

Deep Fission, Inc.  
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# **Regulatory Engagement Plan**

Revision 0

Prepared by Deep Fission

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# 1 - Introduction

The primary purpose of this Regulatory Engagement Plan (REP) is to reduce regulatory complexity by establishing a plan for future interactions and communication between Deep Fission Inc. and the Nuclear Regulatory Commission (NRC) during pre-application activities. The plan outlined in this REP is intended to promote efficient clarity and understanding on the regulatory safety case for a deep borehole nuclear reactor. Deep Fission will submit an application for a Standard Design Approval (SDA) under 10 CFR Part 52, Subpart E [Reference 1] for its pressurized light water reactor emplaced underground in a borehole within 30 months of this REP submission.

Deep Fission was incorporated as a Delaware C-Corp in July 2023 and was founded by Dr. Richard Muller, who serves as CEO, and by Elizabeth Muller, who serves as Chair of the Board of Directors. This REP serves as the formal introduction of Deep Fission to the NRC by presenting an overview of the Deep Fission technology and describing the regulatory approach that Deep Fission will use to effectively collaborate with the NRC and support critical pre-application design and safety objectives. This REP outlines the proposed regulatory strategy and details the engagements, roles, and obligations of both Deep Fission and the NRC staff. Its goal is to establish open communication, enhance collaboration, and reduce complexity during the pre-application, application, and post-application regulatory processes.

Deep Fission began pre-application engagement with an introductory meeting between NRC staff and Deep Fission on February 29th, 2024, followed by Deep Fission's submission of the "Deep Fission Response to NRC Regulatory Issue Summary 2020-02" [Reference 2] on March 12th, 2024.

This introduction section will provide points of contact for correspondence, a background on Deep Fission's company structure, an overview of the REP objectives, a high-level background on the project, and the Deep Fission regulatory approach summary.

## 1.1 - Contact Information

Please refer to the following points of contact for all correspondence with Deep Fission:

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Phone: +1 (910) 257-4327

Deep Fission will accommodate the NRC's preferred method of communication for official interactions but prefers to communicate via email.

Please send all mail correspondence to Deep Fission's corporate headquarters address:

Deep Fission, Inc.  
2831 Garber Street  
Berkeley, CA 94705

## 1.2 - Company Structure

Deep Fission was incorporated as a Delaware C-Corp in July 2023 and is not affiliated with nor a subsidiary of any other company. The founders of Deep Fission have significant experience in regulatory engagement related to nuclear waste management and disposal through a company named "Deep Isolation", though neither Deep Fission nor Deep Isolation have yet submitted a formal application to the NRC. The founders and company are committed to a respectful and effective relationship with the NRC during all engagement phases. Quality assurance programs for research and development have also been used in the past and are being prepared for implementation at Deep Fission.

Majority ownership remains with the founders of the company, Dr. Richard Muller, who serves as CEO, and Elizabeth Muller, who serves as Chair of the Board of Directors. Deep Fission has no foreign ownership or control and is thus not at risk of additional export control restrictions.

Using a staged and adaptive approach that will include the submission and review of white papers, topical reports, and a potential conceptual design assessment, Deep Fission can demonstrate financial qualification to carry out pre-application engagement activities and will provide all required fee payments upon request. Further financial resources for the application review will be secured prior to the submission of the application. At this time no budgetary considerations will negatively affect the pre-application engagement or review schedules.

While contracts with the Departments of Energy and Defense may be possible in the future, Deep Fission currently expects to govern this project solely under the NRC's regulatory authority and guidance.

## 1.3 - Strategic Approach

Deep Fission intends to submit an application for a Standard Design Approval (SDA) under 10 CFR Part 52, Subpart E [Reference 1]. This application will be supported by a series of pre-application white papers, topical reports, and a potential conceptual design assessment. Following the submission of an SDA application, Deep Fission will consider the submission of a Combined License Application (COLA).

This SDA application will need to consider the nontraditional emplacement of the Deep Fission pressurized light water reactor. A major benefit of the reactor's emplacement in a deep borehole is the billion tons of surrounding bedrock, which provide a safe and robust containment environment. Deep Fission will demonstrate that this natural containment will complement the containment function of the reactor vessel to replace the traditional surface containment building. The use of natural containment will be unique to this design and will need to be reviewed in future white paper and topical report submissions. Compliance with NRC regulations concerning monitoring and visual inspection may be challenging due to the deep borehole emplacement of the Deep Fission reactor. Therefore, coordination and guidance from the NRC on remotely operated nuclear reactor designs will be an early matter of discussion. Other exemptions may include the use of passive safety systems, microreactor emergency planning zone reduction, and reduced operational staffing requirements due to the microreactor size. Each of these exemptions will be considered in close coordination with the NRC.

Deep Fission does not anticipate that any unusual sequencing or significant changes in existing NRC policy will be required to complete the proposed licensing strategy and pathway. At this time Deep Fission is not considering applying for an Early Site Permit, Design Certification, Manufacturing License, nor Limited Work Authority. The sole focus of Deep Fission's regulatory strategy is the submission of a SDA application followed by a COLA.

## 1.4 - Background

Deep Fission is basing its reactor design on currently operating and widely understood pressurized water reactors (PWR). This REP follows similar regulatory and technical approaches taken by fellow PWR and small modular reactor industry peers, including NuScale and Holtec, based on the comparable designs and regulatory approaches. Deep

Fission recognizes potential complexities could arise as a result of the reactor's emplacement in a deep borehole. Accordingly, Deep Fission will be utilizing internal and external incorporation by reference of standard PWR systems to allow in-depth analysis and discussion with NRC staff on the regulatory requirements being met in nontraditional means. The development of the Deep Fission borehole nuclear reactor is based on the need for uncompromising safety and cost-effective production of carbon free nuclear electricity. Using natural containment and pressurization at depth may eliminate the need for costly concrete and steel surface containment buildings, thereby enabling a Deep Fission reactor to produce electricity at a cost similar to coal power production while maintaining incomparable safety.

## 1.5 - REP Approach

This REP is guided by Nuclear Energy Institute (NEI) 18-06, "Guidelines for Development of a Regulatory Engagement Plan" [Reference 3]. The preliminary schedule for submissions to the NRC, including white papers, conceptual design assessments, topical reports, and the Standard Design Approval application (SDAA), will be included in Section 3 of this REP. Upon approval of this REP, Deep Fission will request to meet with the NRC staff as often as once a month in whatever mode (in-person, online, or telephone) that the NRC staff requests.

An SDAA will be submitted by Deep Fission approximately 30 months after the submission of this REP. An official update to this REP will occur every six-month period and all updates will be communicated to the NRC staff through emails and regularly scheduled meetings. The NRC should expect at least three periodic updates to the REP throughout the pre-application process. Deep Fission will maintain this REP during this process, updating it as necessary while proactively including recommendations and guidance.

## 2 - Technology Summary

The Deep Fission Borehole Reactor 1 (DFBR-1) is a pressurized light water micro-reactor producing 15 MWt (thermal), 5 MWe (electric) designed to use deep geology to provide safety and security, and lower the cost of nuclear power by using the deep geology to help provide pressurization and containment. DFBR-1 will use standard low enriched uranium (LEU) uranium-dioxide fuel identical to that used in current PWRs.

The reactor core will be cooled by light water in a primary loop, with circulation driven by natural convection. Above the reactor core, but still deeply buried, a heat exchanger will boil water in a secondary loop, and the steam will be brought to the surface through a



steam pipe. The secondary loop water flow will be driven by a pump operating at the surface. As in other PWRs, the light water in the primary loop provides both cooling and neutron moderation. Except for its unique configuration (narrow reactor in a deep borehole), the design of the reactor is fundamentally similar to that of a PWR.

The nominal borehole is vertical or near vertical as seen in Figure 1.

