



September 23, 2022

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U.S. Nuclear Regulatory Commission  
Washington, DC 20555-0001  
ATTN: Document Control Desk

**Subject:** TerraPower, LLC Regulatory Gap Analysis Report

This letter transmits the TerraPower, LLC (TerraPower) white paper titled, "Regulatory Gap Analysis Report." The report provides TerraPower's determination of the applicability of the regulations contained in Title 10 of the Code of Federal Regulations associated with the Natrium™ design, a TerraPower and GE-Hitachi technology, and includes a discussion on potential exemption requests.

TerraPower requests that the U.S. Nuclear Regulatory Commission (NRC) staff provide feedback by letter on topics for which additional discussion may be beneficial and the staff's observations on the conclusions presented in the white paper. The specific review schedule will be developed with TerraPower's NRC project manager; however, TerraPower requests that a nominal review duration of 6 months be considered.

This letter and enclosure make no new or revised regulatory commitments.

If you have any questions regarding this submittal, please contact Ryan Sprengel at [rsprengel@terrapower.com](mailto:rsprengel@terrapower.com) or (425) 324-2888.

Sincerely,

A handwritten signature in black ink that reads "Ryan Sprengel".

Ryan Sprengel  
License Application Development Manager  
TerraPower, LLC



Date: September 23, 2022  
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Enclosure: NATD-LIC-STDY-0002, Rev. 0, "Regulatory Gap Analysis Report"

cc: Mallecia Sutton, NRC

**ENCLOSURE**

**NATD-LIC-STDY-0002, Rev. 0, "Regulatory Gap Analysis Report"**



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			<b>Page:</b> 1 of 46
Approval			
Title	Name	Signature	Date
Originator, Licensing Engineer	Joseph LaPrad	Electronically Signed in Agile	9/22/2022
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## REVISION HISTORY

Revision No.	Effective Date	Affected Section(s)	Description of Change(s)
0	9/22/2022	All	Initial issuance.

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## EXECUTIVE SUMMARY

This report presents TerraPower, LLC's (TerraPower) determination of the applicability of the regulations contained in Title 10 of the *Code of Federal Regulations* as well as a discussion of potential exemption requests. The regulations are organized by their applicability and the report also contains potential exemptions related to the Natrium™ design, a TerraPower and GE-Hitachi technology. The information presented in this report will apply to future Natrium licensing efforts.

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**ACRONYMS**

<b>Acronym</b>	<b>Definition</b>
ASCE	American Society of Civil Engineers
BWR	Boiling Water Reactor
B&W	Babcock and Wilcox
CFR	Code of Federal Regulations
CPA	Construction Permit Application
DOE	Department of Energy
ECCS	Emergency Core Cooling System
EI	Energy Island
GDC	General Design Criteria
GEH	GE-Hitachi Nuclear Energy Americas, LLC
HALEU	High-Assay Low-Enriched Uranium
IHT	Intermediate Heat Transfer System
LWR	Light Water Reactor
NEI	Nuclear Energy Institute
NI	Nuclear Island
NRC	Nuclear Regulatory Commission
OLA	Operating License Application
PWR	Pressurized Water Reactor
RCS	Reactor Coolant System
SFR	Sodium Fast Reactor
SNM	Special Nuclear Material
SSC	Structure, System, and Component
STA	Shift Technical Advisor
TMI	Three Mile Island



## 1 INTRODUCTION

In October 2020, the Department of Energy (DOE) selected the Sodium Sodium Fast Reactor (SFR) design for the Advanced Reactor Demonstration Program. TerraPower, in partnership with GE-Hitachi Nuclear Energy Americas, LLC (GEH), is designing and will be licensing, constructing, and operating a single unit Sodium plant in Kemmerer, Wyoming.

TerraPower is using Part 50 of Title 10 of the *Code of Federal Regulations* (10 CFR) to design, license, construct, and operate the Sodium reactor. In addition, TerraPower is utilizing the methodology described in Revision 1 of Nuclear Energy Institute (NEI) 18-04, "Risk-Informed Performance-Based Technology Inclusive Guidance for Non-Light Water Reactor Licensing Basis Development" (Reference 1) 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" (Reference 2) for the selection of licensing basis events; classification of structures, systems, and components (SSCs); determination of special treatment for SSCs; and assessment of defense-in-depth adequacy.

In accordance with the Draft Interim Staff Guidance "Review of Risk-Informed, Technology-Inclusive Advanced Reactor Applications-Roadmap," (Reference 3) and as part of TerraPower's pre-application regulatory engagement plan, TerraPower is providing this Regulatory Gap Analysis report. TerraPower has reviewed the regulations in 10 CFR to determine those that are applicable and to establish the framework for the NRC review and approval of the Sodium design. Parts 1 through 199 of 10 CFR were reviewed and categorized as applicable or not applicable. Potential exemptions to regulatory requirements were also identified during this review. Regulations are decomposed at the part level, with greater detail and finer decomposition provided to those with a higher potential for design and regulatory implications. The information presented in this report will apply to future licensing efforts associated with the Sodium design.

## 2 DESIGN OVERVIEW

The Sodium reactor is a High-Assay Low-Enriched Uranium (HALEU) metal fueled, pool-type SFR that takes advantage of the simple and robust safety profile of SFRs to reduce the complexities associated with nuclear design and construction. Safety functions are made integral to the reactor vessel, and support equipment is moved to separate structures, resulting in a simplified reactor building. The superior heat transfer characteristics of sodium and low-pressure plant operations permit the use of compact and lightweight equipment, unlike in other reactor types cooled with pressurized water or gas.

The higher operating temperatures and constant thermal output provide an ideal match for thermal energy storage using molten salt, a mature and proven technology that is commercially deployed in the solar energy industry. Hot sodium from the reactor transfers its heat to an intermediate sodium loop and eventually to a molten salt loop, which carries heat from the Nuclear Island (NI) to the Energy Island (EI) where it can be stored, converted into electricity, or used for industrial process heating. This design architecture minimizes the size of the NI and allows the reactor to operate at constant power, while the EI meets variable energy demands. The rating for the Sodium reactor will be 840MW thermal. The EI will have the capability to produce up to 500MW electric.

The Sodium reactor was developed using insights from decades of research, design, and development leveraging the legacy of 40 reactor-years from the Experimental Breeder Reactor-II and Fast Flux Test Facility. Insights were also gained from more recent designs such as the GEH PRISM technology and TerraPower's Traveling Wave Reactor technology. Previous SFR operating experience has demonstrated that the SFR technology can passively accommodate severe transients which challenge traditional Light Water Reactor (LWR) technology. These

inherent safety characteristics are leveraged in the Natrium design to reduce the quantity of safety-related SSCs.

The EI was designed specifically with energy storage to allow the plant to vary its supply of energy provided based on overall grid conditions. This feature allows the Natrium design to provide a utility-scale carbon-free solution that can make a meaningful impact on efforts to mitigate climate change and complement the increased use of renewable energy technology (e.g., solar, wind).

The reactor operates at near atmospheric pressure, circulating sodium through its core by pumps. Heat is transferred from the hot primary sodium pool through the intermediate sodium piping loop by intermediate heat exchangers, which are located inside the reactor vessel. The Intermediate Heat Transfer System (IHT) uses IHT pumps to move sodium through the intermediate heat exchangers, via piping penetrations running through the reactor vessel head, to the sodium/salt heat exchangers. The sodium/salt heat exchangers and IHT pumps are located in the reactor auxiliary building. Cold salt is pumped from the thermal salt storage cold tank through the sodium/salt heat exchangers and is returned as hot salt back to the thermal salt storage hot tank. The thermal salt storage hot tank serves as thermal energy storage and is located on the EI.

The salt stored in the thermal salt storage hot tank is then used to generate steam for use in commercially available steam turbine generators or industrial process heating. This is accomplished by pumping the hot salt from the thermal salt storage hot tank through the steam generators and returning the salt to the thermal salt storage cold tank. The steam generator converts water into steam by passing the hot molten salt through an economizer (water preheater), evaporator, superheater, and reheater and provides that steam to the turbine/generator. This technology is essentially the same as molten salt systems used in the concentrated solar power industry except the heat source is the Natrium reactor.

The use of salt storage tanks provides operational flexibility and allows the Natrium reactor to operate independently of the steam turbine. The duty cycle of the reactor is low because it is isolated from grid demand changes. This enables the NI to operate at 100 percent, 24/7 at a capacity factor greater than 90 percent. Meanwhile, this operational flexibility allows the EI to adjust power output to meet real-time grid demands.

### 3 REGULATORY ANALYSIS METHODOLOGY

#### 3.1 Scope

10 CFR Parts 1 through 199 were reviewed, excluding portions which are reserved and contain no information.

#### 3.2 Methodology

Four initial categories were developed to classify the regulations based on their applicability and design implications. These categories are outlined below.

