UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

January 14, 2026

Donald Statile
Director of Licensing, Safety,
and Quality Assurance
REPLOY Power, Inc.
7301 Seneca Falls Loop
Austin, Texas 78739

SUBJECT: U.S. NUCLEAR REGULATORY COMMISSION RESPONSE TO REPLOY POWER, INC. REQUEST TO REVIEW REPLOY POWER'S "SUBMERSIBLE POWER SYSTEM PROTOTYPE UNIT INTRODUCTION" WHITE PAPER (EPID: L-2025-LRO-0069)

Dear Donald Statile:

By letter dated October 6, 2025 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML25280A243), REPLOY Power, Inc. (REPLOY) submitted to the U.S. Nuclear Regulatory Commission (NRC) staff a white paper (WP) titled "Submersible Power System Prototype Unit Introduction," Revision 0 (ML25280A244).

The WP outlines REPLOY's concept for a prototype reactor, presenting:

- The reasoning for this approach.
- Differences between the prototype reactor and the follow-on commercial reactor.
- The licensing strategy and approach for the prototype reactor.
- Relevant regulatory references.

REPLOY states that the prototype will be a first-of-a-kind reactor used for testing and data collection and REPLOY will seek a Class 103 power reactor license. The licensing application will be developed in accordance with Title 10 of the *Code of Federal Regulations*, (10 CFR) Part 50, "Domestic Licensing of Production and Utilization Facilities," and will include an application for a construction permit, an application for an operating license, and the use of the limited work authorization process.

The NRC staff has completed its assessment of the WP and identified areas where additional details may be necessary, as outlined in the enclosure to this letter.

If you have questions related to this matter, please contact project manager Alina Schiller at (301) 415-8177 or via email at Alina.Schiller@nrc.gov.

Sincerely,

Signed by Jardaneh, Mahmoud
on 01/14/26

Mahmoud Jardaneh, Chief
New Reactor Licensing Branch
Division of New and Renewed Licenses
Office of Nuclear Reactor Regulation

Project No.: 99902132

Enclosure:
As stated

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DATE	01/07/2026	01/12/2026	1/14/26

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U.S. Nuclear Regulatory Commission Staff Feedback
on REPLOY Power, Inc. White Paper
"Submersible Power System Prototype Unit Introduction"

1. Section 5 of the white paper (WP) gives a high-level summary of the proposed licensing approach. The NRC paper "A Regulatory Review Roadmap for Non-Light Water Reactors" (Agencywide Documents Access and Management System (ADAMS) Accession No. ML17312B567) includes appendices entitled "Process for Determining Testing Needs" and "Options for Using a Prototype Plant to Achieve a Design Certification or Standard Design Approval." As described in the report, it would be useful for REPLOY Power, Inc. (REPLOY) to identify and provide a schedule for both the research and development that must be completed before completing construction of a prototype reactor as well as the activities being planned for the prototype plant to support the licensing of the subsequent standardized submersible power system (SPS) production units (e.g., per Title 10 of the *Code of Federal Regulations* (CFR) 50.43(e) & 10 CFR 50.34(a)(8)).

2. The NRC staff understands this reactor design is a submerged power system with no exclusion on where the submerged power system can be placed (e.g., ocean, freshwater lake, brackish water, etc.). In the WP, section 3. Reasons for the Prototype includes "Life of hull / plant component placement" and "Strain gauges on the hull, structural members, and mechanical equipment." REPLOY's Regulatory Engagement Plan, Revision 1, April 2025 (ML25176A059) states that seawater surrounding the hull is the ultimate heat sink for the 300 MWe reactor. Title 46 of the CFR defines the regulations for hull structures. § 67.3 defines a hull as, "In the case of a submersible vessel, the term includes all structural members of the pressure envelope." The NRC staff understands structural standards developed by the American Bureau of Shipping and Lloyd's Register are acceptable to applicable vessels per the requirements of Title 46 of the CFR. The WP does not discuss whether the hull regulations described in Title 46 of the CFR are applicable to this design. Title 46 may have different regulatory requirements for testing.