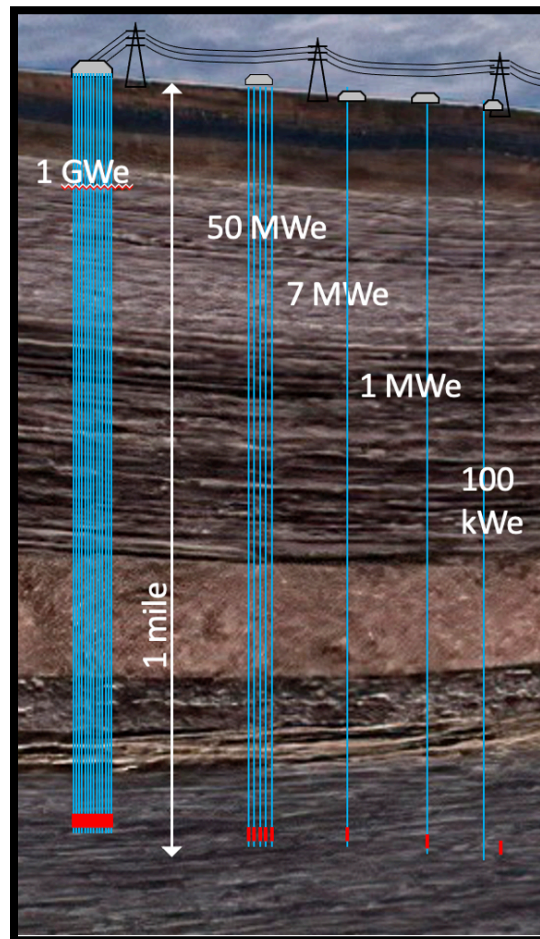


Figure 1: Various sizes of Deep Fission Borehole Reactor options in vertical boreholes

The reactor is emplaced up to 1 mile (1.6 km) deep. Hydrostatic pressure at that depth is 160 atmospheres, similar to the pressure found in standard PWRs. By utilizing this similarity, DFBR-1 will not require thick-walled pressurization vessels. Containment is also complemented by geology, provided by a mile of rock: a 45° cone of rock overburden provides about 10 billion tons of shielding. Detailed simulations of accidents, which will be provided in a future white paper, have shown that even if fully-spent fuel is released at 1.6 km depth, there will be no significant radioactive danger to the public or contamination of shallow aquifers. DFBR-1 would not be placed at a location with deep fresh-water aquifers. Similarly, the reactor is isolated from beyond design basis events that threaten surface

reactors, such as tornadoes, tsunamis, airplane crashes, fires, and human intrusion. Simulations have shown that neither large seismic activity, nor the sudden creation of large new faults or fractures, will seriously endanger public safety.

The nominal diameter of DFBR-1 and the piping of the secondary loop is 16 inches. The height of the nuclear core is 4 to 20 meters, depending on the desired power output and lifetime. Reactivity control is managed through remotely operated control rods and by a natural negative reactivity coefficient. In-situ sensors provide operation relevant information to the surface control room. The only moving parts are the control rods, possible valves for boric acid addition and removal, and the flow of cooling water. For an emergency SCRAM, the control rods are driven by gravity.

The design is passively safe and intrinsically accident resistant. A loss of coolant accident (LOCA) cannot occur from a leak in a pipe, since the reactor is not surrounded by air but is immersed in high pressure water (the brine of the rock formation). A steam bubble from a LOCA is buoyant and will rise to be replaced by water. The mile of water above the reactor provides a natural Emergency Core Cooling System (ECCS) if such a steam bubble were present. In the event of an accident, any radioactive release would occur a mile underground, rather than at the surface.

The reactor is designed to be retrieved at the end of the fuel cycle using cables that are permanently attached to the reactor. The former reactor can then be replaced by a new reactor in a nearby borehole or in the same borehole at a slightly shallower depth. Because the reactor is run at low power, its fuel cycle could be 10 to 20 years, and there is the option (if regulations permit) for the hole to be plugged when the fuel is spent and for the waste to be disposed of in place. Surveys show that the American public much prefers deep local disposal rather than above-ground transportation of radioactive materials over local roads.

### 3 - Regulatory Strategy

Deep Fission describes its regulatory approach in the following section, beginning with the specific application type to be prepared during the pre-application engagement with the Nuclear Regulatory Commission (NRC). There will be multiple opportunities for the regulatory decisions to change through a staged and adaptive approach as new information becomes available.

Applicable regulations and guidance documents will be cited and incorporated by reference to provide a basis for the decisions and processes to be followed throughout the regulatory

strategy section of this report. An assessment of the gaps in applicable regulations will be performed in the near future. This section also includes a short review of the Deep Fission Borehole Reactor 1's (DFBR-1) preliminary principal design criteria selection process as well as a listing of selected key issues.

## 3.1 - Application Type

Deep Fission is pursuing an application that will meet all regulatory requirements for a Standard Design Approval (SDA) under 10 CFR Part 52 Subpart E [Reference 1]. After the potential SDA application submission, Deep Fission is currently planning to apply for a Combined License (COL) under 10 CFR Part 52 Subpart C [Reference 4] with reference to the SDA Final Safety Analysis Review (FSAR). The decision to pursue an SDA, rather than directly applying for a COL, was made after careful analysis of each path's risks and benefits to regulatory success. Deep Fission also considered pursuing a construction permit and prototype reactor demonstration but determined that the benefit of being able to directly reference an SDA in all future COL applications provided significant advantages.

The SDA application may consist of major portions of the final design as allowed by 10 CFR Part 52.135. The full design submission, rather than a "major portions" submission, is also currently under consideration. Updates on the scope of the major portions submission will be provided to the NRC. Deep Fission will submit application components to the NRC staff as early as possible in order to maximize opportunities for review, questions, clarifications, and requests for additional information. During pre-application engagement, Deep Fission will also work with NRC staff to discuss specific portions of the SDA application that may not be explicitly required by existing regulation in order to increase the understanding of the technology and its safety features.

### 3.1.1 - Standard Design Approval (10 CFR 52 Subpart E)

The Standard Design Approval application will be completed based on the required content as provided in 10 CFR Part 52 Subpart E [Reference 1]. Requirements from §52.136 and §52.137 will be referenced extensively and specific requirements for the few significant differences from current pressurized light water designs, such as our use of deep boreholes as a form of reactor containment, will be raised with the Nuclear Regulatory Commission as early as possible. Deep Fission recognizes that the SDA may be completed for "major portions" of the plant and may pursue this option, which will reference the NRC's "A Regulatory Review Roadmap For Non-Light Water Reactors" [Reference 5], as well as the Nuclear Innovation Alliance white paper on the topic titled "Clarifying 'Major Portions' of a Reactor Design in Support of a Standard Design Approval".

### 3.1.2 - Combined License (10 CFR 52 Subpart C)

Deep Fission is giving the highest priority to its application for a Standard Design Approval (SDA). The SDA application will be followed by a Combined License application (COLA). The COLA will be completed based on the required content as provided in 10 CFR Part 52 Subpart C [Reference 4]. Requirements from §52.77, §52.79, and §52.80 will be referenced extensively. The Final Safety Analysis Report (FSAR) incorporating the Standard Design Approval will be completed first along with the site-specific Emergency Plan with its related inspections, tests, analyses, and acceptance criteria (ITAAC). The site-specific Environmental Report based on requirements in §51.55 will also be submitted. All applicable portions of the application will reference the Deep Fission Standard Design Approval. The COLA will not be submitted in the near future, but Deep Fission intends to keep the NRC informed of all long term regulatory actions taken by Deep Fission that could affect regulatory decisions..

### 3.1.3 - Other Considerations

Deep Fission assessment of NEI's "Guidelines for Development of a Regulatory Engagement Plan" [Reference 3], suggests that there are a variety of considerations which are not currently applicable to Deep Fission's pre-application engagement with the NRC. For example, partial application submittals and international considerations are currently not considered applicable to Deep Fission. In the current Regulatory Engagement Plan, Deep Fission is not seeking a construction permit, limited work authorization, nor immediately filing a COLA, all of which may allow a partial application submission. Deep Fission will continue to consider partial submission options in future pre-application activities.

### 3.1.4 - Staged and Adaptive

Deep Fission will use a staged and adaptive approach in its SDA and COL applications because Deep Fission believes that the use of such an approach is fundamental for a successful license application.

Although the draft "NRC Vision and Strategy: Safely Achieving Effective and Efficient Non-Light Water Reactor Mission Readiness" [Reference 6] recommends applicants pursue a "conceptual design assessment", no such formal or informal assessment has yet been publicly recorded by the NRC. Within a year of the submission of this Regulatory Engagement Plan, Deep Fission will seek to pursue a conceptual design assessment, or similar assessment, to allow for an early stage indication as to the key issues and design features to be reviewed and discussed in further detail. Pursuing a conceptual design assessment and receiving early indications of potential challenges in the application will

give all parties involved a more efficient way to adapt the design and regulatory environment.

Deep Fission will request a Preliminary Safety Evaluation Report (PSER) if the conceptual design assessment approach is not offered by the NRC. According to the Nuclear Energy Institute's (NEI) "Guidelines for Development of a Regulatory Engagement Plan" [Reference 3], the NRC staff has offered preliminary reviews on an ad-hoc basis. This includes a PSER, which is based on the submission of a Preliminary Safety Information Document (PSID) via the policy in NUREG-1226, "Development and Utilization of the NRC Policy Statement on the Regulation of Advanced Nuclear Power Plants" [Reference 7]. The PSER will provide another point of early interaction with the NRC to review the way in which Deep Fission meets the unique characteristics of advanced nuclear reactor designs and to give commentary on the reactor's design, safety, and security features. If the NRC staff accept major portions of the Standard Design Approval application for review this will allow for an even more staged regulatory process.