- **Applicable with design implications-** regulations that apply to the Natrium design and have design implications.
- **Applicable with entry condition-** regulations that apply to the Natrium design but require an entry condition be met. An entry condition is a specific technology, SSC, or functionality that the regulation references. As the Natrium design progresses, these regulations will be re-classified to one of the other categories based on whether the Natrium design meets the entry conditions.

- **Applicable with no design implications-** regulations that apply to the Natrium design and are programmatic or administrative in nature and do not have design implications.
- **Not applicable-** regulations that do not apply to the Natrium design (e.g., regulations written for a specific reactor type, application process, or date range).

The 10 CFR Parts were reviewed at three different levels of detail. Part 50 was reviewed sentence-by-sentence. Parts 19, 20, 51, 70, 71, 73, 74, and 100 were reviewed at the section level. The remainder of 10 CFR was reviewed at the part level. Regulation applicability is presented at the highest level (i.e., part, section, sub-section) determined to be consistent with the results of the review, with lower-level delineations used as needed. The identification of regulatory applicability or non-applicability is for a single-unit Natrium SFR in Kemmerer, WY, to be licensed under 10 CFR 50 via a construction permit application and an operating license application.

Following initial categorization, the Natrium design was compared to the applicable regulations to determine areas where the design does not conform. Regulations that the Natrium design cannot satisfy which will potentially require an exemption are identified in Section 4.3 of this report. Regulations determined to be not applicable were reviewed to identify whether the regulations contained underlying bases that are necessary to consider for a comprehensive licensing evaluation of the Natrium design (e.g., 10 CFR 50.62); while these regulations are not applicable, they may be useful for informing Natrium design and licensing efforts.

While it was important to identify design related regulations, for the purposes of this report the regulations are simply presented as either applicable or not applicable.

This Regulatory Gap Analysis was informed by the Updated NRC Staff Draft White Paper "Analysis of Applicability of NRC Regulations for Non-Light Water Reactors," (Reference 4). Following the final categorization, the analysis results were compared to the guidance in the referenced White Paper with differences identified in Section 4.4.

#### 4 REGULATORY ANALYSIS RESULTS

The categorization of the regulations is presented in tabular format and have been condensed to the highest level where all sub-parts have the same categorization.

##### 4.1 Applicable Regulations

<b>Table 1: Applicable Regulations</b>	
<b>10 CFR Part</b>	<b>Topic</b>
1	Statement of organization and general information
2	Agency rules of practice and procedure
7	Advisory committees
9	Public Records
10	Criteria and procedures for determining eligibility for access to restricted data or national security information or an employment clearance
11	Criteria and procedures for determining eligibility for access to or control over special nuclear material
12	Implementation of the Equal Access to Justice Act in agency proceedings
13	Program fraud civil remedies
15	Debt collection procedures
16	Salary offset procedures for collecting debts owed by Federal employees to the Federal government
19	Notices, instructions, and reports to workers: inspection and investigations
20.1001	Purpose
20.1002	Scope
20.1003	Definitions
20.1004	Units of radiation dose
20.1005	Units of radioactivity
20.1006	Interpretations
20.1007	Communications
20.1009	Information collection requirements: OMB approval
20.1101	Radiation protection programs
20.1201	Occupational dose limits for adults
20.1202	Compliance with requirements for summation of external and internal doses
20.1203	Determination of external dose from airborne radioactive material

*Controlled Document - Verify Current Revision***Table 1: Applicable Regulations**

<b>10 CFR Part</b>	<b>Topic</b>
20.1204	Determination of internal exposure
20.1206	Planned special exposures
20.1207	Occupational dose limits for minors
20.1208	Dose equivalent to an embryo/fetus
20.1301	Dose limits for individual members of the public
20.1302	Compliance with dose limits for individual members of the public
20.1401	General provisions and scope
20.1402	Radiological criteria for unrestricted use
20.1403	Criteria for license termination under restricted conditions
20.1404	Alternate criteria for license termination
20.1405	Public notification and public participation
20.1406	Minimization of contamination
20.1501	General
20.1502	Conditions requiring individual monitoring of external and internal occupational dose
20.1601	Control of access to high radiation areas
20.1602	Control of access to very high radiation areas
20.1701	Use of process or other engineering controls
20.1702	Use of other controls
20.1703	Use of individual respiratory protection equipment
20.1704	Further restrictions on the use of respiratory protection equipment
20.1705	Application for use of higher assigned protection factors
20.1801	Security of stored material
20.1802	Control of material not in storage
20.1901	Caution signs
20.1902	Posting requirements
20.1903	Exceptions to posting requirements

*Controlled Document - Verify Current Revision***Table 1: Applicable Regulations**

<b>10 CFR Part</b>	<b>Topic</b>
20.1904	Labeling containers
20.1905	Exemptions to labeling requirements
20.1906	Procedures for receiving and opening packages
20.2001	General requirements
20.2002	Method for obtaining approval of proposed disposal procedures
20.2003	Disposal by release into sanitary sewerage
20.2004	Treatment or disposal by incineration
20.2005	Disposal of specific wastes
20.2006	Transfer for disposal and manifests
20.2007	Compliance with environmental and health protection regulations
20.2008	Disposal of certain byproduct material
20.2101	General provisions
20.2102	Records of radiation protection programs
20.2103	Records of surveys
20.2104	Determination of prior occupational dose
20.2105	Records of planned special exposures
20.2106	Records of individual monitoring results
20.2107	Records of dose to individual members of the public
20.2108	Records of waste disposal
20.2110	Form of records
20.2201	Reports of theft or loss of licensed material
20.2202	Notification of incidents
20.2203	Reports of exposures, radiation levels, and concentrations of radioactive material exceeding the constraints or limits
20.2204	Reports of planned special exposures
20.2205	Reports to individuals of exceeding dose limits
20.2206	Reports of individual monitoring
20.2207	Reports of transactions involving nationally tracked sources

*Controlled Document - Verify Current Revision***Table 1: Applicable Regulations**

<b>10 CFR Part</b>	<b>Topic</b>
20.2301	Applications for exemptions
20.2302	Additional requirements
20.2401	Violations
20.2402	Criminal penalties
20 Appendix A	Assigned Protection Factors for Respirators
20 Appendix B	Annual Limits on Intake (ALIs) and Derived Air Concentrations (DACs) of Radionuclides for Occupational Exposure; Effluent Concentrations; Concentrations for Release to Sewerage
20 Appendix C	Quantities of Licensed Material Requiring Labeling
20 Appendix D	United States Nuclear Regulatory Commission Regional Offices
20 Appendix E	Nationally Tracked Source Thresholds
20 Appendix G	Requirements for Transfers of Low-Level Radioactive Waste Intended for Disposal at Licensed Land Disposal Facilities and Manifests
21	Reporting of defects and noncompliance
25	Access authorization
26	Fitness for Duty Programs
30	Rules of general applicability to domestic licensing of byproduct material
31	General domestic licenses for byproduct material
37	Physical protection of category 1 and category 2 quantities of radioactive material
39	Licenses and radiation safety requirements for well logging
40	Domestic licensing of source material
50.1	Basis, purpose, and procedures applicable
50.2	Definitions
50.3	Interpretations
50.4	Written communications
50.5	Deliberate misconduct
50.7	Employee protection
50.8	Information collection requirements: OMB approval
50.9	Completeness and accuracy of information

*Controlled Document - Verify Current Revision***Table 1: Applicable Regulations**

<b>10 CFR Part</b>	<b>Topic</b>
50.10	License required; limited work authorization
50.11	Exceptions and exemptions from licensing requirements
50.12	Specific exemptions
50.13	Attacks and destructive acts by enemies of the United States; and defense activities
50.20	Two classes of licenses
50.22	Class 103 licenses; for commercial and industrial facilities
50.23	Construction permits
50.30	Filing of application; oath or affirmation
50.31	Combining applications
50.32	Elimination of repetition
50.33	Contents of applications; general information
50.34(a)(1)	Preliminary safety analysis report
50.34(a)(1)(ii)	Preliminary safety analysis report
50.34(a)(2)	Preliminary safety analysis report
50.34(a)(3)	Preliminary safety analysis report
50.34(a)(4)	Preliminary safety analysis report
50.34(a)(5)	Preliminary safety analysis report
50.34(a)(6)	Preliminary safety analysis report
50.34(a)(7)	Preliminary safety analysis report
50.34(a)(8)	Preliminary safety analysis report
50.34(a)(9)	Preliminary safety analysis report
50.34(a)(10)	Preliminary safety analysis report
50.34(a)(12)	Preliminary safety analysis report
50.34(a)(13)	Preliminary safety analysis report
50.34(b)	Final safety analysis report
50.34(b)(1)	Final safety analysis report



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**Table 1: Applicable Regulations**

