

Scope of Work

Project Title: Analysis of Government Applications for Derisking Commercial Maritime Nuclear Applications

1. Background

The USCM is focused on enhancing U.S. maritime competitiveness, technologies for improving maritime operations, addressing technology and energy needs for powering the MTS, and practical approaches for ensuring maritime resilience.

The U.S. maritime industry is driving for maritime competitiveness and maritime energy independence. Nuclear propulsion, proven in naval applications, offers an efficient alternative with high energy density and operational endurance. However, commercial adoption is hindered by regulatory uncertainty, public perception, technical integration, and cost concerns. Recent advances in small modular reactors (SMRs), passive safety systems, and international regulatory frameworks (e.g., IAEA, IMO) have renewed interest in nuclear-powered shipping (World Nuclear Association, 2023; ABS, 2022). This research addresses critical knowledge gaps and supports informed decision-making for future deployment.

2. Project Purpose

This research topic area aims to identify and evaluate opportunities for government action to reduce the potential technical, financial, and regulatory risk of commercial maritime applications of nuclear technologies.

USCM will perform an analysis of government programs, policies, pilot projects, and use cases (e.g., defense, DOE, national labs, and other public-sector initiatives) involving advanced nuclear technologies with potential maritime relevance. The analysis will examine programs such as naval nuclear propulsion (including current and historical submarine and aircraft carrier programs), DOE microreactor and advanced reactor demonstration projects, NASA space nuclear systems, national laboratory research on small modular reactors (SMRs), and any pilot initiatives involving nuclear-powered autonomous vessels or floating nuclear power plants. Special attention will be given to how government entities have addressed challenges such as regulatory approval processes, safety case development, public acceptance, security and safeguards, supply chain development, workforce training, and long-term waste and decommissioning planning.

The work will assess how government-sponsored nuclear initiatives have addressed design development, licensing and approvals, safety case development, safeguards and security, public and stakeholder engagement, supply chain formation, workforce readiness, waste management, decommissioning planning, and program execution. This will include the identification of which elements are transferable to commercial maritime applications, where gaps remain, and what actions could further derisk subsequent commercial vessel and maritime power generation projects.

Multiple government candidate projects will be identified and evaluated, with recommendations on potential path forward, along with evaluations of the advantages and disadvantages of each. This will enable consideration of future government steps to reduce the commercial risk of maritime nuclear power, in both transport and power plant applications. This in turn will inform a structured analysis that maps government efforts to commercial maritime challenges, identifying specific technical solutions, regulatory precedents, and institutional arrangements that could accelerate commercial adoption while maintaining safety and security. Deliverables will include case studies of relevant government steps, identification of application concepts for potential future government applications, a comparative assessment of regulatory and licensing frameworks used across different government contexts, and a gap analysis highlighting areas where government approaches can or cannot be directly transferred to the commercial maritime sector. The project will also provide recommendations on potential public-private partnerships, opportunities to leverage government facilities or expertise, and strategies for engaging regulators and policymakers by leveraging current and future government precedents. Ultimately, this effort will streamline potential future government efforts and enable commercial stakeholders to learn from decades of government nuclear experience, avoid reinventing solutions, and build credibility by demonstrating alignment with proven safety and operational practices.

3. Objectives

The project objectives are to:

1. Identify and characterize government nuclear applications, programs, and pilot efforts with direct or analogous relevance to commercial maritime nuclear use cases.
2. Evaluate the technical, regulatory, operational, safety, security, and institutional approaches used in those government applications.
3. Determine which government-derived practices, precedents, facilities, partnerships, and data sources can be adapted to support commercial maritime nuclear deployment.
4. Compare candidate government applications and identify those with the highest potential to reduce commercial development and approval risk.

4. Key Use Cases / Assessment Scenarios

The project should assess at minimum the following categories of government applications and analogs:

1. Government maritime nuclear propulsion applications

- e.g., current and historical naval nuclear propulsion programs and other government vessel applications.