Deep Fission will remain in contact with the Nuclear Regulatory Commission through all application stages, including pre-application, to pursue a staged and adaptive regulatory approach that maximizes the safety and health of the American public while efficiently providing robust options for early review.

## 3.2 - National Environmental Policy Act

The Environmental Report is a critical component of applications that allows the NRC to meet its National Environmental Policy Act (NEPA) obligations. Although the Combined License Application (COLA) requires a complete Environmental Report, a Standard Design Approval (SDA) application does not, according to 10 CFR §52.136 and §52.137 [Reference 1]. Further, §51.22(c)(22) identifies SDA issuance as a "categorical exclusion". The SDA will be referenced subsequently in the COLA, which will be subject to environmental reporting. Therefore this section of the Regulatory Engagement Plan will be expanded when the time approaches for a COLA to be filed.

## 3.3 - Principal Design Criteria

The Principal Design Criteria for Deep Fission will primarily be based on 10 CFR Part 50 Appendix A [Reference 8] and its General Design Criteria. As an LWR, non-LWR design criteria of alternative advanced reactors will not be considered. However, design-specific Principal Design Criteria are likely to be proposed due to the unique emplacement of the Deep Fission Borehole Reactor 1 (DFBR-1) in a deep borehole.

### 3.3.1 - 10 CFR 50 Appendix A, General Design Criteria (GDC)

As required in 10 CFR 52.137, a standard design approval application must include principal design criteria (PDC). The general design criteria are listed in 10 CFR Part 50 Appendix A [Reference 8] as the “minimum requirements for principal design criteria for water-cooled nuclear power plants similar in design and location to plants for which construction permits have been issued by the Commission.” To ensure public safety and minimize risk, Deep Fission will diligently apply principal design criteria (PDC) to its design of structures, systems, and components (SSC). Any deviations from the prescribed general design criteria will be raised to the NRC as soon as possible.

### 3.3.3 - Establishment of Design-Specific Principal Design Criteria

While deviations from the GDC will be minimized to the greatest extent possible, some design-specific PDC will need to be developed due to the unique emplacement and operation of the Deep Fission reactor. As these deviations have not been evaluated by NRC staff in the past, Deep Fission will initiate early conversation on risk-informed performance based assessments of any exemptions that may be requested to ensure public safety.

## 3.4 - Selection of Applicable Guidance

In order to create a consistent and standardized Regulatory Engagement Plan drafting process, Deep Fission reviewed and applied guidance from a series of documents including NUREG-0800 “Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants: LWR Edition” [Reference 9] as well as the Light-Water Small Modular Reactor Edition (NUREG-0800, Introduction Part 2). Regulatory Guide 1.206, Application for Nuclear Power Plants provides detailed information on the pre-application phase activities as well as the application format. Finally, the most significant reference that Deep Fission has used in the preparation of this Regulatory Engagement Plan has been NEI 18-06, “Guidelines for Development of a Regulatory Engagement Plan (REP)” [Reference 3]. Additional reference materials will continue to be reviewed as they become available.

As Deep Fission will not be submitting an environmental report as the company is not seeking a site-specific license, NUREG-1555, RG 4.2, and RG 4.7 will not be applicable and are unlikely to be referenced though they are mentioned in the NEI “Guidelines for Development of a Regulatory Engagement Plan” [Reference 3]. Similarly, as Deep Fission will be applying for a Standard Design Approval and not for a non-power, test, or research reactor, NUREG-1537 and RG 2.5 will not be referenced.

### 3.4.1 - NUREG-0800

Deep Fission has reviewed the guidance provided by the NUREG-0800 “Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants: LWR Edition” [Reference 9] and is using this guidance to enhance its regulatory engagements. Deep Fission recognizes that the intent of the SRP is to increase regulatory transparency, make information on regulations more easily accessible, and improve conversations between the NRC staff tasked with reviewing the Deep Fission application. The safety review for a Standard Design Approval application (SDAA) will be drafted and submitted based on content required to be submitted as described in the SRP. Deep Fission recognizes that the SRP is not a substitute for regulations and that an NRC assessment of the application compared to the SRP will be needed prior to docketing of the application. Any exceptions to review due to non-relevance of review standards in NUREG-0800 or proposed changes in acceptance criteria will be raised with NRC staff as early as possible.

### 3.4.2 - NUREG-0933

Along with the guidance documents provided by the NRC and NEI, Deep Fission will continuously review the Generic Issues Program (GIP) for issue status and resolution of generic safety issues through NUREG-0933 and the online Generic Issue Management Control System (GIMCS). Proposed solutions to unresolved medium and high-priority generic issues will be provided at the time of the submission of the Combined License, though attention will be given to all unresolved issues throughout the SDAA process as well.

### 3.4.3 - Regulatory Guide 1.206

Deep Fission will be preparing its SDAA based on the guidance in Regulatory Guide (RG) 1.206, Combined License Applications for Nuclear Power Plants [Reference 10]. Although RG 1.206 is not specifically written for a SDA, developing the SDA application based on the format and content recommended by RG 1.206 allows simplified incorporation by reference into the COLA. By applying NUREG-0800 and RG 1.206, Deep Fission will be able to standardize the preparation of the application in the hopes of an efficient review process. Any content that has yet to be fully transitioned from RG 1.70 to NUREG-0800 will be included in the review process.

## 3.5 - Use of Standards and Industry Guidance

The effective utilization of consensus standards (ANS, ASME, ANSI, etc.) and industry guidance (NEI, EPRI, etc.) are central to all of Deep Fission’s pre-application engagement

activities. As highlighted in this Regulatory Engagement Plan, consensus standards from professional engineering societies will guide Deep Fission's technical development.

### 3.5.1 - Consensus Standards

Deep Fission refers to the consensus standards provided by the professional standards development organizations of relevance including the American Nuclear Society (ANS), American Society of Mechanical Engineers (ASME,) and others accredited by the American National Standards Institute (ANSI). These consensus standards will be referenced extensively in the Standard Design Approval application and Deep Fission will meet with NRC staff within the first year of pre-application to discuss the relevant consensus standards as well as the industry guidance documentation from NEI and EPRI.

### 3.5.2 - NEI Guidance

The Nuclear Energy Institute's (NEI) "Guidelines for Development of a Regulatory Engagement Plan" [Reference 3] is widely recognized across the nuclear energy industry as the leading guide for creating quality REPs and properly collaborating with the NRC during the pre-application phase. This guide has been extensively referenced in past REPs by many of Deep Fission's industry peers. Deep Fission will also continue to review guidance documents from NEI on a variety of technical and policy issues.

### 3.5.3 - EPRI Guidance

In addition to extensively referencing the NEI's guidance on a range of industry relevant issues, Deep Fission will coordinate its research and development with the Electric Power Research Institute (EPRI) and resources, such as EPRI's "Advanced Nuclear Technology: Advanced Light Water Reactor Utility Requirements Document, Revision 13" [Reference 11]. Topical areas such as the Pressurized Water Reactor Materials Reliability Program (MRP), Pressurized Water Reactor Steam Generator Management Program (SGMP), and Advanced Nuclear Technology Program are all relevant to Deep Fission. Consistent communication and collaboration with EPRI will allow for standardization in the design and engineering of the pre-application phase.

## 3.6 - Assessing Alignments and Gaps

As Deep Fission reviews the regulatory requirements available in the reference documents mentioned in Section 3.4, any gaps or areas in which applicable regulation is lacking will be listed in a white paper and discussed with NRC staff. This assessment of regulatory gaps will also reference regulatory gap reports from other companies. Deep Fission's regulatory gap analysis will occur within the first twelve months of the pre-application phase. Deep



Fission recognizes this analysis is not required, but expects that this gap analysis will minimize future regulatory risk.

### 3.6.1 - Principal Design Criteria

10 CFR Part 50, Appendix A [Reference 8], establishes General Design Criteria (GDC) that are considered the "minimum requirements for principal design criteria (PDC) for water-cooled nuclear power plants similar in design and location to plants for which construction permits have been issued by the Commission." RG 1.232 also provides guidance on the creation of PDC for non-light water reactors which may be relevant to Deep Fission's design and unique emplacement. While most GDC will be applicable and others will not, Deep Fission will engage with NRC staff on the appropriate PDC and the potential exemptions from GDC within the first twelve months of the pre-application phase.