<b>10 CFR Part</b>	<b>Topic</b>
50.34(b)(2)	Final safety analysis report
50.34(b)(3)	Final safety analysis report
50.34(b)(4)	Final safety analysis report
50.34(b)(5)	Final safety analysis report
50.34(b)(6)(i)	Final safety analysis report
50.34(b)(6)(ii)	Final safety analysis report
50.34(b)(6)(iii)	Final safety analysis report
50.34(b)(6)(iv)	Final safety analysis report
50.34(b)(6)(v)	Final safety analysis report
50.34(b)(6)(vi)	Final safety analysis report
50.34(b)(7)	Final safety analysis report
50.34(b)(8)	Final safety analysis report
50.34(b)(9)	Final safety analysis report
50.34(b)(10)	Final safety analysis report
50.34(b)(11)	Final safety analysis report
50.34(b)(12)	Final safety analysis report
50.34(c)	Physical security plan
50.34(d)	Safeguards contingency plan
50.34(e)	Protection against unauthorized disclosure
50.34(f)	Additional TMI-related requirements
50.34(f)(1)	Additional TMI-related requirements
50.34(f)(1)(i)	Additional TMI-related requirements
50.34(f)(1)(xii)	Additional TMI-related requirements
50.34(f)(2)	Additional TMI-related requirements
50.34(f)(2)(i)	Additional TMI-related requirements
50.34(f)(2)(ii)	Additional TMI-related requirements
50.34(f)(2)(iii)	Additional TMI-related requirements

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**Table 1: Applicable Regulations**

<b>10 CFR Part</b>	<b>Topic</b>
50.34(f)(2)(iv)	Additional TMI-related requirements
50.34(f)(2)(v)	Additional TMI-related requirements
50.34(f)(2)(vii)	Additional TMI-related requirements
50.34(f)(2)(viii)	Additional TMI-related requirements
50.34(f)(2)(xviii)	Additional TMI-related requirements
50.34(f)(2)(xix)	Additional TMI-related requirements
50.34(f)(2)(xxv)	Additional TMI-related requirements
50.34(f)(2)(xxvi)	Additional TMI-related requirements
50.34(f)(2)(xxvii)	Additional TMI-related requirements
50.34(f)(2)(xxviii)	Additional TMI-related requirements
50.34(f)(3)	Additional TMI-related requirements
50.34(f)(3)(i)	Additional TMI-related requirements
50.34(f)(3)(ii)	Additional TMI-related requirements
50.34(f)(3)(iii)	Additional TMI-related requirements
50.34(f)(3)(v)(A)(2)	Additional TMI-related requirements
50.34(f)(3)(vii)	Additional TMI-related requirements
50.34(g)	Combustible gas control
50.34(i)	Mitigation of beyond-design-basis events
50.34a	Design objectives for equipment to control releases of radioactive material in effluents—nuclear power reactors
50.34a(a)	Design objectives for equipment to control releases of radioactive material in effluents—nuclear power reactors
50.34a(b)	Design objectives for equipment to control releases of radioactive material in effluents—nuclear power reactors
50.34a(c)	Design objectives for equipment to control releases of radioactive material in effluents—nuclear power reactors
50.35	Issuance of construction permits
50.36(a)	Technical specifications
50.36(b)	Technical specifications
50.36(c)	Technical specifications

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**Table 1: Applicable Regulations**

<b>10 CFR Part</b>	<b>Topic</b>
50.36(c)(1)(i)(A)	Safety limits, limiting safety system settings, and limiting control settings
50.36(c)(1)(ii)(A)	Safety limits, limiting safety system settings, and limiting control settings
50.36(c)(2)(i)	Limiting conditions for operation
50.36(c)(2)(ii)	Limiting conditions for operation
50.36(c)(3)	Surveillance requirements
50.36(c)(4)	Design features
50.36(c)(5)	Administrative controls
50.36(c)(6)	Decommissioning
50.36(c)(7)	Initial notification
50.36(c)(8)	Written Reports
50.36(d)(3)	Technical specifications
50.36a	Technical specifications on effluents from nuclear power reactors
50.36b	Environmental conditions
50.37	Agreement limiting access to Classified Information
50.38	Ineligibility of certain applicants
50.39	Public inspection of applications
50.40	Standards for Licenses, Certifications, and Regulatory Approvals
50.42	Additional standard for class 103 licenses
50.43(a)	Additional standards and provisions affecting class 103 licenses and certifications for commercial power
50.43(b)	Additional standards and provisions affecting class 103 licenses and certifications for commercial power
50.43(c)	Additional standards and provisions affecting class 103 licenses and certifications for commercial power
50.43(d)	Additional standards and provisions affecting class 103 licenses and certifications for commercial power
50.43(e)	Additional standards and provisions affecting class 103 licenses and certifications for commercial power
50.44(a)	Combustible gas control for nuclear power reactors
50.44(d)	Combustible gas control for nuclear power reactors
50.45(a)	Standards for construction permits, operating licenses, and combined licenses

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**Table 1: Applicable Regulations**

<b>10 CFR Part</b>	<b>Topic</b>
50.46a	Acceptance criteria for reactor coolant system venting systems
50.47	Emergency plans
50.48(a)	Fire protection
50.49(a)	Environmental qualification of electric equipment important to safety for nuclear power plants
50.49(b)	Environmental qualification of electric equipment important to safety for nuclear power plants
50.49(c)	Environmental qualification of electric equipment important to safety for nuclear power plants
50.49(d)	Environmental qualification of electric equipment important to safety for nuclear power plants
50.49(e)	Environmental qualification of electric equipment important to safety for nuclear power plants
50.49(f)	Environmental qualification of electric equipment important to safety for nuclear power plants
50.49(j)	Environmental qualification of electric equipment important to safety for nuclear power plants
50.49(l)	Environmental qualification of electric equipment important to safety for nuclear power plants
50.50	Issuance, Limitations, and Conditions of Licenses and Construction Permits
50.51	Continuation of license
50.52	Combining licenses
50.53	Jurisdictional limitations
50.54	Conditions of licenses
50.55	Conditions of construction permits, early site permits, combined licenses, and manufacturing licenses
50.55a(a)	Codes and standards
50.55a(h)	Protection and safety systems
50.55a(h)(3)	Safety systems
50.55a(z)	Alternatives to codes and standards requirements
50.56	Conversion of construction permit to license; or amendment of license
50.57	Issuance of operating license
50.58	Hearings and report of the Advisory Committee on Reactor Safeguards
50.59	Changes, tests, and experiments

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**Table 1: Applicable Regulations**

<b>10 CFR Part</b>	<b>Topic</b>
50.65(a)	Requirements for monitoring the effectiveness of maintenance at nuclear power plants
50.65(b)	Requirements for monitoring the effectiveness of maintenance at nuclear power plants
50.68(a)	Criticality accident requirements
50.68(b)	Criticality accident requirements
50.68(c)	Criticality accident requirements
50.69	Risk-informed categorization and treatment of structures, systems, and components for nuclear power reactors
50.70	Inspections, Records, Reports, Notifications
50.71	Maintenance of records, making of reports
50.72	Immediate notification requirements for operating nuclear power reactors
50.73	Licensee event report system
50.74	Notification of change in operator or senior operator status
50.75	Reporting and recordkeeping for decommissioning planning
50.76	Licensee's change of status; financial qualifications
50.78	US/IAEA Safeguards Agreement
50.80	Transfers of Licenses—Creditors' Rights—Surrender of Licenses
50.81	Creditor regulations
50.82	Termination of license
50.82(a)	Termination of license
50.82(c)	Termination of license
50.83	Release of part of a power reactor facility or site for unrestricted use
50.90	Amendment of License or Construction Permit at Request of Holder
50.91	Notice for public comment; State consultation
50.92	Issuance of amendment
50.100	Revocation, Suspension, Modification, Amendment of Licenses and Construction Permits, Emergency Operations by the Commission
50.101	Retaking possession of special nuclear material
50.102	Commission order for operation after revocation

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**Table 1: Applicable Regulations**

<b>10 CFR Part</b>	<b>Topic</b>
50.103	Suspension and operation in war or national emergency
50.109	Backfitting
50.110	Enforcement
50.111	Criminal penalties
50.120	Additional Standards for Licenses, Certifications, and Regulatory Approvals
50.150	Aircraft impact assessment
50.155(a)	Mitigation of beyond-design-basis events
50.155(b)	Mitigation of beyond-design-basis events
50.155(c)	Mitigation of beyond-design-basis events
50.155(d)	Mitigation of beyond-design-basis events
50.155(e)	Mitigation of beyond-design-basis events
50.155(f)	Mitigation of beyond-design-basis events
50.155(g)	Mitigation of beyond-design-basis events
50 Appendix B	Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants
50 Appendix C	A Guide for the Financial Data and Related Information Required to Establish Financial Qualifications for Construction Permits and Combined Licenses
50 Appendix E	Emergency Planning and Preparedness for Production and Utilization Facilities
50 Appendix N	Standardization of Nuclear Power Plant Designs: Permits to Construct and Licenses to Operate Nuclear Power Reactors of Identical Design at Multiple Sites
50 Appendix Q	Pre-Application Early Review of Site Suitability Issues
50 Appendix S.I	Earthquake Engineering Criteria for Nuclear Power Plants
50 Appendix S.II	Earthquake Engineering Criteria for Nuclear Power Plants
50 Appendix S.III	Earthquake Engineering Criteria for Nuclear Power Plants
50 Appendix S.IV	Application to Engineering Design
51.0	General Provisions
51.1	Scope
51.2	Subparts

