



NEMO

NUCLEAR ENERGY
MARITIME
ORGANIZATION

Inaugural NEMO and Nuclear Institute Conference & Dinner

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TRINITY HOUSE, LONDON



REPORT – KEY FINDINGS AND NEXT STEPS

Executive Summary

The inaugural NEMO and Nuclear Institute Conference brought together senior representatives from the nuclear and maritime sectors, including regulators, government, the IMO and IAEA, reactor developers, shipowners and operators, classification societies, insurers, lawyers and investors. The conference examined what is required to move maritime nuclear from technological development towards practical deployment.

The conference highlighted how nuclear energy can transform the maritime world. Decoupling speed from fuel burn and the environmental footprint for the voyage could transform shipping.

Following on from the ATLAS launch in the United States the week before, the event in the historic setting of Trinity House provided an opportunity to look more closely at the issues.

NEMO's Inaugural conference examined the international framework needed to enable the safe, secure and commercially viable deployment of nuclear energy at sea. Discussions focused on three priorities: creating an effective international regulatory framework, demonstrating safety and building public confidence, and enabling commercial deployment.

Moreover, the NEMO and Nuclear Institute Conference demonstrated that **maritime nuclear is moving from technology discussion towards potential commercial deployment**, but that the principal barriers are now increasingly regulatory, legal, commercial and operational rather than technological. The central message was **"delivery"**. No single organisation, regulator or country can resolve the remaining issues independently. Successful deployment will require coordinated action across governments, regulators, industry, ports, classification societies, insurers, legal advisers and international bodies.

Three issues require particular focus:

- **Regulatory alignment:** The international regulatory framework must develop sufficiently to enable deployment while maintaining clear responsibility for nuclear safety, maritime safety, safeguards and security.
- **Commercial and legal certainty:** Liability, insurance, jurisdiction and risk allocation remain significant gaps and could constrain financing and insurability.
- **Practical demonstration and readiness:** The sector needs to move beyond discussion towards tangible applications, exercises and demonstration projects, supported by prepared ports, operators, workforce and emergency arrangements.

The next **12–24 months** therefore represent an important delivery period. The conference provided a clear opportunity for NEMO and its partners to translate the emerging consensus into practical outputs that can inform IMO/IAEA processes, support regulators and provide greater confidence to investors, operators, insurers and ports.

1 Key Themes

Five key themes emerged from the conference:

- **Maritime nuclear is progressing towards deployment**
- **Regulation must enable deployment without compromising safety**
- **Practical activity must now replace further discussion**
- **Liability and insurance remain material commercial barriers**
- **Ports, operations and public confidence are part of the deployment solution**

1.1 Maritime nuclear is progressing towards deployment

The conference reflected a significant shift from considering whether maritime nuclear is technically possible towards addressing **how it can be deployed commercially and safely**.

The technology is not starting from zero: there is relevant nuclear, maritime and offshore experience that can be brought together. However, the route from technology to deployment has not yet been fully walked.

The opportunity is therefore real, but the conference recognised that the **window for coordinated action is not indefinite**.

1.2 Regulation must enable deployment without compromising safety

Regulatory alignment was repeatedly identified as a critical dependency.

The future framework will need to accommodate both nuclear and maritime requirements, avoiding duplication while maintaining clear accountability. In particular:

- Nuclear safety, security and safeguards need to be considered from the outset.
- National regulators and flag states will remain important because of sovereignty and national interests.
- IMO and IAEA work needs to progress using common terminology and complementary approaches.
- Safety cases should appropriately address the full operating environment, including **ship-to-port and port-to-ship interfaces**.
- Early engagement between developers, regulators and classification societies is essential.

The objective is not to create an entirely new system, but the existing regulatory approaches should be integrated effectively.

1.3 Practical activity must now replace further discussion

A strong theme from the conference discussion was the need for **tangible exercises and applications**.

A tabletop exercise was proposed for completion within the next 12 months. Industry participants also stressed the need for regulators and governments to work with actual applications and cases rather than relying solely on theoretical discussion.

This provides an opportunity to use real projects to identify regulatory gaps and develop practical solutions.

1.4 Liability and insurance remain material commercial barriers

Nuclear liability was identified as a significant gap affecting insurability.