### 3.6.2 - Design Specific Review Standard and Risk-Informed Review

While a large majority of the review criteria applied to the Deep Fission reactor are easily reviewed using the Standard Review Plan (SRP) of NUREG-0800, a few Design-Specific Review Standards (DSRS) are currently under consideration by Deep Fission. Similar to the NuScale Power DSRS, Deep Fission may augment the SRP with DSRS. The use of risk-informed performance review standards, as applied to advanced reactors, may also be another pathway for Deep Fission to make minor changes to the review standards applied due to the reactor's emplacement deep underground in a borehole. This topic of exemptions to the SRP and DSRS use will be raised with the NRC staff within the first twelve months of engagement.

### 3.6.3 - Ad Hoc Assessments

Along with the traditional assessments of principal design criteria and design specific review standards, Deep Fission has also reviewed alternatives, such as the Regulatory Framework Documents by the Tennessee Valley Authority (TVA), the Regulatory Gap Analyses by NuScale Power, and the assessments of the Next Generation Nuclear Plant (NGNP). By using as much of the light-water reactor regulatory guidance as possible, Deep Fission intends to produce a brief regulatory gap analysis white paper on the potential exemptions already approved by other license applicants as well as those specific to the Deep Fission reactor design.

## 3.7 – Design-Centered Review Approach

Deep Fission will be applying the design-centered approach to licensing through several points in the pre-application and application phases. First, Deep Fission will apply for a Standard Design Approval. Concurrent to that application’s review, or subsequent to that application’s approval, Deep Fission will file a Combined License Application (COLA) and will incorporate by reference the standard content of the SDA in the COLA. This will serve as a “reference” COLA (R-COLA) with each “subsequent” COLA (S-COLA) containing identical content but excluding site-specific information. Deep Fission is not yet participating in a Design-Centered Work Group (DCWG) but will consider creating one in the future in coordination with NRC staff on any generic reference topics of interest.

## 3.8 – Key Issues

Deep Fission will be in regular communication with the NRC on all key issues raised by NRC staff as well as any specific issues related to the emplacement of a nuclear reactor in a borehole. Early identification of issues will allow resolution in the design and development phases of the Deep Fission reactor. The use of white papers will be the standard for discussion direction on key issues and all resolutions will be captured in the final Standard Design Approval application.

### 3.8.1 – Generic Issues

Deep Fission is currently tracking and reviewing the generic issues program of the NRC. Potential reference of the generic issues under screening and implementation may be included in the final Standard Design Approval application. Deep Fission will continue to review the Generic Issues Dashboard as well as the periodic updates to NUREG-0933. If NRC staff associate insights as generically applicable, Deep Fission will also collaborate on those items with technical relevance for other pressurized light water reactors.

### 3.8.2 – New Reactor Issues

The NRC Resolved Policy Issues related to SMRs and non-light water reactors, found on the NRC’s webpage regarding Resolved Policy Issues has been reviewed thoroughly and will be continuously reviewed by Deep Fission throughout the pre-application and application phases. Deep Fission will also coordinate with industry groups, such as the Nuclear Energy Institute, Nuclear Innovation Alliance, and Nuclear Industry Council, along with selected working groups available within these organizations.

### 3.8.3 – Selected Specific Issues

The following specific issues will be addressed by white papers or in-person meeting discussions with additional issues to be added to an updated Regulatory Engagement Plan. As Deep Fission transitions from conceptual design to engineering design, these specific issues will be of the greatest relevance and will thus be given significant resources for review and incorporation.

#### A - Reactor Staffing

Deep Fission will expect to reduce reactor staffing in subsequent iterations of the reactor design based on recent microreactor exemption requests. A combined white paper on this topic and other topics of similar microreactor exemption likelihood is expected. Deep Fission will also incorporate by reference any potential minimizations of control room staffing while meeting all applicable regulations.

#### B - Safeguards and Security

Deep Fission will submit a comprehensive white paper on safeguards and security, covering crucial aspects such as design considerations for physical security, the use of detection and assessment, and security staffing requirements. The white paper will also include the Safeguards Information Plan (SIP). This engagement aims to review and refine the Deep Fission SIP for safeguarding sensitive information (SGI) and the protection of the reactor. Upon successful review and approval by the NRC, this plan will enable Deep Fission to access vital SGI data necessary for integrating safeguards and security measures of the facility design and physical security program. The deep borehole emplacement will serve as a significant protection and safeguard for the reactor.

#### C - Emergency Planning

Deep Fission will apply the final rule and associated regulatory guide using risk-informed, performance-based emergency preparedness requirements to small modular reactors. The new emergency planning framework will be followed to demonstrate effective responses in drills and exercises for emergencies and accidents. Deep Fission will provide a hazard analysis for adjacent facilities, ensuring they do not impede emergency plans. The emergency planning zone size, which will likely be very small due to the microreactor size, is expected to be scalable based on the guidance provided by the NRC. Additionally, Deep Fission's emergency plans will detail ingestion response planning, outlining offsite resources to prevent contaminated food and water from entering the ingestion pathway.

## D - Fuel Qualification

The Deep Fission combined white paper on fuel qualification will be simplified due to the traditional and well-understood fuel practices currently used in multiple commercial nuclear power plants across the United States. The approach to fuel qualification will be demonstrated in coordination with fuel vendors and will include the use of data from low enriched uranium dioxide ceramic fuel used in PWRs. The fuel qualification program will aim to use the past tests of substantial amounts of fuel to gather data that can confidently validate assumed failure rates in both regular operation and accident scenarios for the reactor. As the design of the Deep Fission reactor evolves, along with alterations in service conditions and performance criteria, adaptations may be needed in order to make the fuel irradiation and testing programs align with these changes.

## E - Seismic

Deep Fission will submit a comprehensive white paper focusing on seismic safety, delving into critical aspects such as anticipated challenges and including high site seismicity and evolving seismic characterizations. Additionally, this white paper will discuss the importance of considering seismic isolators in the design process and addressing beyond-design-basis considerations, which are extremely relevant with the deep borehole emplacement.

## F - Flooding

A comprehensive white paper or section of a larger comprehensive white paper focusing on flooding safety will be submitted by Deep Fission. This paper will address significant safety topics such as anticipated challenges, including the necessity for site-specific analysis, and evaluations regarding surface versus deep underground emplacement. Deep Fission will also examine the vulnerability or resilience of the reactor designs to flooding impacts and discuss considerations that go beyond the standard design parameters. This white paper is expected to be simplified due to the limited surface facilities that could be impacted by flooding.

## G - Aircraft Impact and “Loss of Large Area” Requirements

Deep Fission will review both 10 CFR 50.150 on aircraft impact assessments as well as 10 CFR 50.54 on aircraft impact threat and loss-of-large-area response. A white paper on this topic will be simplified and may be combined with flooding and other natural disaster response topics. Due to the reactor’s emplacement approximately one mile below the surface, Deep Fission anticipates that aircraft impact and loss-of-large-area response will be minimal with extremely low projected radiation impact.

## H - I&C, Digital I&C

Deep Fission will likely pursue a digital instrumentation and control system and will prepare a white paper or include a section on the topic in a larger comprehensive white paper on the cyber security implications as well as the potential for failure due to a software or hardware malfunction. All inter-channel and safety to non-safety digital system communication will be reviewed under NRC regulations.

## I - Accident Analysis Methodology

A white paper on the licensing basis events, the beyond design basis events, and other accident review methodology will be prepared for the NRC within the first year. Phenomena identification is currently underway at Deep Fission. The ranking of risk through models and codes will be presented in the white paper. A review of RG 1.203 on “Transient and Accident Analysis Methods” will be coordinated, with the risk-informed framework currently being applied to advanced reactors, along with an analysis of the implications of ANSI/ANS-30.3-2022 “Light-Water Reactor Risk-Informed Performance-Based Design”.

## J - Probabilistic Risk Assessment and Risk-Informed, Performance-Based Regulatory Framework

Deep Fission will prepare a white paper or a section in a comprehensive white paper outlining the probabilistic risk assessment, severe accident evaluation, and potential use of risk-informed, performance based regulatory guidance. This white paper will likely be combined with the accident analysis methodology paper listed previously.

## K - Human Factors

After a review of NUREG-0700, “Human-System Interface Design Review Guidelines”, and NUREG- 0711, “Human Factors Engineering Program Review Model”, it seems unlikely that a white paper will be required by Deep Fission on the subject of Human Factors. However, concepts related to this topic may be incorporated in future white papers.