*Controlled Document - Verify Current Revision***Table 1: Applicable Regulations**

<b>10 CFR Part</b>	<b>Topic</b>
51.3	Resolution of conflict
51.4	Definitions
51.5	Interpretations
51.6	Specific exemptions
51.10	Purpose and scope of subpart; application of regulations of Council on Environmental Quality
51.13	Emergencies
51.14	Definitions
51.15	Time schedules
51.16	Proprietary information
51.17	Information collection requirements; OMB approval
51.20	Criteria for and identification of licensing regulatory actions requiring environmental impact statements
51.21	Criteria for and identification of licensing regulatory actions requiring environmental assessments
51.22	Criterion for categorical exclusion, identification of licensing and regulatory actions eligible for categorical exclusion or otherwise not requiring environmental review
51.23	Environmental impacts of continued storage of spent nuclear fuel beyond the licensed life for operation of a reactor
51.25	Determination to prepare environmental impacts statement or environmental assessment eligibility for categorical exclusion
51.26	Requirements to publish notice of intent and conduct scoping process
51.27	Notice of intent
51.28	Scoping—Participants
51.29	Scoping-environmental impact statement and supplement to environmental impact statement
51.30	Environmental assessment
51.31	Determinations based on environmental assessment
51.32	Finding of no significant impact
51.33	Draft finding of no significant impact; distribution
51.34	Preparation of finding of no significant impact
51.35	Requirement to publish finding of no significant impact; limitation on Commission action

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<b>10 CFR Part</b>	<b>Topic</b>
51.40	Consultation with NRC staff
51.41	Requirements to submit environmental information
51.45	Environmental report
51.50	Environmental report-construction permit, early site permit, or combined license stage
51.53	Postconstruction environmental reports
51.58	Environmental report—number of copies; distribution
51.60	Environmental Report – Materials Licenses
51.66	Environmental report—number of copies; distribution
51.68	Environmental Reports—Rulemaking
51.70	Draft environmental impact statement—general
51.71	Draft environmental impact statement—contents
51.72	Supplement to draft environmental impact statement
51.73	Request for comments on draft environmental statement
51.74	Distribution of draft environmental impacts statement and supplement to draft environmental impact statement; news release
51.75	Draft environmental impact statement—construction permit, early site permit, or combined license
51.77	Distribution of draft environmental impact statement
51.85	Draft environmental impact statement--rulemaking
51.86	Distribution of draft environmental impact statement
51.88	Proposals for legislation
51.90	Final environmental impact statements—general requirements
51.91	Final environmental impact statements—contents
51.92	Supplement to the final environmental impact statement
51.93	Distribution of the final environmental impact statement and supplement to final environmental impact statement; news releases
51.94	Requirement to consider final environmental impact statement
51.95	Postconstruction environmental impact statements
51.100	Timing of Commission action



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<b>10 CFR Part</b>	<b>Topic</b>
51.101	Limitations on actions
51.102	Requirement to provide a record of decision; preparation
51.103	Record of decision
51.104	NRC proceeding using public hearings, consideration of environmental impact statement
51.105	Public hearings in proceedings for issuance of construction permits or early site permits; limited work authorizations
51.106	Public hearings in proceedings for issuance of operating licenses
51.116	Notice of Intent
51.117	Draft environmental impact statement—notice of availability
51.118	Final environmental impact statement—notice of availability
51.119	Publication of finding of no significant impact; distribution
51.120	Availability of environmental documents for public inspection
51.121	Status of NEPA actions
51.122	List of interested organizations and groups
51.123	Charges for environmental documents, distribution to public, distribution to governmental agencies
51.124	Commission duty to comment
51.125	Responsible official
51 Appendix A	Format for Presentation of Material in Environmental Impact Statements
51 Appendix B	Environmental Effect of Renewing the Operating License of a Nuclear Power Plant
54	Requirements for renewal of operating licenses for nuclear power plants
55	Operators' licenses
70.1	Purpose
70.2	Scope
70.3	License Requirements
70.4	Definitions
70.5	Communications

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<b>10 CFR Part</b>	<b>Topic</b>
70.6	Interpretations
70.7	Employee protection
70.8	Information collection requirements: OMB approval
70.9	Completeness and accuracy of information
70.10	Deliberate misconduct
70.17	Specific exemptions
70.18	Types of licenses
70.19	General license for calibration or reference sources
70.21	Filing
70.22	Contents of applications
70.23	Requirements for the approval of applications
70.24	Criticality accident requirements
70.25	Financial assurance and recordkeeping for decommissioning
70.31	Issuance of licenses
70.32	Conditions of licenses
70.33	Applications for renewal of licenses
70.34	Amendment of licenses
70.35	Commission action on applications to renew or amend
70.36	Inalienability of licenses
70.37	Disclaimer of warranties
70.38	Expiration and termination of licenses and decommissioning of sites and separate buildings or outdoor areas
70.40	Ineligibility of certain applicants
70.41	Authorized use of special nuclear material
70.42	Transfer of special nuclear material
70.44	Creditor regulations
70.50	Reporting requirements
70.51	Records requirements

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**Table 1: Applicable Regulations**

<b>10 CFR Part</b>	<b>Topic</b>
70.52	Reports of accidental criticality
70.55	Inspections
70.56	Tests
70.81	Modification and revocation of licenses
70.82	Suspension and operation in war or national emergency
70.91	Violations
70.92	Criminal penalties
71	Packaging and transportation of radioactive material
72	Licensing requirements for the independent storage of spent nuclear fuel and high-level radioactive waste, and reactor-related greater than Class C waste
73.1	Purpose and scope
73.2	Definitions
73.3	Interpretations
73.4	Communications
73.5	Specific exemptions
73.6	Exemptions for certain quantities and kinds of special nuclear material
73.8	Information collection requirements: OMB approval
73.21	Protection of Safeguards Information: Performance Requirements
73.22	Protection of Safeguards Information: Specific Requirements
73.23	Protection of Safeguards Information—Modified Handling: Specific Requirements
73.24	Prohibitions
73.28	Security background checks for secure transfer of nuclear materials
73.35	Requirements for physical protection of irradiated reactor fuel (100 grams or less) in transit
73.37	Requirements for physical protection of irradiated reactor fuel in transit
73.38	Personnel access authorization requirements for irradiated reactor fuel in transit
73.40	Physical protection: General requirements at fixed sites
73.51	Requirements for the physical protection of stored spent nuclear fuel and high-level radioactive waste

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**Table 1: Applicable Regulations**

<b>10 CFR Part</b>	<b>Topic</b>
73.54	Protection of digital computer and communication systems and networks
73.55	Requirements for physical protection of licensed activities in nuclear power reactors against radiological sabotage
73.56	Personnel access authorization requirements for nuclear power plants
73.57	Requirements for criminal history records checks of individuals granted unescorted access to a nuclear power facility, a non-power reactor, or access to Safeguards Information
73.58	Safety/security interface requirements for nuclear power reactors
73.59	Relief from fingerprinting, identification and criminal history records checks and other elements of background checks for designated categories of individuals
73.61	Relief from fingerprinting and criminal history records check for designated categories of individuals permitted unescorted access to certain radioactive materials or other property
73.67	Licensee fixed site and in-transit requirements for the physical protection of special nuclear material of moderate and low strategic significance
73.71	Reporting of safeguards events
73.72	Requirement for advance notice of shipment of formula quantities of strategic special nuclear material, special nuclear material of moderate strategic significance, or irradiated reactor fuel
73.75	Posting
73.77	Cyber security event notifications
73.80	Violations
73.81	Criminal penalties
73 Appendix A	US Nuclear Regulatory Commission Offices and Classified Mailing Addresses
73 Appendix B	General Criteria for Security Personnel
73 Appendix C	Licensee Safeguards Contingency Plans
73 Appendix D	Physical Protection of Irradiated Reactor Fuel in Transit, Training Program Subject Schedule
73 Appendix E	Levels of Physical Protection to Be Applied in International Transport of Nuclear Material
73 Appendix F	Countries and Organizations That Are Parties to the Convention on the Physical Protection of Nuclear Material
73 Appendix G	Reportable Safeguards Events
73 Appendix H	Weapons Qualification Criteria
74.1	Purpose

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**Table 1: Applicable Regulations**

<b>10 CFR Part</b>	<b>Topic</b>
74.2	Scope
74.4	Definitions
74.5	Interpretations
74.6	Communications
74.7	Specific exemptions
74.8	Information collection requirements OMB approval
74.11	Reports of the loss or theft or attempted theft or unauthorized production of special nuclear material
74.13	Material status reports
74.15	Nuclear material transaction reports
74.19	Recordkeeping
74.81	Inspections
74.82	Tests
74.83	Violations
74.84	Criminal penalties
75	Safeguards on nuclear material—implementation of safeguards agreements between the United States and the International Atomic Energy Agency
95	Facility security clearance and safeguarding of national security information and restricted data
100.1	Purpose
100.2	Scope
100.3	Definitions
100.4	Communications
100.8	Information collection requirements: OMB approval
100.20	Factors to be considered when evaluating sites
100.21	Non-seismic site criteria
100.23	Geologic and seismic siting criteria

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**Table 1: Applicable Regulations**

10 CFR Part	Topic
110	Export and import of nuclear equipment and material
140	Financial protection requirements and indemnity agreements
170	Fees for facilities, materials, import and export licenses, and other regulatory services under the Atomic Energy Act of 1954, as amended
171	Annual fees for reactor licenses and fuel cycle licenses and materials licenses, including holders of certificates of compliance, registrations, and quality assurance program approvals and government agencies licensed by the NRC

#### 4.2 Not Applicable Regulations

The identification of regulations that are not applicable is for a single-unit Sodium SFR in Kemmerer, WY, to be licensed under 10 CFR 50 via a construction permit application and an operating license application.

