Are Newly Formed Entities

### A. Applications for Construction Permits or Combined Licenses

1. Estimate of construction costs. The information that will normally be required of applicants which are newly formed entities will not differ in scope from that required of established organizations. Accordingly, applicants should submit estimates as described above for established organizations.

2. Source of construction funds. The application should specifically identify the source or sources upon which the applicant relies for the funds necessary to pay the cost of constructing the facility, and the amount to be obtained from each. With respect to each source, the application should describe in detail the applicant's legal and financial relationships with its stockholders, corporate affiliates, or others (such as financial institutions) upon which the applicant is relying for financial assistance. If the sources of funds relied upon include parent companies or other corporate affiliates, information to support the financial capability of each such company or affiliate to meet its commitments to the applicant should be set forth in the



*application. This information should be of the same kind and scope as would be required if the parent companies or affiliates were in fact the applicant. Ordinarily, it will be necessary that copies of agreements or contracts among the companies be submitted.*

*As noted earlier in this appendix, an applicant which is a newly formed entity will normally not be in a position to submit the usual types of balance sheets and income statements reflecting the results of prior operations. The applicant should, however, include in its application a statement of its assets, liabilities, and capital structure as of the date of the application.*

*[...]*

#### 4.3 Exemption Request

Pursuant to 10 CFR 50.12, USO requests an exemption to use of the financial qualification standards required for Part 70 applicants in place of the requirements for newly formed entities that are identified in 10 CFR 50. The requested exemption would result in the following 10 CFR 50.33(f) and 10 CFR 50 Appendix C requirements for the USO CPA:

*10 CFR 50.33(f) Except for an electric utility applicant for a license to operate a utilization facility of the type described in § 50.21(b) or § 50.22, information sufficient to demonstrate to the Commission the financial qualification of the applicant to carry out, in accordance with regulations in this chapter, the activities for which the permit or license is sought. As applicable, the following should be provided:*

*(1) If the application is for a construction permit, the applicant shall submit information demonstrating that the applicant appears to be financially qualified to engage in the proposed activities in accordance with the regulations in 10 CFR 50. The applicant shall submit estimates of the total construction costs of the facility and related fuel cycle costs.*

*[...]*

*(4) Each application for a construction permit, operating license, or combined license submitted by a newly-formed entity organized for the primary purpose of constructing and/or operating a facility must include information demonstrating that the applicant appears to be financially qualified to engage in the proposed activities in accordance with the regulations in 10 CFR 50.*

*[...]*

*10 CFR 50 Appendix C - A Guide for the Financial Data and Related Information Required to Establish Financial Qualifications for Construction Permits and Combined Licenses*

*[...]*

#### *II. Applicants Which Are Newly Formed Entities*

##### *A. Applications for Construction Permits or Combined Licenses*

*1. Estimate of construction costs. The information that will normally be required of applicants which are newly formed entities will not differ in scope from that required of established organizations. Accordingly, applicants should submit estimates as described above for established organizations.*

*2. Source of construction funds. The applicant should provide information to demonstrate that the applicant appears to be financially qualified to engage in the proposed activities in accordance with the regulations in 10 CFR 50.*

*As noted earlier in this appendix, an applicant which is a newly formed entity will normally not be in a position to submit the usual types of balance sheets and income statements reflecting the results of prior operations. The applicant should, however, include in its application a statement of its assets, liabilities, and capital structure as of the date of the application.*

*[...]*

In support of this exemption request, USO proposes the following construction permit license condition:

*USO shall notify the NRC at least 60 days prior to its anticipated date of construction that this license condition has been fulfilled and that the following are available for inspection:*

*(i) An updated cost estimate.*

*(ii) Documentation justifying any material variances from the original cost estimate provided in the application; and*

*(iii) Documentation demonstrating that the licensee has secured financing to fund the updated cost estimate for the project. This documentation will include operative closing documents, and may include documented proof of parent and affiliate assurances, or capital from other sources (as required to close the financing) that reflect financing for the project.*