2. Government maritime nuclear power generation applications

- e.g., floating or port-adjacent nuclear power concepts supporting maritime or port operations.

3. Advanced reactor demonstration and test programs

- e.g., DOE microreactor, advanced reactor, and national laboratory demonstration efforts with transferable maritime relevance.

4. Other mission-driven nuclear applications with analogous challenges

- e.g., space nuclear systems, remote power applications, and autonomous or highly constrained operating environments.

These use cases and analogs will be used throughout the project to maintain a practical focus on commercial maritime transferability.

5. Task 1: Project Framing and Candidate Application Screening

5.1 Task 1 Work

1.1. Project kickoff and detailed workplan: Review prior completed projects and other relevant work, confirm project scope, schedule, roles, coordination approach, and decision points.

1.2. Define assessment framework: Establish the evaluation methodology and criteria for government applications, including technical maturity, safety basis, regulatory pathway, security and safeguards, operational applicability, scalability, affordability, schedule realism, and commercial transfer potential.

1.3. Identify candidate government applications: Develop an initial list of relevant government programs, projects, and use cases, including domestic and selected international precedents where appropriate. Plan to include USCM Working Group meeting to gather industry feedback on candidate ideas.

1.4. Conduct preliminary screening: Screen candidate applications against the agreed framework and prioritize those offering the strongest relevance to derisking commercial maritime applications.

5.2 Task 1 Deliverables

- Detailed project workplan and schedule
- Assessment framework and screening criteria
- Initial list of candidate government applications
- Screening matrix and prioritized shortlist for detailed evaluation

6. Task 2: Comparative Assessment of Selected Government Applications

6.1 Task 2 Work

2.1. Case study research and documentation: Gather and synthesize information on selected government applications, including mission need, technology basis, reactor or power system characteristics, system integration approach, development path, and implementation status.

2.2. Regulatory and approvals pathway assessment: Examine how each application addressed licensing, authorizations, oversight, safety review, environmental review, and interfacing authorities.

2.3. Program execution assessment: Evaluate acquisition strategy, funding approach, stakeholder roles, governance structure, schedule drivers, and key risks encountered.

2.4. Enabling factors and barriers analysis: Identify what enabled progress in each case and what constraints would limit direct transfer to commercial maritime applications.

2.5. Commercial transfer mapping: Map lessons learned and precedents from each case study to commercial maritime vessel and maritime power generation applications.

6.2 Task 2 Deliverables:

- Case study summaries for selected government applications
- Comparative assessment matrix across selected cases
- Gap analysis of transferability to commercial maritime applications
- Interim briefing on key findings and candidate paths forward



7. Task 3: Development of Future Government Application Concepts

7.1 Task 3 Work

3.1. Identify candidate future government applications: Develop candidate concepts for government maritime nuclear applications that would both advance public-sector missions and reduce risk for future commercial use.

3.2. Preliminary evaluation of candidate concepts: Screen candidate concepts based on mission value, technical feasibility, regulatory plausibility, cost and schedule considerations, stakeholder complexity, and commercial relevance.

7.2 Task 3 Deliverables

- Candidate concept set for future government applications
- Evaluation matrix for future government application concepts
- Executive briefing on recommended paths forward

8. Task 4 – Final Reporting and Technology Transfer

8.1 Task 4 Work

4.1. Draft final report preparation: Prepare a draft report documenting methods, findings, comparisons, lessons learned, transferability analysis, and recommendations.

4.2. Review and finalization: Conduct review by the Secretariat and MARAD, resolve comments, and finalize project outputs.

4.3. Technology transfer material development: Prepare agreed technology transfer materials, such as a webinar package, presentation materials, and content suitable for public release and possible journal development.

4.4. Project debrief: Review project insights and lessons learned with MARAD

8.2 Task 4 Deliverables

- Final Report: Evaluation of Opportunities for Government Reduction of Commercial Maritime Risk
- Executive briefing slide deck

9. Timeline

It is preliminarily estimated that this project will take approximately 8 months.