The conference highlighted unresolved questions around:

- allocation of nuclear and maritime liability;
- jurisdiction;
- treatment of incidents that may involve both nuclear and maritime elements;

- risk allocation between relevant parties; and
- the legal basis on which insurers can underwrite the risk.

A cross-sector dialogue between shipping and nuclear lawyers and maritime and nuclear insurers was proposed, potentially leading to a framework or bilateral agreement that could then be tested against commercial requirements.

1.5 Ports, operations and public confidence are part of the deployment solution

Deployment cannot be considered solely as a reactor or vessel issue.

Port access, emergency preparedness, security, safeguards, operator competence, workforce availability and public/stakeholder confidence need to be incorporated into the overall deployment model.

These requirements should be addressed **early rather than treated as downstream approvals**.

2 Key Points from the Conference Discussions

2.1 Maritime nuclear is moving towards deployment

The conference opened with welcomes from **Virginia Crosbie, CEO of NEMO**, and **Robert Gofton, CEO of the Nuclear Institute**, followed by a video address by **Rafael Mariano Grossi, Director General, IAEA**.

The opening discussions highlighted growing momentum around nuclear propulsion and maritime nuclear applications, driven by decarbonisation, energy security, resilience and the potential for highly reliable power. **Mikal Bøe** set out in his keynote address that maritime industry experience in mass production and modular construction could help address some of the cost and delivery challenges historically associated with nuclear projects.

A recurring theme was the importance of **standardisation and repeatability**. The reactor manufacturer's perspective highlighted factory and shipyard manufacture, common components, design-for-manufacture and design-for-maintenance, while minimising design changes. The master slide pack also identified scale-up of reactors, fuel, supply chain and nuclear-capable shipyards as a likely constraint.

The first-of-a-kind project nevertheless presents substantial cost and schedule uncertainty. Jonathan Stephens identified approximately five years as a floor for a first commercial deployment, assuming several activities—including shipyard preparation, fuel qualification and manufacture, long-lead forgings, personnel and training—can proceed in parallel. Novel technologies or fuel cycles could extend this considerably.

2.2 Early regulatory engagement is essential

David Davenport of ABS delivered the keynote for Panel 1, which examined the practical steps needed to move maritime nuclear from ambition to deployment. Panel 1 with **Paul Fyfe, Office for Nuclear Regulation (ONR)**, **Jonty Slater, Maritime & Coastguard Agency (MCA)** and **Masud Karim, International Maritime Organisation (IMO)** placed considerable emphasis on **engaging regulators and classification societies at the earliest possible stage**, rather than presenting regulators with a

completed design. The MCA and ONR stressed the value of early dialogue to establish expectations and identify how nuclear and maritime regulatory responsibilities would interact.

The IMO Nuclear Code and SOLAS Chapter VIII provide an existing framework, but participants noted that this framework needs updating to reflect modern nuclear and maritime technologies. The IMO's consensus-based processes may take longer than individual states' deployment ambitions, creating a potential interim period in which bilateral or national arrangements may be required.

The conference therefore identified a need for regulators, classification societies, developers and governments to work together actively rather than waiting for a fully developed international framework.

2.3 Safety, security and public confidence must be designed in

Safety was consistently presented as a non-negotiable foundation for deployment. At the same time, our second panel of speakers which included: **Capt. Simon Chaplin, WNTI, Ciara Middlehurst, Nuclear Transport Solutions** stressed that **confidence depends on transparency, credible safety cases and visible evidence of safe operation.**

Furthermore, a key theme of **Mark Tipping's, Lloyd's Register** keynote speech was the maintenance of public trust.

Security and safeguards were identified as issues that must be considered from the beginning of design. Port operations introduce different vulnerabilities and require coordination between multiple agencies. Participants also highlighted the need for emergency response arrangements as appropriate, regular testing and engagement with local communities.

Ioannis Kourasis of CORE POWER presented the Nuclear Safety at Sea (NUCSAS) work, demonstrating how existing nuclear safety guidance can be adapted for nuclear-powered merchant ships while addressing maritime-specific hazards and operating conditions. The NUCSAS work provided a concrete example of how existing nuclear safety guidance can be adapted. Its review found that much of the existing IAEA guidance (IAEA Safety Standards Series No. SSG-61, *Format and Content of the Safety Analysis Report for Nuclear Power Plants*) could apply to nuclear merchant ships, provided maritime-specific hazards and circumstances are incorporated. It nevertheless identified areas requiring further work, including terminology, changing site characteristics, reactor and electrical systems, radioactive waste, radiation protection, management for safety, and emergency preparedness.

