



## **NRC Regulatory Engagement Plan**

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Licensing Director

### Revision History

Rev.	Date	Affected Section(s)	Description
0	See approval page	All	<p>Initial Deep Fission-NRC REP was issued on 3/22/2024 with no document ID. ADAMS accession number ML24135A163.</p> <p>The first update of the REP was issued as 2025-DF-LIC-001 on 1/17/2025. ADAMS accession number ML25017A406.</p> <p>This document further updates the REP due to the shifting regulatory environment and updated NRC submittal strategy. This document is issued with a new document number as revision 0 under Deep Fission's updated Document Control Records Management (DCRM) system.</p>

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## Acronyms

Acronym	Definition
ACRS	Advisory Committee on Reactor Safeguards
ADAMS	NRC Agencywide Documents Access and Management System
CFR	Code of Federal Regulations
DOE	U.S. Department of Energy
DOW	U.S. Department of War
DSA	Documented Safety Analysis
eRR	Electronic reading room
FOAK	First-of-a-kind
NRC	Nuclear Regulatory Commission
NUREG	NRC nuclear regulatory report series
OER	Offeror's Environmental Report
PDSA	Preliminary Documented Safety Analysis
PRA	Probabilistic risk assessment
QAPD	Quality Assurance Program Description
REP	Regulatory Engagement Plan
RPP	Reactor Pilot Program

# 1 Introduction

This Regulatory Engagement Plan (REP) establishes a structured framework for engagement between Deep Fission, Inc. (Deep Fission) and the U.S. Nuclear Regulatory Commission (NRC) during development and demonstration of the Gravity Reactor under the Department of Energy (DOE) Reactor Pilot Program (RPP) through approval of Deep Fission's first NRC license. This revision focuses on Deep Fission-NRC interaction during RPP; Deep Fission is designing the DOE authorization with the NRC in mind to establish a basis for reduced re-review of DOE content in the NRC application phase.

This work is under NRC project number 99902126 (Ref. 4.1.2). The REP assumes initial authorization and operation under DOE oversight, followed by commercial licensing under NRC authority.

This REP is intended to:

- Promote early and transparent communication.
- Identify key technical topics requiring regulatory alignment.
- Provide predictability in licensing timelines.
- Support an efficient transition from DOE authorization to NRC licensing in the spirit of Executive Order 14300 (Ref. 4.3.1) and in accordance with memorandums on NRC involvement in DOE pilot programs (e.g., Ref. 4.3.2 and Ref. 4.3.3).
- Describe a risk-informed and performance-based approach to regulatory interactions as defined in SRM-SECY-98-144 (Ref. 4.3.4) and implemented in NUREG-1649, "Reactor Oversight Process" (Ref. 4.4.1).

This document is a planning tool to facilitate coordination and mutual understanding between Deep Fission and NRC staff and will be updated periodically.

## 1.1 Background

Deep Fission submitted this project's initial REP in March of 2024 (Ref. 4.1.1), followed by an update in January of 2025 (Ref. 4.1.3). This document, although it has a new document number, is an update to Reference 4.1.3 under Deep Fission's new document control system.

## 1.2 Licensing Strategy

The primary goal of this REP is to lay out Deep Fission's licensing strategy and key milestones in support of obtaining an NRC-approved license for Deep Fission's first location in Parsons, Kansas. Deep Fission anticipates submitting an application based on pending new and revised Code of Federal Regulations (CFR) pursuant to Executive Order 14300 (Ref. 4.3.1). We anticipate that new and pending rulemakings responsive to these mandates will be risk-informed and performance-based. As such, and to meet the license timeframe, we expect the NRC to apply a performance-based review that applies risk insights to focus on matters most important to safety.