**Table 2: Not Applicable Regulations**

10 CFR Part	Topic	Rationale
4	Nondiscrimination in Federally assisted programs or activities receiving Federal financial assistance from the Commission	Only applies to NRC
5	Nondiscrimination on the basis of sex in education programs or activities receiving Federal financial assistance	Only applies to academic institutions
14	Administrative claims under Federal Tort Claims Act	Only applies to NRC
20.1008	Implementation	The Sodium project does not meet the date specified in this regulation
32	Specific domestic licenses to manufacture or transfer certain items containing byproduct material	Not applicable to power reactors
33	Specific domestic licenses of broad scope for byproduct material	Not applicable to power reactors

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**Table 2: Not Applicable Regulations**

<b>10 CFR Part</b>	<b>Topic</b>	<b>Rationale</b>
34	Licenses for industrial radiography and radiation safety requirements for industrial radiographic operations	Not applicable to power reactors
35	Medical use of byproduct material	Only applies to medical uses of byproduct material
36	Licenses and radiation safety requirements for irradiators	Not applicable to power reactors
50.21	Class 104 licenses; for medical therapy and research and development facilities	Only applies to medical therapy and research and development facilities
50.34(a)(1)(i)	Preliminary Safety Analysis Report	The Natrium project does not meet the date specified in this regulation
50.34(a)(11)	Construction hazards	Only applies to multi-unit sites
50.34(b)(6)(vii)	Final safety analysis report	Only applies to multi-unit sites
50.34(f)(1)(ii)	Additional TMI-related requirements	Only applies to PWRs
50.34(f)(1)(iii)	Additional TMI-related requirements	Not technically relevant to the Natrium design
50.34(f)(1)(iv)	Additional TMI-related requirements	Only applies to PWRs
50.34(f)(1)(v)	Additional TMI-related requirements	Only applies to BWRs
50.34(f)(1)(vi)	Additional TMI-related requirements	Only applies to BWRs
50.34(f)(1)(vii)	Additional TMI-related requirements	Only applies to BWRs
50.34(f)(1)(viii)	Additional TMI-related requirements	Only applies to BWRs
50.34(f)(1)(ix)	Additional TMI-related requirements	Only applies to BWRs
50.34(f)(1)(x)	Additional TMI-related requirements	Only applies to BWRs
50.34(f)(1)(xi)	Additional TMI-related requirements	Only applies to BWRs
50.34(f)(2)(vi)	Additional TMI-related requirements	Not technically relevant to the Natrium design
50.34(f)(2)(ix)	Additional TMI-related requirements	Not technically relevant to the Natrium design
50.34(f)(2)(x)	Additional TMI-related requirements	Not technically relevant to the Natrium design

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**Table 2: Not Applicable Regulations**

<b>10 CFR Part</b>	<b>Topic</b>	<b>Rationale</b>
50.34(f)(2)(xi)	Additional TMI-related requirements	Not technically relevant to the Natrium design
50.34(f)(2)(xii)	Additional TMI-related requirements	Only applies to PWRs
50.34(f)(2)(xiii)	Additional TMI-related requirements	Only applies to PWRs
50.34(f)(2)(xiv)	Additional TMI-related requirements	Not technically relevant to the Natrium design
50.34(f)(2)(xv)	Additional TMI-related requirements	Not technically relevant to the Natrium design
50.34(f)(2)(xvi)	Additional TMI-related requirements	Only applies to B&W plants
50.34(f)(2)(xvii)	Additional TMI-related requirements	Not technically relevant to the Natrium design
50.34(f)(2)(xx)	Additional TMI-related requirements	Only applies to PWRs
50.34(f)(2)(xxi)	Additional TMI-related requirements	Only applies to BWRs
50.34(f)(2)(xxii)	Additional TMI-related requirements	Only applies to B&W plants
50.34(f)(2)(xxiii)	Additional TMI-related requirements	Only applies to B&W plants
50.34(f)(2)(xxiv)	Additional TMI-related requirements	Only applies to BWRs
50.34(f)(3)(iv)	Additional TMI-related requirements	Not technically relevant to the Natrium design
50.34(f)(3)(v)	Additional TMI-related requirements	Not technically relevant to the Natrium design
50.34(f)(3)(vi)	Additional TMI-related requirements	Not technically relevant to the Natrium design
50.34(h)	Conformance with the Standard Review Plan (SRP)	Does not apply to non-LWRs
50.34a(d)	Design objectives for equipment to control releases of radioactive material in effluents—nuclear power reactors	Only applies to applicants licensing under 10 CFR 52
50.34a(e)	Design objectives for equipment to control releases of radioactive material in effluents—nuclear power reactors	Only applies to applicants licensing under 10 CFR 52
50.36(c)(1)(i)(B)	Technical Specifications	Only applies to fuel reprocessing facilities
50.36(c)(1)(ii)(B)	Technical Specifications	Only applies to fuel reprocessing facilities



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**Table 2: Not Applicable Regulations**

<b>10 CFR Part</b>	<b>Topic</b>	<b>Rationale</b>
50.36(c)(2)(iii)	Technical Specifications	The Natrium project does not meet the date specified in this regulation
50.36(d)(1)	Technical Specifications	The Natrium project does not meet the date specified in this regulation
50.36(d)(2)	Technical Specifications	The Natrium project does not meet the date specified in this regulation
50.36(e)	Technical Specifications	Only applies to licensees whose authority to operate has been removed
50.41	Additional standards for class 104 licenses	Only applies to class 104 licenses
50.44(b)	Requirements for currently-licensed reactors	Only applies to currently-licensed reactors
50.44(c)	Requirements for future water-cooled reactor applicants and licenses	Only applies to water cooled reactors
50.45(b)	Standards for construction permits, operating licenses, and combined licenses	Only applies to holders of a combined license
50.46	Acceptance criteria for emergency core cooling systems for light-water nuclear power reactors	Does not apply to non-LWRs
50.48(b)	Fire protection	The Natrium project does not meet the date specified in this regulation
50.48(c)	Fire protection	Does not apply to non-LWRs
50.48(f)	Fire protection	The Natrium project has not submitted the certifications required under § 50.82(a)(1) for termination of license
50.49(g)	Environmental qualification of electric equipment important to safety for nuclear power plants	The Natrium project does not meet the date specified in this regulation
50.49(h)	Environmental qualification of electric equipment important to safety for nuclear power plants	The Natrium project does not meet the date specified in this regulation
50.49(i)	Environmental qualification of electric equipment important to safety for nuclear power plants	The Natrium project does not meet the date specified in this regulation

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**Table 2: Not Applicable Regulations**

<b>10 CFR Part</b>	<b>Topic</b>	<b>Rationale</b>
50.49(k)	Environmental qualification of electric equipment important to safety for nuclear power plants	The Natrium project does not meet the date specified in this regulation
50.54(o)	Conditions of licenses	Only applies to water cooled power reactors
50.55a(b)	Codes and standards	Does not apply to non-LWRs
50.55a(c)	Reactor coolant pressure boundary	Does not apply to non-LWRs
50.55a(d)	Quality Group B components	Does not apply to non-LWRs
50.55a(e)	Quality Group C components	Does not apply to non-LWRs
50.55a(f)	Pre-service and in-service testing requirements	Does not apply to non-LWRs
50.55a(g)	Pre-service and in-service inspection requirements	Does not apply to non-LWRs
50.55a(h)(2)	Protection systems	The Natrium project does not meet the date specified in this regulation
50.60	Acceptance criteria for fracture prevention measures for light water nuclear power reactors for normal operation	Does not apply to non-LWRs
50.61	Fracture toughness requirements for protection against pressurized thermal shock events	Does not apply to non-LWRs

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**Table 2: Not Applicable Regulations**