#### 4.4 Basis for Exemption

The underlying purpose of the financial qualification requirements for construction permits in 10 CFR 50.33(f) and 10 CFR 50 Appendix C is to prevent safety lapses resulting from underfunded projects during construction. As stated in the Final Safety Evaluation Report (FSER) for the South Texas Project, Units 3 and 4, Combined License Application (Reference 14):

*Financial qualification regulations are intended to protect public health and safety. Specifically, the objective is to prevent safety lapses caused by underfunding during the construction or operation of a nuclear power plant.*

As acknowledged in the STP Units 3 and 4 FSER, the staff has not found a direct correlation between an applicant's initial financial qualification (i.e., prior to commencing construction activities) and later safe construction practices or safe operating performance. The NRC directly assures that new reactor construction and operations are conducted safely and in accordance with the license and NRC regulations through the NRC's licensing, oversight, and inspection

processes. The requested exemption would not compromise public health and safety because the NRC maintains a number of programs and processes that more directly ensure safe plant construction and operation. These include detailed licensing review, construction oversight process, reactor oversight process, resident inspector program, operating experience program, vendor inspection program, and quality assurance inspection program. As such, financial qualifications that include detailed funding statements are not required for the CPA in order to meet the underlying purpose of the regulations.

The financial qualification standards required to be met for newly formed entities do not account for the limitations of data available at the time of construction permitting. For example, financial qualification for past applicants has not dependably accounted for actual costs of construction. As described in the STP Units 3 and 4 FSER, nuclear power plant construction companies have experienced substantial cost overruns, with the cost of construction vastly exceeding the construction cost estimates that were used to determine their financial qualification for the license. This is consistent with recent nuclear power plant construction activities. Considering that the preliminary cost estimates typically diverge significantly from actual costs, aligning a preliminary cost estimate with detailed funding assurances does not provide consequential financial qualification determinations. As acknowledged in the STP Units 3 and 4 FSER, "there is no evidence that cost overruns led to safety problems during construction." As such, financial qualifications that include detailed funding statements are not required for the CPA in order to meet the underlying purpose of the regulations.

The underlying purpose of the financial qualification requirements for construction permits in 10 CFR 50.33(f) and 10 CFR 50 Appendix C is to prevent safety lapses during construction from underfunded projects. The proposed license condition will ensure that construction of the project only proceed with adequate funding assured, therefore, the underlying purpose of the financial qualifications requirements in Part 50 are met prior to beginning construction.

#### 4.4.1 Criteria of 10 CFR 50.12, Specific Exemptions

The exemption is authorized by law. The exemption is not inconsistent with the Atomic Energy Act of 1954 as amended or the Energy Reorganization Act of 1974 as amended. The language of the regulation was adopted at the discretion of the Nuclear Regulatory Commission, consistent with its statutory authority, and was not mandated by statute. The NRC has authority under 10 CFR 50.12 to grant exemptions from the requirements of this regulation.

The exemption will not present an undue risk to the public health and safety. There is no correlation between an applicant's initial financial qualification (i.e., prior to commencing construction activities) and later safe construction practices or safe operating performance. Additionally, the license condition will ensure that construction of the project only proceed with adequate funding assured. Therefore, requiring a standard that the applicant appears to be financially qualified, in order to proceed with construction permitting, does not present an undue risk to the public health and safety.

The requested exemption is consistent with the common defense and security. The exemption does not affect the design, function, or operation of structures or plant equipment that are necessary to maintain the secure status of the plant. The proposed exemption has no impact on plant security or safeguards procedures.

*Controlled Document - Verify Current Revision*

Special circumstances are present in that application of the regulation is not necessary to achieve the underlying purpose of the rule. The underlying purpose of the financial qualification requirements for construction permits in 10 CFR 50.33(f) and 10 CFR 50 Appendix C is to prevent safety lapses during construction from underfunded projects. Because the license condition will ensure that construction of the project only proceed with adequate funding assured, the conditions satisfy the underlying purpose of the financial qualification requirements in Part 50.