3. The NRC staff does not have guidance for the NRC staff to use in the review and licensing of remote and autonomous operation of SPSs. The NRC also has not issued guidance to industry for such facilities. Specifically, the principal design criteria in 10 CFR Part 50, appendix A, "General Design Criteria for Nuclear Power Plants," and Regulatory Guide (RG) 1.232, "Guidance for Developing Principal Design Criteria for Non-Light Water Reactors" (ML17325A611), were both developed with the understanding that these facilities would be operated by on-site staff. Therefore, REPLOY should: (1) clearly describe the plans for remote and autonomous operation, (2) include the general design criteria (GDC) applicable to prototype reactors (For example, GDC 14, "Reactor Coolant Pressure Boundary," requires that the reactor coolant pressure boundary be designed, fabricated, erected, and tested so as to have an extremely low probability of abnormal leakage, of rapidly propagating failure, and of gross rupture. GDC 14 would be one of the GDC that the prototype reactor should comply with. Section 3 of the WP lists "Improve assembly processes," which would follow GDC 14), (3) identify the "design and operating characteristics, unusual or novel design features, and principal safety considerations" (see 10 CFR 50.34(a)(2)) associated with the planned remote and autonomous operation of these SPSs, and (3) develop principal design criteria for these specific facilities (see 10 CFR 50.34(a)(3)(a)).

4. Other topics for REPLOY to consider include:

    - Potential external hazards applicable to ocean or deepwater environments (e.g., earthquakes, tsunamis, submarine landslides, wave and current effects, etc.), and how these external hazards would be incorporated into the prototype reactor siting and design.

    - Brief discussions of: (i) the proposed sitting criteria for the hull deployment location (e.g., pond depth, volume, discharge requirements, etc.); and (ii) how the prototype reactor hull would be placed, anchored, and secured at the deployment location.

    - Operating experience (i.e., operational data) of material degradation and degradation mechanism(s) of safety-related structures, systems and components (SSCs), such as degradation data of reactor shell material, reactor internal components, and piping.

    - 10 CFR 50.65, “Requirements for monitoring the effectiveness of maintenance at nuclear power plants.”

    - 10 CFR 50, appendix B, “Quality Assurance Criteria for Nuclear Power Plants and Fuel Processing Plant.”

    - Performing preservice and inservice inspections of the prototype reactor in accordance with 10 CFR 50.55a, “Codes and standards.”

    - Integrity of safety-related SSC. E.g., designing the reactor vessel in accordance with 10 CFR 50, appendix G, “Fracture Toughness Requirements,” and appendix H, “Reactor Vessel Material Surveillance Program Requirements,” and 10 CFR 50.61, “Fracture toughness requirements for protection against pressurized thermal shock events,” to maintain its structural integrity.

    - How Technical Specifications (TS) will be implemented. Commercial nuclear plants are required to implement TS in accordance with 10 CFR 50.36.

    - Applicable NRC RGs as part of the design of the prototype reactor.

    - Qualification and certification of control room operators and nondestructive examination (NDE) examiners. The NRC qualifies and certifies the control room operators. The NDE examiners are qualified and certified following various industry codes and standards, such as the American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code), Sections V and XI, Division 1.

    - References to the industry codes and standards to which the prototype reactor is designed. Commercial light water reactor nuclear plants are designed based on the ASME Code, Section III, Division 1, and relevant Institute of Electrical and Electronics Engineers standards.

    - Volumetric (e.g., ultrasonic or radiological testing) and surface (e.g., penetrant testing) inspections, in addition to the visual inspections which are listed in WP table 1.

- Radiation protection and health physics monitoring, as part of design considerations in WP table 1.

- Pressure-temperature limits, as part of design considerations in WP table 1. Commercial nuclear plant owners are required to operate their reactor vessel within pressure-temperature limits for the heatup, cooldown, and leak test, as specified in their TS or the pressure-temperature limit report.

- SSCs that provide protection and mitigation of accidents and transients and plan for ensuring those SSCs can perform their intended function; design feature to manage a safe shutdown during transients and accidents; plan and description of the process and criteria for determining the additional safety features that may be needed to ensure protection during testing, transients, and accidents.

- Description of the “semi-permanent structure” mentioned in WP table 1, and applicable design and construction standards, such as recognized offshore and subsea engineering codes if applicable.”

- Description of REPLOY Hub and Limited work authorization mentioned in WP section 5.1.

- Brief description of the external cooling towers, including key features, and how cooling water is supplied and discharged.

- Detailed discussion on routine or emergency maintenance.

- 10 CFR 50.43, “Emergency Plans,” Outline of measures to compensate for potential consequences based on uncertainties in the design for which the testing is needed.

- WP section 6 indicates that “the prototype plant will be collocated with the REPLOY Hub under a separate license.” Description of the relationship between the REPLOY Hub license and the protype plant license.

NOTE: The NRC staff recommended that REPLOY consult RG 1.232 and 10 CFR 50.34(a)(3)(i) for further guidance regarding the development of principal design criteria for the proposed facility.