## L - Quality Assurance

Deep Fission expects to submit a topical report on the company’s quality assurance program, and will significantly incorporate by reference previously approved quality assurance guidance such as the Regulatory Guide 1.28. At this time no alternative QA programs nor use of other international standards are expected. The QA program will be implemented in Deep Fission within the first year of pre-application activities.

## M - Concept of Operations

Deep Fission expects to submit a white paper on its departure from the traditional refueling schedule of pressurized light water reactors. This white paper or section in a comprehensive white paper will review the expected fuel cycle lengths, maintenance approaches, and inspection frequencies to be discussed in meetings with NRC staff.

## N - ITAAC and Design Acceptance Criteria

Deep Fission will provide a white paper on the standard design descriptions and their connected inspections, tests, analyses, and acceptance criteria (ITAAC). These will be identified in the license application and are necessary and sufficient to provide reasonable assurance that the facility will be constructed and operated according to the license. No site specific ITAAC will be listed during the Standard Design Approval application (SDAA) period.

## O - Nuclear Insurance and Disaster Relief

No white paper or topical report is expected on the specific issue of nuclear insurance and disaster relief. While Deep Fission will seek offsite liability insurance via Price-Anderson, with potential reduced risk due to the microreactor size when a Combined License (COL) is being applied for, neither off site liability nor onsite insurance apply to a SDAA with no site specified.

## P - Ownership and Financial Insurance

No white paper or topical report is expected on the specific issue of ownership and financial insurance. Deep Fission will meet the review standard of “appears to be financially qualified”, set out by DG-9004 [Reference 12], for construction and operation when applying for a COL. During the SDA pre-application, Deep Fission will maintain its financial qualification. Decommissioning funding and required assurances are not relevant to a SDA but will apply to the COL application. Finally, there is currently no foreign ownership or control of Deep Fission and any changes, though unexpected, will be reported to the NRC immediately.

## 3.9 - NRC Review Timeframes

The current planned schedule of pre-application activities is as follows:

- February 29, 2024: Private Meeting with NRC on Introduction of Deep Fission
- March 12, 2024: Submission of Regulatory Issues Summary 2020-02 Response
- March 22, 2024: Submission of Regulatory Engagement Plan
- April 2024: Public Meeting with NRC on Regulatory Engagement Plan

- April-May 2024: Potential Review of Regulatory Engagement Plan by NRC Staff
- May 2024: Submission of White Paper 1 on Design Description Overview
- June 2024: Public Meeting with NRC on White Paper 1
  - June-July 2024: Potential Review of White Paper 1 by NRC Staff
- July 2024: Submission of Topical Report 1 on Quality Assurance Program Description
  - July-September 2024: Potential Review of Topical Report 1 by NRC Staff
- August 2024: Submission of White Paper 2 on Core Design and Convective Cooling
  - September-October 2024: Potential Review of White Paper 2 by NRC Staff
- September 2024: Public Meeting with NRC on White Paper 2
- September 2024: Submission of Updated Regulatory Engagement Plan
  - October 2024: Potential Review of Updated Regulatory Engagement Plan
- October 2024: Submission of Topical Report 2 on Principal Design Criteria
  - October-December 2024: Potential Review of Topical Report 2 by NRC Staff
- November 2024: Submission of White Paper 3 on Reactivity Control and Accidents
  - November-December 2024: Potential Review of White Paper 3 by NRC Staff
- December 2024: Public Meeting with NRC on White Paper 3
- February 2025: Submission of Conceptual Design Assessment Request
- March 2025: Potential Conceptual Design Assessment by NRC Staff
- March 2025: Potential Submission of Updated Regulatory Engagement Plan
- June 2025: Submission of White Paper 4 on [To Be Determined]
- June 2025: Public Meeting with NRC on White Paper 4
  - July-August 2025: Potential Review of White Paper 4 by NRC Staff
- September 2025: Submission of White Paper 5 on [To Be Determined]
- September 2025: Public Meeting with NRC on White Paper 5
- September 2025: Submission of Updated Regulatory Engagement Plan
  - October-November 2025: Potential Review of White Paper 5 by NRC Staff
- December 2025: Submission of White Paper 6 on [To Be Determined]
- December 2025: Public Meeting with NRC on White Paper 6
  - January-February 2026: Potential Review of White Paper 6 by NRC Staff
- February 2026: Submission of Readiness Assessment Audit Request
- March 2026: Potential Readiness Assessment Audit from NRC Staff
- September 2026: Submission of Standard Design Approval Application
- October 2026: Potential Acceptance of Standard Design Approval Application
- November 2026: Potential Docketing of Standard Design Approval Application
- March 2028: Submission of Combined Operating License Application
- April 2028: Potential Acceptance of Combined Operating License Application
- May 2028: Potential Docketing of Combined Operating License Application
- September 2028: Potential Letter of Standard Design Approval from the NRC

Each potential event on this planned schedule may be delayed or expedited based on NRC review resources as well as Deep Fission's design progress. The schedule is already expedited from the generic schedule provided by the NRC based on NEIMA requirements from July 13, 2019. In that generic schedule the NRC states that a Standard Design Approval Final Safety Evaluation Report for a light water power reactor could take as long 42 months following the acceptance review of the application. The hope is that, with significant pre-application engagement, this review time can be shortened or can incorporate the two years of pre-application engagement in the total time accrued.

It is understood that the timeframe for review is subject to adjustment based on a variety of factors including the level of design complexity, which Deep Fission claims is reduced. Deep Fission will seek previously accepted exemptions, but will otherwise work to minimize any alternatives to the traditional review acceptance criteria. Deep Fission will use topical reports supporting the application sparingly due to the generic schedule stating that these reports can take up to two years for review. For any and all responses to requests for additional information (RAI), Deep Fission will respond within 30 days unless otherwise directed. Audits and staff on-site and off-site reviews of procedures, detailed calculations, and data files are welcomed including during the Conceptual Design Assessment review. An electronic reading room will be provided to the NRC staff as early as possible for data review.

## 4 - Pre-Application Engagement

The following section will review information included in Section 3 and provide deeper context on relevant topics to a productive and successful pre-application phase. A discussion on the identification and prioritization of topics will be followed by a review of the expected types and frequency of interactions. Deep Fission's current expectations on NRC staff feedback and schedule considerations will provide an important baseline for interactions. Finally, the consideration and coordination of other reviews as well as preparation for site visits and audits will be described in this section.

### 4.1 - Identification of Topics

If additional information on the topics described in Section 3 (Regulatory Strategy), such as accident analysis methodology, seismic and flooding analysis, and emergency planning methodology would benefit the NRC staff, Deep Fission will provide it upon request. Additional topics for white papers and technical discussions are expected to be raised by the NRC staff and Deep Fission throughout the pre-application phase. Using a staged and adaptive licensing process, Deep Fission will seek to minimize its licensing risk by discussing topics early and often with the NRC staff.



### 4.1.1 - Regulatory Strategy

Deep Fission intends to submit a Standard Design Approval (SDA) application no later than September 2026. As a pressurized water microreactor, very few novel regulatory approaches will need to be considered. Exemptions or design based review standards on topics such as the lack of use of large surface containment structures will be reviewed in depth with the NRC staff prior to submission of the application. Clarification on NRC staff access needs and required monitoring data will also be an early topic of discussion with the NRC staff, well in advance of application submission.

### 4.1.2 - Applicable Generic and Industry Issues

As mentioned in Section 3.8.1 and 3.8.2, Deep Fission will continuously review all generic impact issues. Coordination with industry partners and organizations such as the Nuclear Energy Institute (NEI) will allow Deep Fission to apply generic resolved issues. For example, an extensive surface containment structure was not required by licensees such as NuScale and review of the methodology that allows this simplified design will be referenced if applicable.

### 4.1.3 - Applicable Design-Specific Issues

Design specific issues such as the deep borehole emplacement will be an important topic of discussion with NRC staff. Other design specific issues such as those described in Section 3.8.3 will be updated, identified, and resolved as early as possible. Generic impact issues such as the use of natural convection, as used by prior license applicants, will also be discussed with the NRC staff as well as industry conveners such as NEI.

### 4.1.4 - Applicable Site-Specific Issues

As mentioned throughout this Regulatory Engagement Plan, no site specific issues are expected to be discussed with the NRC staff. This is due to the fact that site specific issues are not relevant in an SDA application. Generic siting issues that are required in the SDA application, such as seismic behavior, have already been researched and will be reviewed with the NRC staff as necessary.

### 4.1.5 - Prioritization of Topics

A prioritization of the topics for white papers and technical discussions to be held throughout the pre-application phase has not been finalized by Deep Fission at this time. Preliminary white papers will discuss the safety provided by deep borehole emplacement as well as the natural pressurization available at depth. White papers on the use of natural convection cooling and reactivity control systems, which have broad programmatic impact

on the design, are also expected to be submitted within the first year of engagement with the NRC. Besides technical discussions as described in these white papers, topics such as the quality assurance program development, safeguards information access, and regulatory gap analysis will be prioritized.