<b>10 CFR Part</b>	<b>Topic</b>	<b>Rationale</b>
50.61a	Alternate fracture toughness requirements for protection against pressurized thermal shock events.	Does not apply to non-LWRs
50.62	Requirements for reduction of risk from anticipated transients without scram (ATWS) events for light-water-cooled nuclear power plants	Does not apply to non-LWRs
50.63	Loss of all alternating current power	Does not apply to non-LWRs
50.64	Limitations on the use of highly enriched uranium (HEU) in domestic non-power reactors	Only applies to non-power reactors
50.65(c)	Requirements for monitoring the effectiveness of maintenance at nuclear power plants	The Natrium project does not meet the date specified in this regulation
50.66	Requirements for thermal annealing of the reactor pressure vessel	Does not apply to non-LWRs
50.67	Accident source term	The Natrium project does not meet the date specified in this regulation
50.82(b)	Termination of license	Only applies to non-power reactors
50.155(h)	Mitigation of beyond-design-basis events	Only applies to withdrawal of orders for specific operating plants
50 Appendix A	General Design Criteria for Nuclear Power Plants	Does not apply to non-LWRs
50 Appendix F	Policy Relating to the Siting of Fuel Reprocessing Plants and Related Waste Management Facilities	Only applies to fuel reprocessing plants
50 Appendix G	Fracture Toughness Requirements	Does not apply to non-LWRs

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**Table 2: Not Applicable Regulations**

<b>10 CFR Part</b>	<b>Topic</b>	<b>Rationale</b>
50 Appendix H	Reactor Vessel Material Surveillance Program Requirements	Does not apply to non-LWRs
50 Appendix I	Numerical Guides for Design Objectives and Limiting Conditions for Operation to Meet the Criterion "As Low as is Reasonably Achievable" for Radioactive Material in Light-Water-Cooled Nuclear Power Reactor Effluents	Does not apply to non-LWRs
50 Appendix J	Primary Reactor Containment Leakage Testing for Water-Cooled Power Reactors	Does not apply to non-LWRs
50 Appendix K	ECCS Evaluation Models	Does not apply to non-LWRs
50 Appendix R	Fire Protection Program for Nuclear Power Facilities Operating Prior to January 1, 1979	The Natrium project does not meet the date specified in this regulation
51.12	Application of subpart to ongoing environmental work	The Natrium project does not meet the date specified in this regulation
51.49	Environmental report—limited work authorization	No limited work authorization is being requested
51.51	Uranium fuel cycle environmental data – Table S-3	Does not apply to non-LWRs
51.52	Environmental effects of transportation of fuel and waste—Table S-4	Does not apply to non-LWRs
51.54	Environmental report—manufacturing license	Only applies to manufacturing licenses
51.55	Environmental report—standard design certification	Only applies to design certification
51.61	Environmental Report— independent spent fuel storage installation (ISFSI) or monitored retrievable storage installation (MRS) license	Only applies to applicants for issuance of a license for ISFSI or for the storage of spent fuel and high-level radioactive waste in an MRS
51.62	Environmental report—land disposal of radioactive waste under 10 CFR Part 61	Only applies to a geological repository

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**Table 2: Not Applicable Regulations**

<b>10 CFR Part</b>	<b>Topic</b>	<b>Rationale</b>
51.67	Environmental information concerning geological repositories	Only applies to a geological repository
51.76	Draft environmental impact statement—limited work authorization	No limited work authorization is being requested
51.80	Draft environmental impact statements—materials licenses	Only applies to materials licensees meeting the criteria of 10 CFR 51.20 (7)-(12)
51.81	Distribution of draft environmental impact statement	Only applies to materials licensees meeting the criteria of 10 CFR 51.20 (7)-(12)
51.97	Final environmental impact statements—materials licenses	Only applies to materials licensees meeting the criteria of 10 CFR 51.20 (7)-(12)
51.105a	Public hearings in proceeding for issuance of manufacturing licenses	Only applies to manufacturing licenses
51.107	Public hearings in proceeding for issuance of combined licenses; limited work authorizations	Only applies to applicants licensing under 10 CFR 52
51.108	Public hearings on Commission finding that inspections, tests, analyses, and acceptance criteria of combined licenses are met	Only applies to applicants licensing under 10 CFR 52
51.109	Public hearings in proceeding for issuance of materials license with respect to a geologic repository	Only applies to a geological repository
52	Licenses, certifications, and approvals for nuclear power plants	Only applies to applicants licensing under 10 CFR 52
60	Disposal of high-level radioactive wastes in geologic repositories	Only applies to geological repository
61	Licensing requirements for land disposal of radioactive waste	Only applies to land disposal facilities

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**Table 2: Not Applicable Regulations**

<b>10 CFR Part</b>	<b>Topic</b>	<b>Rationale</b>
62	Criteria and procedures for emergency access to non-federal and regional low-level waste disposal facilities	Only applies to low-level waste disposal facilities
63	Disposal of high-level radioactive wastes in a geologic repository at Yucca Mountain, Nevada	Only applies to DOE licensing of Yucca Mountain.
70.11	Persons using special nuclear material under certain Department of Energy and Nuclear Regulatory Commission contracts	Only applies to DOE and NRC contractors
70.12	Carriers	Only applies to carriers of special nuclear material
70.13	Department of Defense	Only applies to Department of Defense
70.14	Foreign military aircraft	Only applies to foreign military aircraft that carry special nuclear material
70.20	General license to own special nuclear material	Only applies to general licensees as defined in 10 CFR 70.18
70.20a	General license to possess special nuclear material for transport	Only applies to general licensees as defined in 10 CFR 70.18
70.20b	General license for carriers of transient shipments of formula quantities of strategic special nuclear material, special nuclear material of moderate strategic significance, special nuclear material of low strategic significance, and irradiated reactor fuel	Only applies to general licensees as defined in 10 CFR 70.18
70.23a	Hearing required for uranium enrichment facility	Only applies to enrichment facilities
70.39	Specific licenses for the manufacture or initial transfer	Manufacture or initial transfer of calibration or reference sources is

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**Table 2: Not Applicable Regulations**

<b>10 CFR Part</b>	<b>Topic</b>	<b>Rationale</b>
	of calibration or reference sources	not within the scope of the Natrium project
70.59	Effluent monitoring reporting requirements	Not applicable to power reactors
70.60	Applicability	Only applies to enriched uranium processing and fabrication facilities
70.61	Performance requirements	Only applies to enriched uranium processing and fabrication facilities
70.62	Safety program and integrated safety analysis	Only applies to enriched uranium processing and fabrication facilities
70.64	Requirements for new facilities or new processes at existing facilities	Only applies to enriched uranium processing and fabrication facilities
70.65	Additional content of applications	Only applies to enriched uranium processing and fabrication facilities
70.66	Additional requirements for approval of license application	Only applies to enriched uranium processing and fabrication facilities
70.72	Facility changes and change process	Only applies to enriched uranium processing and fabrication facilities
70.73	Renewal of licenses	Only applies to enriched uranium processing and fabrication facilities
70.74	Additional reporting requirements	Only applies to enriched uranium processing and fabrication facilities
70.76	Backfitting	Only applies to enriched uranium processing and fabrication facilities
70 Appendix A	Reportable Safety Events	Only applies to enriched uranium processing and fabrication facilities
73.20	General performance objective and requirements	Exempt in accordance with 10 CFR 73.6(a)
73.25	Performance capabilities for physical protection of strategic special nuclear material in transit	Exempt in accordance with 10 CFR 73.6(a)
73.26	Transportation physical protection systems, subsystems, components, and procedures	Exempt in accordance with 10 CFR 73.6(a)
73.27	Notification requirements	Exempt in accordance with 10 CFR 73.6(a)

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**Table 2: Not Applicable Regulations**

<b>10 CFR Part</b>	<b>Topic</b>	<b>Rationale</b>
73.45	Performance capabilities for fixed site physical protection systems	Exempt in accordance with 10 CFR 73.6(a)
73.46	Fixed site physical protection systems, subsystems, components, and procedures	Exempt in accordance with 10 CFR 73.6(a)
73.50	Requirements for physical protection of licensed activities	Only applies to licensees who are not subject to 10 CFR 73.51
73.60	Additional requirements for physical protection at nonpower reactors	Only applies to non-power reactors
73.70	Records	Exempt in accordance with 10 CFR 73.6(a)
73.73	Requirement for advance notice and protection of export shipments of special nuclear material of low strategic significance	SNM exports are not within the scope of the Natrium project
73.74	Requirement for advance notice and protection of import shipments of nuclear material from countries that are not party to the Convention on the Physical Protection of Nuclear Material	Import shipments of nuclear material from countries that are not party to the Convention on the Physical Protection of Nuclear Material are not within the scope of the Natrium project
74.17	Special nuclear material physical inventory summary report	Not applicable to nuclear reactors licensed pursuant to 10 CFR 50
74.31	Nuclear material control and accounting for special nuclear material of low strategic significance	Not applicable to nuclear reactors licensed pursuant to 10 CFR 50



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**Table 2: Not Applicable Regulations**