The NRC application will be based on Deep Fission's approved DOE authorization documents. Details of the anticipated transition are in Table 1. The pathway for DOE authorization of a reactor facility is described in DOE-STD-1271 (Ref. 4.4.3) and

supported by the Department's performance-based approach to contractor authorization and oversight, described in DOE Policy 226.2, "Policy for Federal Oversight and Contractor Assurance Systems (Ref. 4.4.2). Under the DOE, Deep Fission will submit a Preliminary Documented Safety Analysis (PDSA) which is reviewed and incorporated into a Documented Safety Analysis (DSA). The DSA contains the safety analysis report and other sections and parts parallel to the NRC's Title 10 of the Code of Federal Regulations (10 CFR) Part 50 and 52 reactor licensing process. Additionally, the DOE requires submission and approval of an Offeror's Environmental Report (OER), which is similar in scope to an Environmental Report for an NRC application.

To ensure efficient use of the NRC staff's time, Deep Fission will minimize license application content to the maximum extent allowed by regulation. Specifically, only safety-related systems and functions will be described in detail in the safety analysis report; items and functions that are important to safety or classified as defense-in-depth will be described in sufficient detail necessary to support their function; and nonsafety-related items and functions will not be mentioned in the report unless relevant to demonstrating acceptable safety outcomes.

### **1.3 Technology Summary**

Deep Fission is developing the Gravity Reactor; a pressurized water reactor designed for installation in a deep vertical borehole. Reference 4.1.4 is an updated conceptual design description.

### **1.4 Project Structure**

The project involves three principal entities: Deep Fission as the technology developer and future license applicant, DOE as the initial authorization authority under the RPP, and NRC as the licensing authority for commercial deployment. The first reactor will operate initially under a DOE safety assurance case, with analyses, testing, operational experience, or a combination thereof used to inform and streamline the subsequent NRC licensing process.

Table 1: Proposed DOE-to-NRC Document Crosswalk

DOE Authorization Document	NRC Application Component	Proposed Treatment in NRC Application	Justification	Residual NRC Review Focus
DSA	Final Safety Analysis Report	Direct incorporation as Part 2 of an application	10 CFR 50/52 Standard Review Plan is the DSA base guidance, with case-by-case deviations justified (e.g., use of research and test reactor Standard Review Plan)	Justification for use of non-standard guidance where applicable
QAPD	QAPD Topical Report (10 CFR Part 50 Appendix B)	Direct incorporation as topical report	DOE program implements NQA-1	Program scope differences (e.g., DOE vs NRC lifecycle)
Emergency Preparedness Plan	NRC Emergency Preparedness Plan (10 CFR 50.47 or 50.160)	<i>Strategy still under development</i>	Reference 4.4.4 encourages leveraging prior emergency preparedness analyses where applicable	Regulatory framework differences (e.g., DOE vs NRC emergency planning zone criteria)
Security Plan	NRC Security Plan (10 CFR 73.55)	<i>Strategy still under development</i>	DOE programs partially align but NRC has prescriptive requirements	Design basis threat assessment, insider threat
Fire Protection Program	Fire Protection Program	<i>Strategy still under development</i>	Reference 4.4.4 encourages leveraging if aligned with NRC guidance	Compliance with NFPA 805/806 or RG 1.205
Technical Safety Requirements	Technical Specifications	Direct incorporation as Part 4 of an application	The DOE document is based on 10 CFR 50 research and test reactor technical specification guidance.	Justification for use of research and test reactor guidance.
Site Characterization / OER	Environmental Report and Safety Analysis Report	Direct incorporation as Part 3 of an application	10 CFR Part 51 and Part 100 overlap significantly with DOE NEPA analyses	NRC-specific dose/meteorology criteria
Testing & Operational Data from RPP	Initial Test Program / Inspections, Tests, Analyses, and Acceptance Criteria	Use as demonstration under 10 CFR 50.43(e) and to fulfill initial testing requirements for the NRC license	Reference 4.4.4 encourages leveraging DOE testing program	Applicability to commercial license

## 2 Engagement Approach

### 2.1 Communication

Types of NRC-Deep Fission engagement will include:

- Technical meetings: public and closed meetings, site visits, audits (in-person or via an electronic reading room [eRR]).
- Administrative meetings: routine project management meetings.
- Commissioner and executive management meetings (if or as needed)
- Document submittals: white papers, topical reports, etc.
- Document early alignment: review of Safety Analysis Report outlines or other drafted submittals.
- Observation of DOE RPP authorization milestones.