## 4.2 - Types and Frequency of Interactions

Deep Fission expects a variety of types of interactions with the NRC staff during the pre-application phase. Early and frequent interactions with the NRC will help Deep Fission to minimize regulatory risk. The “novelty” of the Deep Fission reactor is generally limited to its emplacement in a deep borehole, but with consistent communication to the NRC staff Deep Fission expects to be able to successfully apply for a Standard Design Approval no later than September 2026.

### 4.2.1 - Routine Project Management Discussions

Deep Fission anticipates, at minimum, to hold monthly interactions with the assigned NRC staff project manager. As the application nears submission, Deep Fission is prepared for multiple interactions in increasing frequency. While no site is under consideration to potentially necessitate multiple NRC project managers, any rotation or change in assignment of NRC project managers is requested to be announced to Deep Fission with enough time to properly transition any and all information on the project. This will be a two year pre-application phase and two year application phase, carried out with the hope that staffing at the NRC will remain relatively consistent throughout.

### 4.2.2 - Project Management “Drop-Ins”

Deep Fission will expect to have periodic “drop-in” visits with the NRC project manager, multiple members of the senior NRC staff, and Commissioners, during the pre-application and application review phase. As these meetings will be private, Deep Fission understands that no technical discussions will occur in these meetings and no regulatory action or decision will be made. Assuming monthly or bimonthly public meetings with NRC staff, project management “drop-ins” are not expected to be needed on a frequent basis. All such meetings will be coordinated with the NRC project manager.

### 4.2.3 - Technical Discussions

The use of technical discussions early and often in the pre-application phase will allow Deep Fission to review and address any potential regulatory challenges with ample time to make necessary corrections. While initial introductory discussions are expected to be free, Deep Fission is prepared to receive invoices for the public meeting technical discussions.

Once a full list of priority topics for review is established in coordination with the NRC project manager, Deep Fission may seek to consolidate related items to maximize efficiency during meetings. All meetings are able to be done via web conferencing or in person depending on the preference of the NRC staff. Deep Fission has no strong preference between these options.

#### 4.2.4 - NRC Staff Familiarization

The highest priority for Deep Fission is creating a transparent, respectful, staged, and adaptive regulatory engagement with the NRC. Deep Fission will coordinate with the NRC project manager to be assured that the appropriate NRC staff are being familiarized with the Deep Fission technical design and regulatory strategy. The expectation is that early and often regulatory engagement with the NRC staff will minimize regulatory risk during the application review which, if not minimized, could lead to significant challenges for Deep Fission in the future. This extensive REP and the first white paper providing background technical information may be valuable assets to provide to NRC staff onboarding to the project.

#### 4.2.5 - Written Submittals

At this time Deep Fission is expecting to submit a series of white papers and potentially topical reports on the technical and regulatory topics mentioned throughout this REP. As topical reports provide a safety evaluation report and can be referenced by any other license applicant, a systematic review of all such topical reports is currently in progress by Deep Fission and the complete list of topical reports expected to be incorporated by reference will be provided to the NRC within the first year of the pre-application phase. Deep Fission will provide a white paper to the NRC for review roughly every three months. As NRC staff correspondence or commentary on the white papers is provided to Deep Fission, the frequency and complexity of interactions regarding these white papers may change accordingly.

#### 4.2.6 - Early ACRS Engagement

As mandated by the Atomic Energy Act of 1954, The Advisory Committee on Reactor Safeguards (ACRS) has four main purposes including to review and report on safety studies and reactor facility license and license renewal applications; to advise the Commission on the hazards of proposed and existing production and utilization facilities and the adequacy of proposed safety standards; to initiate reviews of specific generic matters or nuclear facility safety-related items; and to provide advice in the areas of health physics and radiation protection. Deep Fission has reviewed the ACRS letter reports and public

meetings of both small modular reactor license applicants and advanced reactor license applicants.

As the application phase nears, Deep Fission will coordinate with NRC staff to prepare for ACRS discussions and review opportunities. As specific issues, such as deep borehole use of natural geologic containment, are proposed and reviewed by the NRC staff, interactions with the ACRS may be beneficial to help increase familiarity with the topics being discussed and reviewed.

#### 4.2.7 - Escalation of Issues

While a respectful and transparent relationship between Deep Fission and the NRC staff is Deep Fission's top priority, moments of technical and regulatory disagreement are likely to occur. After initial responses and feedback are provided, an escalation to the NRC project manager and the NRC senior staff will occur based on a system of escalation that is agreed to by the NRC project manager and Deep Fission. While NEI guidance recommends a tiered interaction model, sometimes known as a "zipper plan", the preference for any escalation of issues will be devised after careful consideration by both Deep Fission and the NRC staff.

### 4.3 - NRC Feedback

Early and often engagement with the NRC staff is a high priority for Deep Fission. Extended feedback engagement is expected. Deep Fission values the NRC's feedback and will work to appropriately incorporate it. Each planned submission is expected to receive commensurate feedback to the level of applicability to the full application submission. With design maturity still under development, engaged feedback with the NRC staff will have a significant impact on Deep Fission.

#### 4.3.1 - Feedback as a Function of Submittal Type

Deep Fission recognizes that planned submissions will receive varying levels of NRC staff feedback. The company has reviewed the Safety Evaluation Reports that are publicly available as feedback responses to approved topical reports. Due to the extensive review time, topical reports are expected to be used sparingly throughout the pre-application phase. Instead, NRC staff correspondence as feedback on white papers and technical reports will be the primary form of feedback expected by Deep Fission. If approval of prior submitted reports with publicly available information is expected to be referenced, Deep Fission will coordinate the receipt of any feedback as to the applicability of the report to the Deep Fission design. Deep Fission will continue to review the NRC staff's "A Regulatory Review Roadmap for Non-Light Water Reactors" [Reference 5] as a reference on NRC staff feedback including the use of Requests for Additional Information during the application

phase. Deep Fission requests the topic of feedback be an early topic of discussion within the first or second month of pre-application engagement.

#### 4.3.2 - “Finality”

As Deep Fission is demonstrating its dedication to regulatory engagement in very early pre-application engagement, finality of design is not to be expected. As design maturity increases and technical readiness level rises, Deep Fission will continue to update the NRC staff through early and often regulatory engagement. Deep Fission recognizes that staff conclusions provided on early conceptual designs are non-binding but believes that through the use of such mechanisms as a Conceptual Design Assessment, findings issued on the conceptual design will inform the completion of the necessary information for a Standard Design Approval. There is also a recognition that the white papers may carry “less weight” than topical reports but the staged and adaptive process being employed by Deep Fission finds the benefit of iteration to outweigh early finality.

### 4.4 - Schedule Considerations

Deep Fission is well aware of its comparatively early pre-application engagement with the NRC relative to other companies also seeking a license. With 25 small modular reactor applications expected by 2029, according to the NRC Commissioner’s public remarks, the time and resource availability of the NRC staff is sure to be limited and a constraining factor. Consistent communication with the NRC project manager is expected and, as previously mentioned, as often as monthly meetings with the NRC to provide technical and application updates are being requested.

The full schedule of planned submissions is included in Section 3. Not included in this schedule are the monthly private or public meetings which will be coordinated and agreed to by the NRC project manager and Deep Fission within one month of the submission of the Regulatory Engagement Plan. Deep Fission requests an estimated cost and approved schedule with expected availability of the NRC staff within three months of the submission of the Regulatory Engagement Plan. The expected duration of the NRC staff reviews will be one month for the Regulatory Engagement Plan, no more than two months for all submitted white papers, and no more than three months for the Conceptual Design Assessment. If the NRC expects a longer duration of review to be necessary, Deep Fission requests notification of the expected length of duration for review within one month of the related submission. Deep Fission will be certain to update the schedule of planned submissions or meetings with the NRC project manager by email or during regularly scheduled meetings.

## 4.5 - Relation to NRC and Other Proceedings

Following the submission of the Standard Design Approval application (SDAA), Deep Fission will consider the submission of a Combined License (COL) application. This COL application may be under review at the same time as the SDAA review. If and when this occurs, Deep Fission will be sure to coordinate all related portions between the SDA and COL. As mentioned in the NEI guidance on the preparation of a Regulatory Engagement Plan, an example of this coordination might include the deferment of COL Requests for Additional Information associated with the portion of the design under review in the SDA until such issues are resolved in the SDA application review.