<b>10 CFR Part</b>	<b>Topic</b>	<b>Rationale</b>
74.33	Nuclear material control and accounting for uranium enrichment facility authorized to produce special nuclear material of low strategic significance	Only applies to enriched uranium processing and fabrication facilities
74.41	Nuclear material control and accounting for special nuclear material of moderate strategic significance	Not applicable to nuclear reactors licensed pursuant to 10 CFR 50
74.43	Internal Control, Inventory, and Records	Not applicable to nuclear reactors licensed pursuant to 10 CFR 50
74.45	Measurands and Measurements Controls	Not applicable to nuclear reactors licensed pursuant to 10 CFR 50
74.51	Nuclear material control and accounting for strategic special nuclear material	Not applicable to nuclear reactors licensed pursuant to 10 CFR 50
74.53	Process monitoring	Not applicable to nuclear reactors licensed pursuant to 10 CFR 50
74.55	Item monitoring	Not applicable to nuclear reactors licensed pursuant to 10 CFR 50
74.57	Alarm Resolution	Not applicable to nuclear reactors licensed pursuant to 10 CFR 50
74.59	Quality assurance and accounting requirements	Not applicable to nuclear reactors licensed pursuant to 10 CFR 50
76	Certification of gaseous diffusion plants	Only applies to gaseous diffusion plants
81	Standard Specifications for the Granting of Patent Licenses	Only applies to licensing NRC patented inventions for use
100.10	Factors to be considered when evaluating sites	The Sodium project does not meet the date specified in this regulation

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**Table 2: Not Applicable Regulations**

10 CFR Part	Topic	Rationale
100.11	Determination of exclusion area, low population zone, and population center distance	The Natrium project does not meet the date specified in this regulation
100 Appendix A	Seismic and Geologic Siting Criteria for Nuclear Power Plants	The Natrium project does not meet the date specified in this regulation
150	Exemptions and continued regulatory authority in Agreement States and in offshore waters under section 274	Only applies to persons in Agreement States or offshore waters
160	Trespassing on Commission property	Only applies to NRC

### 4.3 Potential Exemption Requests

There are nine topics identified that will potentially require requests for exemptions from regulations. Each topic is explained in this section and the regulations are summarized in Table 3.

#### 4.3.1 Shift Technical Advisor

The regulations of 10 CFR 50.120(b)(2) require, in part, training and qualification of a shift technical advisor (STA):

*10 CFR 50.120(b) The training program must be derived from a systems approach to training as defined in 10 CFR 55.4, and must provide for the training and qualification of the following categories of nuclear power plant personnel: [...]  
(iii) Shift technical advisor.*

The inherent safety features of the Natrium design result in lower operational complexity and provide improvement in overall plant safety including a reduced reliance on operator actions. These safety features combined with the improvements made regarding human system interface in control room design and improved operator training and qualification post-TMI preclude the necessity to train and qualify personnel to perform specific STA roles. This is consistent with the staff positions identified in SECY-21-0039, "Elimination of the Shift Technical Advisor for the NuScale Design," (Reference 5). TerraPower expects to submit a request for exemption to remove requirements of 10 CFR 50.120(b)(2)(iii) to train and qualify STAs.

#### 4.3.2 HALEU Fuel

The regulations of 10 CFR 50.68(a) require that licensees meet the criticality monitoring requirements in 10 CFR 70.24 or the requirements in 10 CFR 50.68(b), where 10 CFR 50.68(b) delineates conditions for criticality safety based on, in part, the maximum uranium enrichment of the fuel:

*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: [...]*

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

The Natrium design uses high-assay low enriched uranium (HALEU) fuel with uranium enrichment that is higher than that specified in 10 CFR 50.68(b)(7). As described in SECY-21-0109, "Rulemaking Plan on Use of Increased Enrichment of Conventional and Accident Tolerant Fuel Designs for Light-water Reactors," (Reference 6) 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." TerraPower expects to submit a request for exemption from 10 CFR 50.68(b)(7) to change the maximum nominal U-235 enrichment to less than 20 percent by weight.

#### **4.3.3 ECCS Analysis**

The regulations of 10 CFR 50.34(a)(4) and 10 CFR 50.34(b)(4) require, in part, that an analysis of the emergency core cooling system (ECCS) be performed in accordance with the requirements of 10 CFR 50.46:

*10 CFR 50.34(a)(4) [...] 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) [...] 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.*

The regulations of 10 CFR 50.46, "Acceptance criteria for emergency core cooling systems for light-water nuclear power reactors" are not applicable to the Natrium design (i.e., the regulations are specific to light-water reactors (LWRs)). The Natrium design removes heat from the core without reliance on injection of coolant into the reactor from an ECCS. TerraPower expects to submit a request for exemption to remove 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 first sentences of 10 CFR 50.34(a)(4) and 10 CFR 50.34(b)(4) would not be impacted by the exemption request. This approach is consistent with the Updated NRC Staff Draft White Paper "Analysis of Applicability of NRC Regulations for Non-Light Water Reactors," (Reference 4).

#### **4.3.4 Fission Product Release**

The regulations of 10 CFR 50.34(a)(1)(ii)(D) require, in part, that an evaluation and analysis of a postulated fission product release be performed, assuming a fission product release from the core into containment and a demonstrable containment leak rate, to evaluate offsite radiological consequences:

*10 CFR 50.34(a)(1)(ii)(D) [...] In performing this assessment, an applicant shall assume a fission product release from the core into the containment assuming that*

*the facility is operated at the ultimate power level contemplated. The applicant shall perform an evaluation and analysis of the postulated fission product release, using the expected demonstrable containment leak rate and any fission product cleanup systems intended to mitigate the consequences of the accidents, together with applicable site characteristics, including site meteorology, to evaluate the offsite radiological consequences. Site characteristics must comply with part 100 of this chapter. The evaluation must determine that [...]*

The Sodium design uses a functional containment approach (see SECY-18-0096, “Functional Containment Performance Criteria for Non-Light-Water-Reactors” (Reference 7)). The phrasing “from the core into the containment” and “demonstrable containment leak rate” of the regulation is not consistent with the use of a functional containment design. TerraPower expects to submit a request for exemption to remove the phrases “from the core into the containment” and “the expected demonstrable containment leak rate and” from the requirements of 10 CFR 50.34(a)(1)(ii)(D). This is consistent with the Updated NRC Staff Draft White Paper, “Analysis of Applicability of NRC Regulations for Non-Light Water Reactors” (Reference 4).

#### **4.3.5 Nuclear Island to Energy Island Interface**

The regulations of 10 CFR 50.10 and 10 CFR 50.65 include requirements for certain non-safety related SSCs:

*10 CFR 50.10(a)(1) Activities constituting construction are 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, which are for: [...]*

*(iv) SSCs whose failure could cause a reactor scram or actuation of a safety-related system.*

*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:[...]*

*–(2) Nonsafety related structures, systems, or components:[...]*

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

The requirements of 10 CFR 50.10 and 10 CFR 50.65 associated with SSCs “whose failure could cause a reactor scram or actuation of a safety-related system” are applicable to certain Sodium SSCs. The Energy Island (EI) and Nuclear Island (NI) interface provides a boundary between the thermal energy production of the NI and the power generation of the EI. The NI boundary conditions have been intentionally designed so the interface with the EI does not impact the Sodium reactor's safety case. TerraPower expects to submit a request for exemption to remove the scope of EI SSCs “whose failure could cause a reactor scram or actuation of a safety-related system” from the requirements of 10 CFR 50.10 and 10 CFR 50.65. SSCs outside of the EI would not be impacted by the exemption request.

#### **4.3.6 Reactor Coolant Pressure Boundary**

Several regulations of 10 CFR 50 include requirements specific to the reactor coolant pressure boundary:

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*10 CFR 50.36(c)(2)(ii) A technical specification limiting condition for operation of a nuclear reactor must be established for each item meeting one or more of the following criteria:*

*(A) Criterion 1. Installed instrumentation that is used to detect, and indicate in the control room, a significant abnormal degradation of the reactor coolant pressure boundary. [...]*

*10 CFR 50.49(b) Electric equipment important to safety covered by this section is:*

*(1) Safety-related electric equipment.*

*(i) This equipment is that relied upon to remain functional during and following design basis events to ensure—*

*(A) The integrity of the reactor coolant pressure boundary [...]*

*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. [...]*

*10 CFR 50 Appendix S, III. Definitions*

*Structures, systems, and components required to withstand the effects of the safe-shutdown earthquake ground motion or surface deformation are those necessary to assure:*

*(1) The integrity of the reactor coolant pressure boundary; [...]*

The regulations of 10 CFR 50.2 define reactor coolant pressure boundary:

*10 CFR 50.2 Reactor coolant pressure boundary means all those pressure-containing components of boiling and pressurized water-cooled nuclear power reactors, such as pressure vessels, piping, pumps, and valves, which are:*

*(1) Part of the reactor coolant system, or*

*(2) Connected to the reactor coolant system, up to and including any and all of the following:*

*(i) The outermost containment isolation valve in system piping which penetrates primary reactor containment,*

*(ii) The second of two valves normally closed during normal reactor operation in system piping which does not penetrate primary reactor containment,*

*(iii) The reactor coolant system safety and relief valves.*

*For nuclear power reactors of the direct cycle boiling water type, the reactor coolant system extends to and includes the outermost containment isolation valve in the main steam and feedwater piping.*

The 10 CFR 50.2 definition of reactor coolant pressure boundary is limited to “boiling and pressurized water-cooled nuclear power reactors.” The Sodium design does not include a

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reactor coolant pressure boundary as defined in 10 CFR 50.2. TerraPower expects to submit a request for exemption to provide a definition of “primary coolant boundary” that is applicable to the Sodium design, and to replace the term “reactor coolant pressure boundary” with the term “primary coolant boundary” in the following regulations: 10 CFR 50.36(c)(2)(ii), 10 CFR 50.49(b), 10 CFR 50.65(b), 10 CFR 50.69(b)(1)(x), and 10 CFR 50 Appendix S (III. Definitions). This is consistent with the Updated NRC Staff Draft White Paper, “Analysis of Applicability of NRC Regulations for Non-Light Water Reactors” (Reference 4), as well as Regulatory Guide 1.232 “Guidance for Developing Principal Design Criteria for Non-Light-Water Reactors,” (Reference 8).