Annie Caputo, Caputo Energy Advisory moderated a panel on the challenges of global regulation with **Nick Tomkinson, Global Nuclear Security Partners** stressing that safeguards needed to be considered from the very start. **Dr Mamdouh El-Shanawany** set out the IAEA approach with safety culture being of key importance. He also suggested that the nuclear reactor and associated systems should be 100% the responsibility of the nuclear regulator appropriately, and maritime regulations should be applied to the ship design as appropriate. However, the interactions between the nuclear systems and the ship design should take into account the nuclear and maritime requirements.

2.4 Ports and operations are a critical part of the system

The conference made clear that a nuclear vessel cannot be considered in isolation from its operating environment. Ports, shipyards, emergency services, regulators and local communities all form part of the deployment system. This was a key theme of **Don Hoffman, Excel Services Corporation** keynote.

Participants identified the need for proportionate port infrastructure, standardised approaches where appropriate, multi-agency emergency arrangements and regular assurance exercises. Existing experience from nuclear transport and naval operations provides a valuable starting point, but civilian commercial shipping will require its own operating arrangements.

Workforce capability was another recurring issue. Maritime personnel will need appropriate nuclear knowledge and training, while nuclear specialists will need an understanding of maritime operations. Participants therefore highlighted the importance of developing a **talent pipeline and international training pathway**.

3 Commercial, Legal and Financial Issues

Jonathan Stephens, BWXT's keynote focussed on the reactor manufacturer's perspective. Factory manufacturing was key to reducing cost but first of a kind would be especially expensive. **Per Jander, WMC Energy** gave a perspective on the significant and growing commercial opportunities for example as a uranium buyer. The conference concluded that the principal barriers are increasingly **systemic rather than technological**. The US perspective presentation summarised this as an improved regulatory environment but a pathway that has not yet been walked, with the international dimension remaining particularly important.

For investors and customers, the central questions are cost certainty, reliability, longevity, sustainability and the ability to manage risk. The commercial presentation identified potential customer interest where nuclear could offer reliability, low maintenance, long operating life and predictable energy costs. At the same time, investors remain cautious because maritime nuclear is relatively new, illiquid and exposed to regulatory and project-development uncertainty.

Panel 4, moderated by **Virginia Crosbie, CEO of NEMO** and featuring **Alexis Trahan, IAEA** and **Scott Edwards, CORE POWER** looked at ATLAS and the next steps and NEMO's role feeding into NUCSAS.

Liability and insurance emerged as particularly important gaps with **Ian Truman, Burges Salmon** and **Mark Smith, NorthStandard** giving legal and insurance perspectives respectively.

Participants identified uncertainty over liability, jurisdiction and allocation of risk as a barrier to obtaining insurance and financing. The discussion suggested that an interim legal framework may be needed while longer-term international arrangements are developed. Bringing maritime and nuclear lawyers, insurers and other specialists together was identified as a practical way of developing potential bilateral arrangements.

4 Priorities Identified for Future Action

4.1 Accelerate regulatory alignment

- Continue the revision of the IMO Nuclear Code and associated SOLAS provisions.

- Ensure IAEA and IMO workstreams are complementary, with clear boundaries between nuclear and maritime responsibilities.
- Promote technology-neutral, risk-informed approaches that allow innovation while maintaining a very high safety standard.
- Encourage early engagement between developers, flag states, nuclear regulators, maritime authorities and classification societies.

4.2 Turn ATLAS into practical activity

The IAEA ATLAS initiative was repeatedly identified as an important vehicle for bringing the international community together.

4.3 Develop practical demonstration projects

Speakers repeatedly stressed the importance of moving beyond conferences and conceptual discussion towards real projects, applications and exercises. A credible project would allow regulators and industry to identify practical gaps and test proposed solutions. A key proposed milestone is a **table-top exercise within 12 months**, focused not only on identifying problems but on testing potential solutions.