If Deep Fission forms a design center or working group, Deep Fission will similarly consider any design-centered review coordination with a design center for small modular reactor pressurized water reactors. Other coordination that may be of benefit to the NRC staff during the pre-application phase will be considered when discussed with the NRC project manager.

As Deep Fission is not currently considering any site, as allowed by the SDAA, and is not currently coordinating with the Department of Energy, US Army Corps of Engineers, nor the Federal Emergency Management Agency. NEPA Consultation is also not expected at this time. When siting considerations begin during the COL application phase, all coordination will be handled promptly as recommended by the NRC staff.

## 4.6 - Pre-Application Site Visits, Audits, and Inspections

During the pre-application phase, Deep Fission will comply with all requested audits and inspections. No site visits are expected as there is currently no site under consideration, as allowed by the SDAA. Deep Fission will maintain constant contact with the NRC project manager to determine the scope, schedule, and topics of any such audits, visits, or inspections.

### 4.6.1 - Quality Assurance

A quality assurance program will be implemented as the application for a Standard Design Approval (SDA) is developed. Deep Fission will be prepared for any audit or formal inspection of the quality assurance program, which the NRC staff may deem necessary. A topical report describing the quality assurance program, based on the applicable standards, will be submitted within six months of the submission of this Regulatory Engagement Plan.

## 4.6.2 - Testing

At this time, no testing or demonstration is expected to be required of Deep Fission due to the use of standard pressurized water reactor components. If testing or demonstration is required by the NRC staff, or if a determination based on the NRC staff's "A Regulatory Review Roadmap for Non-Light Water Reactors" [Reference 5] indicates a need for testing, all applicable inspections or site visits to the testing facility will be coordinated with the NRC project manager.

## 4.6.3 - Site Selection and Site Characterization

As previously mentioned, Deep Fission is not currently considering any site at this time. As an SDA application does not require a specific site to be selected for submission, this lack of site consideration is expected to be acceptable. If a site is considered, such as in the Combined License (COL) application to be submitted following the SDA application, an audit, inspection, and formal site visit will be proactively coordinated by Deep Fission with the NRC project manager.

## 4.6.4 - Security/Critical Infrastructure

Similar to the previous section, Deep Fission is not currently considering any site at this time. Therefore, no coordination for a site visit with the Department of Homeland Security is expected. Coordination and incorporation of safeguard and security by design will provide context for future site visits when required in future application submissions.

## 4.6.5 - Vendors/Suppliers/Supply Chain

As Deep Fission completes the design and engineering to the technical readiness level required by the SDA application, key suppliers will be coordinated, established, and contracted with. Until a COL is applied for, no audits of these vendors and supply chain members are expected. However, future revisions to this Regulatory Engagement Plan will update NRC staff on with any details related to vendors, suppliers, and supply chain selection.

## 4.7 - Budget

Both Deep Fission and the NRC will communicate with each other regarding any important budgetary considerations while establishing and maintaining the SDAA project schedule. Deep Fission recognizes that NRC fees and rates are subject to change. Estimated NRC staff review fees – including review hours – will be estimated at the time of acceptance for

review, monitored on an ongoing basis, and retroactively audited in order to better inform financial planning.

## 5 - Application Process

After pre-application engagement with the NRC, Deep Fission will submit a Standard Design Approval application (SDAA) no later than September 2026. The following section will outline Deep Fission's expectations for the application process. This includes the readiness assessment audit, application submittal, application acceptance review and docketing, and understanding of the critical NRC processes at the time of the submission of the application.

### 5.1 - Readiness Assessment Audit

Deep Fission intends to request a readiness assessment audit no later than March 2026, approximately six months ahead of the submission of the SDAA. While Deep Fission will work to prepare a completed application for auditing by that date, a nearly-completed application may be acceptable and will be clarified in future updates to this Regulatory Engagement Plan. Following the multi-day audit, Deep Fission expects the NRC staff to highlight and comment on issues that might prevent the acceptance and docketing of the application as well as areas of the application for which clarification could minimize requests for additional information. Observations made during the audit are not binding and care will be taken to prepare the application according to the standard review plan regulations for the greatest likelihood of application acceptance. Deep Fission recognizes that significant resources will be required for the audit and prefers to address any issues as early as possible as part of its staged and adaptive licensing process. In preparation for the audit, Deep Fission will review NRO-REG-104, "Pre- Application Readiness Assessment" in detail.

### 5.2 - Application Submittal

As previously stated, Deep Fission expects to submit an SDAA no later than September 2026. An earlier submission may be possible as Deep Fission continues to refine the design and engineering of its reactor. Any changes to the expected submission schedule will be given to the NRC staff as early as possible during the regularly scheduled meetings. Deep Fission will submit the SDAA in advance of the COLA, which will reference the SDAA.

Deep Fission intends to submit all documentation electronically, rather than through a hard copy, but is willing to submit in whichever format the NRC prefers. A review of the e-submittal process has already been conducted and non-application documents, such as



the regulatory engagement plan, white papers, and conceptual design assessment, will be submitted electronically unless otherwise directed by the NRC. Non-docketed information requested by the NRC staff, such as internal calculations, procedures, and reports, will be available to the NRC staff through an electronic reading room.

## 5.3 - Acceptance Review and Docketing

Following the e-submittal of the application, Deep Fission expects NRC staff to perform an acceptance review according to 10 CFR 2.101, 10 CFR 52.136, and 10 CFR 52.137. Deep Fission recognizes that NRC staff will be reviewing the documentation provided to ensure the inclusion of sufficient technical information in scope and depth. Deep Fission will support the NRC staff where appropriate as the NRC conducts a detailed technical review of the application and expects that the NRC will complete the review on a predictable schedule. Deep Fission will refer to NRO-REG-100 “Acceptance Review Process for Early Site Permit, Design Certification, and Combined License Applications” [Reference 13], although the guidance was not directly prepared for an SDA application acceptance review. Deep Fission expects that NRO-REG-100 will, similar to NUREG-0800, consider the Standard Design Approval application (SDAA) to be nearly equivalent to the design certification application referenced in NRO-REG-100. Once an application review schedule is proposed by NRC staff, that schedule will be added to the Regulatory Engagement Plan. If the acceptance review progresses as anticipated, Deep Fission expects that the application will be docketed in October or November of 2026.

## 6 - Post-Application Engagement

While this Regulatory Engagement Plan is primarily concerned with the pre-application phase of engagement in preparation for the submission of an SDAA, a brief review of post-application engagement is included with the understanding that updates to this section are likely as the application nears completion. The use of technical meetings and audits to assist in the review of the application will be discussed first, followed by the current understanding of the requests for additional information, and closing with the process for changes to the application or its review schedule.

### 6.1 - Technical Meetings

Deep Fission recognizes the need to meet consistently with NRC staff to discuss the many important technical features that provide safety benefits. While monthly meetings are being requested in the pre-application engagement phase, Deep Fission recognizes that technical meetings will likely become more frequent and may not be able to be scheduled on a routine basis after the SDA application has been submitted. Deep Fission will maintain

constant communication with the NRC project manager and make its staff readily available for in-person or web conference meetings at the NRC staff's request. Deep Fission requests that all meetings be requested via email and understands that at least 10 days of advance notice will be needed for public access to these technical meetings. At this time Deep Fission does not expect to participate in public technical hearings, but will comply with all NRC directions should a hearing be required.

## 6.2 - Audits and Inspections

Along with technical meetings, audits and inspections can be scheduled at the NRC staff's request. Deep Fission expects these audits and inspections to increase in frequency following the submission of the Standard Design Approval application (SDAA). Topics such as the use of below-grade containment and the simplified convective cooling system may be of interest for audit meetings. Further topics will be suggested as questions are raised by NRC staff in the pre-application phase.

## 6.3 - Submittal of Additional Information

Following the submission of the SDAA, Deep Fission recognizes that additional information may need to be submitted. This might include supplemental information such as changes in organization or periodic mandated updates. Deep Fission is also aware of the Requests for Additional Information (RAI) systems and will be responding quickly to any such requests. Although unexpected, any significant revisions to Deep Fission's SDA application will be communicated to the NRC staff as early as possible.

### 6.3.1 - Supplemental Information

During the NRC staff's review of Deep Fission's SDA application, it may become necessary to update certain information. This could be due to changes in the information initially provided, discoveries made during interactions with NRC staff, or periodically mandated updates.

It is essential for Deep Fission to maintain regular communication with the NRC staff project manager and ensure they are informed about any upcoming supplemental information well in advance. Deep Fission may choose to include scheduling details for significant updates, such as scheduled periodic revisions to the application, to streamline the process.