#### 4.3.7 Emergency Preparedness

TerraPower is planning to follow the emergency preparedness requirements of the 10 CFR 50.160 proposed rule (i.e., Proposed Final Rule “Emergency Preparedness for Small Modular Reactors and Other New Technologies”) in lieu of 10 CFR 50.47(b) and 10 CFR 50 Appendix E. However, if the 10 CFR 50.160 proposed rule is not final by the time of the operating license application submittal, TerraPower expects to submit exemption requests to certain parts of the following regulations:

- 10 CFR 50.33(g), Radiological E-Plans of State and Local Governments
- 10 CFR 50.47(b), Offsite E-Plan Standards
- 10 CFR 50.47(c)(2), Emergency Planning Zones
- 10 CFR 50, Appendix E, Offsite Emergency Response Considerations

#### 4.3.8 Seismic Design Criteria

TerraPower is planning to follow the risk-informed performance-based seismic design approach described in ASCE 43-19, “Seismic Design Criteria for Structures, Systems, and Components in Nuclear Facilities.” To apply the ASCE 43-19 guidance to the Sodium SSCs, TerraPower expects to submit exemption requests to certain portions of the following regulations:

- 10 CFR 50 Appendix S, Earthquake Engineering Criteria for Nuclear Power Plants
- 10 CFR 100.23, Geologic and Seismic Siting Criteria

Incorporation of ASCE 43 guidance within Sodium SSC seismic design is consistent with RIL 2021-04, “Feasibility Study on a Potential Consequence-Based Seismic Design Approach for Nuclear Facilities,” (Reference 9) which describes a “process for achieving seismic safety has been developed that aligns the LMP concepts, as described in NEI 18 04, with ASCE 43.” TerraPower is currently working to identify specific exemption requests associated with implementation of ASCE 43-19 guidance within the Licensing Modernization Project framework.

#### 4.3.9 Operator Licensing Examination Standards

The regulations of 10 CFR 55.40 require, in part, that facility licensees use the criteria of NUREG-1021, “Operator Licensing Examination Standards for Power Reactors,” to prepare the written examinations required by 10 CFR 55.41 and 10 CFR 55.43 and the operating tests required by 10 CFR 55.45:

*10 CFR 55.40(b) Power reactor facility licensees may prepare, proctor, and grade the written examinations required by §§ 55.41 and 55.43 and may prepare the operating tests required by § 55.45, subject to the following conditions:*

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*(1) Power reactor facility licensees shall prepare the required examinations and tests in accordance with the criteria in NUREG-1021 as described in paragraph (a) of this section; [...]*

NUREG-1021 includes technology specific guidance which does not encompass SFR technology, i.e., NUREG-1021 does not include technology specific guidance applicable to the Sodium design. If NUREG-1021 is not revised to encompass SFR technology by the time TerraPower prepares the licensed operator written examinations and operating tests, then TerraPower expects to submit a request for an exemption from 10 CFR 50.40(b)(1) to prepare the written examinations required by 10 CFR 55.41 and 10 CFR 55.43 and the operating tests required by 10 CFR 55.45 without incorporating the technology specific criteria of NUREG-1021. Incorporation of the non-technology specific criteria of NUREG-1021 would not be impacted by the exemption request.

#### 4.3.10 Potential Exemptions Summary

<b>Table 3: Summary of Potential Exemptions</b>	
<b>Topic</b>	<b>10 CFR Part</b>
Shift Technical Advisor	50.120(b)(2)(iii)
HALEU Fuel	50.68(b)(7)
ECCS Analysis	50.34(a)(4)
	50.34(b)(4)
Fission Product Release	50.34(a)(1)(ii)(D)
Nuclear Island to Energy Island Interface	50.10(a)(1)(iv)
	50.65(b)(2)(iii)
Reactor Coolant Pressure Boundary	50.36(c)(2)(ii)
	50.49(b)
	50.65(b)
	50 Appendix S, III. Definitions
Emergency Preparedness	50.33(g)
	50.47(b)
	50.47(c)(2)
	50 Appendix E
Seismic Design Criteria	50 Appendix S
	100.23

**Table 3: Summary of Potential Exemptions**

Topic	10 CFR Part
Operator Licensing Examination Standards	55.40(b)(1)

#### 4.4 Comparison with Draft NRC Guidance

The results of this analysis were compared to the Updated NRC Staff Draft White Paper “Analysis of Applicability of NRC Regulations for Non-Light Water Reactors,” (Reference 4). Several regulations were identified where the guidance in the draft white paper and the results of this analysis differ.

##### 4.4.1 TMI Requirements

The NRC draft white paper (Reference 4) states that non-LWR Part 50 applicants are required to demonstrate compliance with the TMI items that are technically relevant, consistent with SECY-15-0002 “Proposed Updates of Licensing Policies Rules, and Guidance for Future New Reactor Applications” (Reference 10). Several of the regulations of 10CFR50.34(f) that are identified in Reference 4 as applicable to non-LWRs are not technically relevant to the Sodium design; these have been identified in Table 2 as not applicable. This determination (i.e., not technically relevant) is provided for information only for the purposes of this white paper. TerraPower is not seeking a regulatory position from the NRC staff, or concurrence from the NRC staff, regarding TMI requirements that are not technically relevant to the Sodium design.

##### 4.4.2 10 CFR 50 Appendix F

10 CFR Part 50 Appendix F is not applicable to the Sodium design because it only applies to fuel reprocessing plants and related waste management facilities.

##### 4.4.3 10 CFR 81

10 CFR Part 81 is not applicable to the Sodium design because it only applies to the NRC’s process for the granting of patent licenses.

## 5 CONCLUSIONS

This report includes the determination of the applicability of the regulations contained in 10 CFR Parts 1 through 199 for the Sodium design. Potential exemption requests are identified. The determination of applicability of regulations presented in this report will serve as a basis for demonstrating regulatory compliance.



## 6 REFERENCES

- 1) Nuclear Energy Institute, "Risk-Informed Performance-Based Technology Inclusive Guidance for Non-Light Water Reactor Licensing Basis Development," NEI 18-04 Rev. 1, August 2019. (ML19241A472)
- 2) U.S. Nuclear Regulatory Commission, "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," RG 1.233 Rev. 0, June 2020. (ML20091L698)
- 3) U.S. Nuclear Regulatory Commission, "Review of Risk-Informed, Technology-Inclusive Advanced Reactor Applications-Roadmap," Draft Interim Staff Guidance, December 2021. (ML21336A702).
- 4) U.S. Nuclear Regulatory Commission, "Analysis of Applicability of NRC Regulations for Non-Light Water Reactors," Updated NRC Staff Draft White Paper, July 2021. (ML21175A287)
- 5) U.S. Nuclear Regulatory Commission, "Elimination of the Shift Technical Advisor for the NuScale Design," SECY-21-0039, April 2021. (ML21060A823)
- 6) U.S. Nuclear Regulatory Commission, "Rulemaking Plan on Use of Increased Enrichment of Conventional and Accident Tolerant Fuel Designs for Light-water Reactors," SECY-21-0109, December 2021. (ML21232A237)
- 7) U.S. Nuclear Regulatory Commission, "Functional Containment Performance Criteria for Non-Light-Water-Reactors," SECY-18-0096, September 2018. (ML18115A157)
- 8) U.S. Nuclear Regulatory Commission, "Guidance for Developing Principal Design Criteria for Non-Light-Water Reactors," RG 1.232 Rev. 0, April 2018. (ML17325A611)
- 9) U.S. Nuclear Regulatory Commission, "Feasibility Study on a Potential Consequence-Based Seismic Design Approach for Nuclear Facilities," Research Information Letter, May 2021. (ML21113A066)
- 10) U.S. Nuclear Regulatory Commission, "Proposed Updates of Licensing Policies Rules, and Guidance for Future New Reactor Applications," SECY-15-0002, January 2015. (ML13277A420)

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