Deep Fission will coordinate interactions through the NRC Project Manager.

### 2.2 Escalation

Deep Fission and NRC staff will establish a process for escalating licensing issues that cannot be resolved through routine technical interactions. Escalation may occur through (1) NRC management meetings, (2) executive-level meetings, and (3) formal regulatory submittals requesting high-level review of the issue.

### 2.3 Audit Plan

Deep Fission requests the NRC open a pre-application audit that parallels the RPP licensing document review cycle. The review effort in this audit would be separate from the efforts of the NRC staff matrixed to the DOE.

Deep Fission proposes bounding the audit as listed below. Details are negotiable.

- Audit title: NRC Pre-Application Audit of Deep Fission's DOE Pilot Project.
- Purpose: Support efficient conversion of the DOE authorization into an NRC license application by reviewing and providing comments in parallel with the DOE review. This supports the goal of Deep Fission obtaining an NRC-approved license.

- Administrative Limits:

NRC feedback provided during this audit does not constitute acceptance, approval, or commitment regarding future licensing submittals; the level of review should be similar to that of a readiness review under 10 CFR Parts 50 or 52. Deep Fission retains responsibility for demonstrating compliance with all applicable regulations at the time of formal application.

Deep Fission and the NRC will periodically communicate and adjust to ensure NRC interactions during this audit do not interfere with DOE authorization activities. For example, Deep Fission only requests one set of written NRC comments for each major document upload, to which Deep Fission will

respond, but no more iterations are expected until another revision is submitted to the DOE and subsequently uploaded to the NRC eRR.

- Audit open and close dates per Section 3.
- Mid-term coordination meeting per Section 3 to review progress, address any emerging issues, and confirm alignment on remaining audit activities.
- NRC cap per budgeted month: 500 hours or \$175,000, whichever is reached first. Deep Fission and the NRC should negotiate charges over this cap in writing and in advance to ensure audit scope is adhered to.

- Scope:

- Review DOE RPP documents uploaded to an eRR; Deep Fission intends to upload documents that will later transition to an NRC license application, along with key technical validation material for those documents.

The eRR will be established in accordance with NRC cybersecurity and access control expectations. Access will be granted to designated NRC staff and contractors under appropriate nondisclosure agreements. Document version control and audit trails will be maintained.

- Provide written feedback to each major document upload within 45 calendar days. Deep Fission will provide written responses within 45 calendar days and, when necessary and feasible, will integrate changes into the next document revision. Only one cycle of question and response is allowed per major document upload unless authorized by both Deep Fission and NRC management.

For the 45-day feedback commitment, "major documents" are defined as those exceeding 50 pages or containing foundational licensing content (e.g., PDSA, DSA, OER, Emergency Response Plan). Shorter technical memoranda or appendices may be reviewed less formally, such as by verbal feedback in a meeting.

- NRC may be invited to observe events on site (e.g., new fuel receipt and inspection, initial fuel load, canister emplacement, criticality testing) if deemed necessary to support the future transition of regulatory oversight of the RPP Gravity Reactor to the NRC. Deep Fission will formally request NRC onsite observation of these activities and evolutions at least 60 days in advance, including a proposed scope, safety briefing plan, and access logistics. NRC participation is subject to staff availability.
- Planning meetings between NRC and Deep Fission.
- Technical meetings on topics that Deep Fission or the NRC believes warrant early engagement.

- Excluded from the scope:
  - Formal technical reviews of topical reports submitted to the NRC on the docket (e.g., QAPD).
  - Regulatory decisions, acceptances, or commitments related to future licensing actions, including if Deep Fission submits an NRC application prior to closure of this audit.
  - NRC staff participation in DOE-led RPP activities or decision-making forums.