### 6.3.2 – Requests for Additional Information

The use of Requests for Additional Information (RAIs) is a well understood process for sharing additional information with the NRC staff to complete an application review. Deep Fission has reviewed NRO-REG-101 “Processing Requests for Additional Information” in depth and is prepared to answer any RAIs from the NRC project manager. Following a draft RAI request via email, Deep Fission will identify any proprietary information (which is expected to be minimized) and then discuss any clarification of the requested information. While the usual expectation is a 30 day response time, Deep Fission will respond within 20 days unless the RAI is severely complex. Deep Fission will notify the NRC project manager as soon as possible if an RAI is expected to require more than 20 days to respond to. Assuming that an RAI may impact the application, Deep Fission will provide a marked up version of the SDA application that includes all RAI impacts.

### 6.3.3 – Application Revisions and Updates

Deep Fission recognizes the importance of maintaining up-to-date content in its various application types. Following the submission of the SDA application, Deep Fission will submit a COL application. In the case of the COL application, the Final Safety Analysis Report (FSAR) will require annual updates while under review, as mandated by 10 CFR 50.71(e)(3)(iii). Although there is no specific regulation dictating the minimum update frequency for an SDA application, Deep Fission understands the necessity of periodically revising its applications. This includes incorporating any changes resulting from Requests for Additional Information (RAIs) up to a predetermined point before formal revision.

This Regulatory Evaluation Plan (REP) is designed to outline the expected frequency of updates, ensuring alignment with other key schedule milestones for effective coordination between Deep Fission and the NRC staff. Deep Fission’s top priority is remaining current and compliant with regulatory requirements to ensure the integrity and safety of our applications.

## 6.4 – Frequency of Interactions

Deep Fission understands the significance of pre-application and post-application engagement with the NRC and expects to meet once per month with the NRC during all application phases. At minimum, Deep Fission will request a meeting every other month, but would prefer to meet monthly. These meetings will allow an assessment of schedule performance with the NRC project manager and related staff. Deep Fission also recognizes that more meetings may become necessary at the NRC’s request.

## 6.5 - Review Phases and Schedule

Deep Fission has reviewed the process of acceptance and docketing as well as the review schedules of other companies that have previously applied for licenses before the NRC. The phases from application submission to the approval of the final safety evaluation report (FSER) with no open items are listed below with potential milestone dates. Using the NRO-REG-100 assumptions for milestones of 42 months for a design certification application and 30 months for a COL application, Deep Fission has estimated a SDA application review of 24 months based on the schedule for the SDA review for NuScale Power. The table below represents proposed milestone dates by Deep Fission and is, of course, subject to the NRC's discretion.

<b>Task</b>	<b>Task Name</b>	<b>Milestone</b>
Submittal	SDA Application Submittal	Sep 2026
Docketing	Application Accepted/Docketed	Oct 2026
Phase 1	Preliminary Safety Evaluation Report (SER) and RAIs	Sep 2027
Phase 2	SER with Open Items	Nov 2027
Phase 3	ACRS Review of SER with Open Items	Jan 2028
Phase 4	Advanced SER with No Open Items	Mar 2028
Phase 5	ACRS Review of Advanced SER with No Open Items	Jul 2028
Phase 6	Final SER with No Open Items	Sep 2028

## 6.6 - Relations to Other Proceedings and Reviews

Deep Fission does not intend to file multiple applications concurrently but, rather, intends to file an application for an SDA followed by an application for a COL. If a decision is made by Deep Fission to run parallel applications for an SDA and a COL, Deep Fission will coordinate all requests for additional information as well as the resolution of any outstanding technical issues.

## 7 - Withheld Information

The amount of information to be withheld from the public will be minimized to the greatest extent possible. While other companies have previously sought to withhold even the REP itself, Deep Fission has drafted this REP and the subsequent technical reports and application with the recognition that the public has a right to access any information that is not security-sensitive in nature. Nonetheless, Deep Fission reserves the right to request

that security-sensitive information or trade secrets are withheld from the public. If the NRC staff determines that certain information must be withheld, Deep Fission will comply with this direction and protect and control that information.

## 7.1 - Classified Information

Deep Fission is not seeking to handle classified information, national security information, nor restricted data. The current application does not consider the use of special nuclear material and intends to use low enriched uranium procured from a certified nuclear vendor. Although multiple personnel for Deep Fission have maintained security clearances in the past, these clearances are not expected to be required for the SDA application process.

## 7.2 - Safeguards Information

While classified information will likely not be required to be shared or handled, safeguards information (SGI) programs will be properly managed according to 10 CFR 73 “Physical Protection of Plants and Materials”, RG 5.79 “Protection of Safeguards Information”, and the NRC’s “Guide to Marking Safeguards Information”. An SGI program will be established within the first twelve months of the pre-application process in order to prepare for possible future disclosure of design-basis threat information in upcoming technical reports and similar writing.

## 7.3 - SUNSI and SGI

The protection of sensitive unclassified non-safeguards information (SUNSI) will be controlled similarly to the SGI program and will also be established within the first twelve months of the pre-application process. Personnel privacy, attorney communications including patent disclosures, and similar information will be withheld from public disclosure, similar to prior applicants. Information security will be managed by Deep Fission’s Chief of Staff until a Chief Information Officer is hired.

## 7.4 - Withholding Information from Public Disclosure

Deep Fission will strive to minimize the amount of withheld information from public access as much as possible. The identification and justification of withholding information is determined by the regulatory guidance provided in 10 CFR 2.390. A detailed review of 10 CFR 2.390 will be completed within the first twelve months of the pre-application process and any requests for clarification will be raised with the NRC staff.

## 7.5 – Other Information Control Requirements

Deep Fission has considered a variety of other information that may need to be controlled. Deep Fission has determined that any non-NRC requirements are not applicable in a request for withheld public information to the NRC. For example, with no significant import or export plans relating to 10 CFR Part 110 [Reference 14] foreseen, export control information is not currently expected to be withheld. Similarly, applied technology labeling has not been applied to any currently relevant Department of Energy research and will not need to be withheld from the application or from public disclosure. Finally, as Deep Fission is not currently under contract with any government agency, the use of official-use-only withheld information will not be relevant.

## 8 – References

1. U.S. Code of Federal Regulations, “Standard Design Approvals” Subpart E, Part 52, Chapter I, Title 10, “Energy,” (10 CFR 52 Subpart E)
2. Deep Fission, “Deep Fission Response to NRC Regulatory Issue Summary 2020-02”, March 12, 2024
3. Nuclear Energy Institute, “Guidelines for Development of a Regulatory Engagement Plan,” NEI 18-06, Rev. 0, June 2018
4. U.S. Code of Federal Regulations, “Combined Licenses” Subpart C, Part 52, Chapter I, Title 10, “Energy,” (10 CFR 52 Subpart C)
5. U.S. Nuclear Regulatory Commission, “A Regulatory Review Roadmap For Non-Light Water Reactors” Advanced Reactors Policy Branch, Division of Safety Systems, Risk Assessment, and Advanced Reactors, Office of New Reactors, ADAMS Accession Number ML17312B567, December 2017
6. U.S. Nuclear Regulatory Commission, “NRC Vision and Strategy: Safely Achieving Effective and Efficient Non-Light Water Reactor Mission Readiness” ADAMS Accession Number ML16356A670, December 2016
7. U.S. Nuclear Regulatory Commission, “Development and Utilization of the NRC Policy Statement on the Regulation of Advanced Nuclear Power Plants”, NUREG-1226, June 1988
8. U.S. Code of Federal Regulations, “General Design Criteria for Nuclear Power Plants” Appendix A, Part 50, Chapter I, Title 10, “Energy,” (10 CFR 50 Appendix A)
9. U.S. Nuclear Regulatory Commission, “Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants: LWR Edition (SRP),” NUREG-0800
10. U.S. Nuclear Regulatory Commission, “Applications for Nuclear Power Plants,” Regulatory Guide 1.206, Rev. 1, October 2018
11. Electric Power Research Institute, “Advanced Nuclear Technology: Advanced Light Water Reactor Utility Requirements Document”, Revision 13, December 2014

12. U.S. Nuclear Regulatory Commission, “Financial Qualifications for Power Reactors and Non-Power Production or Utilization Facilities,” Draft Regulatory Guide DG-9004, 2018
13. U.S. Nuclear Regulatory Commission, “Acceptance Review Process for Early Site Permit, Design Certification, and Combined License Applications,” NRO-REG-100, Rev. 2, December 18, 2014, ADAMS Accession Number ML14078A152.
14. U.S. Code of Federal Regulations, “Export and Import of Nuclear Equipment and Material” Part 110, Chapter I, Title 10, “Energy,” (10 CFR Part 110)