#### 4.5 Conclusion

The construction permit can be issued without detailed funding documentation to support financial qualifications. Construction of the project will only proceed once adequate funding assured as required by the proposed license condition. On this basis, and the details described above, USO requests an exemption from the requirements of 10 CFR 50.33(f) and 10 CFR 50 Appendix C as stated in Section 4.3.

## 5 REFERENCES

1. TerraPower, "Fuel and Control Assembly Qualification," Topical Report NATD-FQL-PLAN-0004, Revision 0, January 25, 2023, ML23025A409.
2. U.S. NRC, "Increased Enrichment of Conventional and Accident Tolerant Fuel Designs for Light-Water Reactors, Regulatory Basis Document (RIN 3150-AK79)," NRC Docket ID: NRC-2020-0034, September 2023, ML23032A504.
3. U.S. NRC, "Proposed Rule: Risk-Informed, Technology-Inclusive Regulatory Framework for Advanced Reactors (RIN 3150-AK31)," SECY 23-0021, March 1, 2023, ML21162A093.
4. U.S. NRC, "Proposed Rule: Risk-Informed, Technology-Inclusive Regulatory Framework for Advanced Reactors (RIN 3150-AK31)," SRM-SECY-23-0021, March 4, 2024, ML24064A047
5. U.S. NRC, "Criticality Accident Requirements, Final Rule (RIN 3150-AF87)," 63 FR 63130, November 12, 1998.
6. U.S. NRC, "Criticality Accident Requirements, Direct Final Rule (RIN 3150-AF87)," 62 FR 63825, December 3, 1997.
7. U.S. NRC, "Rulemaking Plan on Use of Increased Enrichment of Conventional and Accident Tolerant Fuel Designs for Light-water Reactors," SECY 21-0109, December 20, 2021, ML21232A237.
8. U.S. NRC, "Emergency Core Cooling Systems Revisions to Acceptance Criteria, Final Rule," 53 FR 36004, September 16, 1988.
9. Nuclear Energy Institute, "Risk-Informed Performance-Based Technology Inclusive Guidance for Non-Light Water Reactor Licensing Basis Development," Technical Report NEI 18-04, Revision 1, August 2019, ML19241A336.
10. U.S. NRC, "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," Regulatory Guide 1.233, Revision 0, June 2020, ML20091L620.
11. U.S. NRC, "Monitoring the Effectiveness of Maintenance at Nuclear Power Plants Final Rule," 56 FR 31324, July 10, 1991.
12. U.S. NRC, "Limited Work Authorizations for Nuclear Power Plants Final Rule," 72 FR 57441, October 9, 2007.
13. U.S. NRC, "Combined License, South Texas Project Unit 3, Nuclear Innovation North America LLC, STP Nuclear Operating Company, NINA Texas 3 LLC, City of San Antonio Texas Acting by and Through the City Public Service Board, Docket No. 52-012, License No. NPF-097 (ML16033A020).
14. U.S. NRC, "Final Safety Evaluation Report (FSER) for the South Texas Project (STP), Units 3 and 4, Combined License Application," September 29, 2015, FSER Chapter 1 (ML15271A126).

**6 ACRONYMS**

BDBE	beyond design basis event
CPA	construction permit application
DBA	design basis accident
DBE	design basis event
DID	defense-in-depth
ECCS	Emergency Core Cooling System
F-C	frequency-consequence
HALEU	high-assay low-enriched uranium
IAC	Intermediate Air Cooling System
IHT	Intermediate Heat Transport System
LBE	licensing basis event
LWA	limited work authorization
LWR	light water reactor
NEI	Nuclear Energy Institute
NSRSS	non-safety-related but safety-significant
NSRST	non-safety-related with special treatment
NSS	non-safety-significant
NST	non-safety-related with no special treatment
PHT	Primary Heat Transport System
PSAR	preliminary safety analysis report
RAC	Reactor Air Cooling System
RISC	Risk-Informed Safety Class
RSF	required safety function
SFR	sodium-cooled fast reactor
SR	safety-related
SSC	structure, system, or component

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