Separate audits can be arranged for review of items excluded from this audit's scope, as needed.

## 2.4 Key Areas of Engagement

Deep Fission desires early NRC interaction to support the aggressive goal of obtaining an NRC-approved license. Deep Fission and NRC may conduct pre-application interactions prior to the start of the RPP audit if mutual agreement is reached on format and fee structure.

The proposed areas of engagement listed below are either first-of-a-kind (FOAK) features or topics recommended in the draft Interim Staff Guidance, "NRC Application Pathway for Reactor Designs Previously Authorized by U.S. Department of Energy or Department of War" (Ref. 4.4.4).

After the NRC audit opens, a planning meeting should be conducted per Section 3 of this document to decide if NRC-Deep Fission interactions as described in Section 2.1 are needed for the following topics:

- Quality Assurance Program, including Deep Fission's strategy for conversion to an NRC topical report
- Topics presented in this document or the Conceptual Design Description (Ref. 4.1.4) as needed

After initial PDSA submittal to the DOE, a planning meeting should be conducted per Section 3 of this document to decide if NRC-Deep Fission interactions as described in Section 2.1 are needed for the following topics:

- Principal Design Criteria, including a discussion on whether exemptions will be necessary and whether NRC staff will self-initiate them (i.e., effectively finding that requirements will not be imposed based on supporting technical or policy justification).
- Use of research and test reactor guidance (NUREG-1537) in lieu of power reactor guidance (NUREG-0800) in several Safety Analysis Report chapters (e.g., Conduct of Operations, Human Factors Engineering, Technical Specifications) based on the Gravity Reactor's reduced risk profile
- Licensing event selection and classification of structures, system, and components, including justifying the basis for nonsafety-related components whose classification is FOAK for the design

- Source term calculation and consequence analysis methodology
- Reactivity control methods
- Other topics presented in the PDSA as needed

After initial DSA submittal to the DOE, a planning meeting should be conducted per Section 3 of this document to decide if NRC-Deep Fission interactions as described in Section 2.1 are needed for the following topics and activities:

- Initial testing during RPP, including potential NRC observation(s) requirements for the future NRC license
- Fuel qualification for the Gravity Reactor's geometry
- Seismic safety analyses
- Technical specifications
- Emergency preparedness and response plan
- Security plan(s)
- Fire protection program
- Instrumentation within the borehole environment and signal transmission from the borehole to operator monitoring devices
- Site characterization and design for external hazards
- Other novel reactor site configuration topics (e.g., water table contamination control and prevention)
- Other topics presented in the DSA as needed

Similar planning meetings may be conducted as desired for major document uploads (such as PDSA and DSA revisions or the OER) to the eRR.

## **2.5 ACRS Engagement**

Deep Fission desires early interaction with the Advisory Committee on Reactor Safeguards (ACRS) to support the aggressive goal of obtaining an NRC-approved license. Deep Fission will invite the ACRS to observe select pre-application interactions prior to and during the RPP audit through appropriate channels.

### 3 Timeline

Table 2 provides goal dates for major milestone completion, working backward from the primary goal of Deep Fission's licensing strategy as described in this REP: NRC approval of Deep Fission's license.

*Table 2: Proposed NRC License Approval Schedule*

<b>Description</b>	<b>Schedule</b>
NRC audit of RPP opens (see Table 3)	Q2 2026
Deep Fission submits Quality Assurance Program Description to NRC	Q2 2026
Deep Fission negotiates planned regulatory pathway for license application with NRC	Q3 2026
NRC publishes final updated and new regulations per Reference 4.3.1	Q4 2026
Deep Fission achieves first approved NRC license	Q4 2027

Table 3 gives an estimated timeline of Deep Fission actions within RPP and recommended associated NRC-Deep Fission interactions.