4.4 Resolve liability and insurance

NEMO and relevant legal and insurance stakeholders should continue work on the allocation of nuclear and maritime liability, jurisdiction, insurance coverage and potential bilateral arrangements.

4.5 Prepare ports, infrastructure and emergency response

Develop proportionate approaches to port acceptance, entry procedures, emergency preparedness, security and safeguards, drawing on existing nuclear transport and naval experience wherever possible.

4.6 Build the workforce and supply chain

Develop nuclear-maritime training pathways and address future requirements for qualified seafarers, nuclear specialists, engineers, shipyard personnel, regulators, lawyers, insurers and other professionals. At the same time, industry needs to prepare for potential constraints in reactor manufacture, fuel, components and specialist shipyard capacity.

4.7 Maintain public and stakeholder confidence

Transparency, safety culture, secure-by-design principles and engagement with ports and communities should be incorporated from the outset rather than treated as later-stage communications activities.

5 Next Steps

The clearest immediate priority is to convert the work already underway into **specific deliverables over the next 12 months**.

NEMO: Continue using its working groups to develop practical technical outputs and provide industry input into IAEA and IMO regulatory revisions. NEMO also identified work on port-entry

documentation and the need to develop consensus positions that can be provided to international organisations.

IMO and regulators: Maintain active industry engagement in the Nuclear Code revision and related working groups. Participants specifically encouraged industry stakeholders to submit papers and contribute expertise rather than waiting for the final regulatory framework.

Industry: Bring forward credible projects and applications that regulators, ports and other stakeholders can use to test the proposed framework. Early engagement was repeatedly identified as preferable to waiting until designs are finalised.

Legal and insurance community: Continue cross-sector work on liability, jurisdiction, risk allocation and insurance, including consideration of interim bilateral solutions where appropriate.

Ports and operators: Begin practical work on port readiness, emergency response, security, safeguards, crew competencies and operating procedures.

6 Conclusion

The conference demonstrated a significant degree of momentum across the maritime nuclear ecosystem, but also highlighted that **technology alone will not deliver deployment**. The central challenge is to build the regulatory, legal, commercial, operational and societal framework around the technology.

The strongest recurring message was therefore **delivery**: use the existing momentum to undertake practical exercises, develop reference projects, engage regulators early, test solutions and turn the work of NEMO, ATLAS and the wider industry into tangible outputs. The closing remarks explicitly identified NEMO's working groups, its engagement with the IMO and its contribution to ATLAS as the principal channels for continuing this work.

Our inaugural conference demonstrated that the conversation about commercial nuclear shipping has moved decisively from whether it can happen to how we make it happen. The technology exists, as do the capital and professional expertise needed to support deployment. What is now required is a coherent international regulatory, legal, insurance and commercial framework that allows a new generation of nuclear-powered commercial vessels to operate safely around the world. London, with its centuries of leadership in maritime law, insurance and finance, has a pivotal role to play.

Mamdouh El-Shanawany, Chairman, NEMO concluded:

NEMO has been recognised by the industry, the IAEA and the IMO. NEMO is the bridge to help deliver nuclear maritime. NEMO is in the heart of the ATLAS project and the update of the IMO's nuclear Code.

Alexis Trahan of the International Atomic Energy Agency:

The launch of ATLAS reflects growing international interest in the safe and responsible use of atomic technologies at sea. Progress will depend on sustained cooperation between different stakeholders. ATLAS will bring together international organizations, Member States, regulators, industry, shipping companies and port authorities, turning shared ambition into practical work.

Masud Karim of the International Maritime Organization:

The safe introduction of nuclear-powered ships will require close international collaboration between regulators, governments and industry. The NEMO and Nuclear Institute Conference

provided a valuable forum in which to exchange perspectives and consider the work needed to support the development of an effective international framework.



Pictured: Virginia Crosbie, CEO, NEMO with Robert Gofton, CEO Nuclear Institute.

Thank you!

NEMO would like to thank the Nuclear Institute team for its partnership in delivering the conference, together with Lead Sponsors ABS and HD Korea Shipbuilding & Offshore Engineering; Partner Sponsor CORE POWER; Dinner Sponsor GNSP; and Premier Sponsor EXCEL Services Corporation.

Virginia Crosbie, Chief Executive Officer, NEMO