*Table 3: Timeline of Deep Fission-DOE RPP and Associated NRC Audit Interactions*

<b>DOE RPP Action</b>	<b>Date</b>	<b>Associated NRC-Deep Fission Action</b>	<b>Date</b>
N/A	Q2 2026	Open NRC audit per Section 2.3	TBD pending NRC review of this REP
QAPD submittal	Q2 2026	Upload QAPD to eRR	Within five business days of DOE acceptance or of commencing NRC audit, whichever is later
PDSA initial submittal	Q3 2026	Upload PDSA to eRR	Within five business days of DOE submittal
		Planning meeting for PDSA-related NRC interaction topics	Within four weeks of eRR upload
OER initial submittal	Summer 2026	Upload OER to eRR	Within five business days of DOE submittal or of audit open date, whichever is later
		Conduct planning meeting for OER-related NRC interaction topics	Within four weeks of eRR upload
PDSA revised submittal	Q3 2026	Upload revised PDSA to eRR including change tracking	Within five business days of DOE submittal
-	-	Mid-term coordination meeting	Prior to December 31, 2026
DSA initial submittal	Q4 2026	Upload DSA to eRR	Within five business days of DOE submittal
		Planning meeting for DSA-related NRC interaction topics	Within four weeks of eRR upload
DSA revised submittal	Q1 2027	Upload revised DSA to eRR including change tracking	Within five business days of DOE submittal
Initial testing	2027	If deemed a regulatory necessity, organize NRC observations of initial RPP testing	As needed

## 4 References

### 4.1 Project Documents

- 4.1.1 Deep Fission “Regulatory Engagement Plan Revision 0,” ADAMS accession number ML24135A163. Document date March 22, 2024.
- 4.1.2 NRC memorandum, “Deep Fission, Inc. – Assignment of Project Number and Explanation of Billing and Fees,” ADAMS accession number ML24144A059. Document date May 23, 2024.
- 4.1.3 2025-DF-LIC-001, Deep Fission “Regulatory Engagement Plan Revision 1,” ADAMS accession number ML25017A406. Document date January 17, 2025.
- 4.1.4 DF-LIC-WHP-001, Deep Fission “Conceptual Design Description of the Gravity Reactor,” Revision 0. Will be submitted roughly concurrently with this document.

### 4.2 Regulations

- 4.2.1 10 CFR 50, NRC “Domestic Licensing of Production and Utilization Facilities.” Accessed March 2026.

### 4.3 Federal Communications

- 4.3.1 Executive Order 14300, “Ordering the Reform of the Nuclear Regulatory Commission,” 90 FR 22587. Signed May 23, 2025.
- 4.3.2 Addendum No. 9 to the NRC-DOE memorandum titled “Coordinating DOE and NRC Technical Expertise and Knowledge on Advanced Nuclear Reactor and Advanced Reactor Fuel Technologies,” ADAMS accession number ML25303A288. Document date October 24, 2025.
- 4.3.3 NRC memorandum, “Expectations for NRC Staff Involvement with Prospective NRC License Applicants Planning to Refer to DOE and DOW Authorization Processes,” ADAMS accession number ML25322A208. Document date December 11, 2025.
- 4.3.4 NRC staff requirements memorandum, SRM-SECY-98-144, “Staff Requirements – SECY-98-144 – White Paper on Risk-Informed and Performance-Based Regulation,” ADAMS accession number ML003753601. Document date March 1, 1999.

### 4.4 Guidance

- 4.4.1 NUREG-1649, “Reactor Oversight Process,” Nuclear Regulatory Commission, Revision 6, July 2016.
- 4.4.2 DOE-P-226.2, “Policy for Federal Oversight and Contractor Assurance System,” Department of Energy, August 2016.
- 4.4.3 DOE-STD-1271-2025, “Authorization Pathway for Nuclear Facilities,” Department of Energy, August 2025.

- 4.4.4 DANU-ISG-2026-XX, “NRC Application Pathway for Reactor Designs Previously Authorized by U.S. Department of Energy or Department of War,” Nuclear Regulatory Commission, April 2026. ADAMS accession number ML25363A192.