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Blue Sky Maritime Coalition Comments on the Request for Information Regarding the Advanced Technology Vehicles Manufacturing Loan Program

The Blue Sky Maritime Coalition is a non-profit organization committed to greenhouse gas (GHG) emission reduction of North American waterborne transportation in the U.S. and Canada. BSMC is comprised of over 110 member entities that are committed to collaboration across the entire marine shipping value chain to achieve commercially viable net-zero carbon emissions by 2050. These public and private entities hail from across North America and globally and recognize that engagement with the full value chain — on which each organization’s success depends — is critical to the achievement of meaningful, economically viable reductions in GHG emissions.

The Coalition recently published the Roadmap to Net-Zero Emissions: North American Waterborne Transportation. This report sets forth Blue Sky’s Roadmap toward the achievement of commercially viable, net-zero GHG emissions across the North American Waterborne Transportation sector. Also relevant to this RFI are the three position papers on Pathways to Net-Zero 2050 in The North American Shipping Industry. This body of research details baseline knowledge and provides recommendations related to Vessel Inventories & Emissions – Pathways and Challenges, discusses critical needs for Fuels and Propulsion Systems, and identifies strategies for Optimizing Technology and Operations to Achieve Emission Reductions. Additional resources, including white papers and briefing papers, are available for download on the Coalition’s website¹.

1. Defining “Advanced Technology Vehicles”

a. Performance Requirements:

Business as Usual Vessels:

The DOE can consider performance requirements for “business as usual” maritime vessels by examining traditional metrics such as fuel efficiency, operational reliability, and compliance with existing emission regulations. These vessels typically utilize conventional fuels like marine diesel or heavy fuel oil and are designed for optimized fuel consumption and minimal maintenance costs. Performance standards are largely influenced by operational efficiency including aspects such as engine performance, hull design, and overall vessel weight. Operational reliability is paramount, ensuring that vessels can complete voyages with minimal downtime due to mechanical failures or maintenance issues. Compliance with safety and environmental regulations, including those set by the International Maritime Organization (IMO), is also a critical factor. These regulations mandate limits on sulfur oxides (SOx) and nitrogen oxides (NOx) emissions, driving the need for technologies such as scrubbers and

¹ PUBLICATIONS | [Blue Sky Maritime \(bluesky-maritime.org\)](http://Blue Sky Maritime (bluesky-maritime.org))

selective catalytic reduction systems to meet these standards (for more detailed information, Blue Sky Maritime Coalition Comments on EPA Emissions Sinks, can be provided upon request).

Low or Zero GHG Emission Vessels:

For low or zero GHG emission “advanced technology” maritime vessels, the DOE should focus on performance metrics that include greenhouse gas emissions (CO₂, methane, and other GHGs), fuel economy improvements, and the integration of advanced technologies such as hybrid propulsion systems or alternative fuels (e.g., hydrogen, ammonia, methanol, biofuels). These vessels aim to significantly reduce or eliminate GHG emissions through the use of innovative technologies and cleaner energy sources. Performance requirements might include evaluating the efficiency of propulsion systems, the effectiveness of energy storage solutions like batteries or fuel cells, and the vessel's ability to operate effectively under various operational conditions. Additionally, these vessels may be assessed on their lifecycle emissions, encompassing production, operation, and decommissioning stages to ensure a holistic approach to environmental impact. The implementation of digital technologies for monitoring and optimizing fuel consumption and emissions in real-time is also a critical performance criterion (for more detailed information, Blue Sky Maritime Coalition’s response on the Request for Information for DOE Zero Emission Shipping Mission, can be provided upon request).

b. Performance Metrics:

Typical Metrics:

Customers typically measure the performance requirements and performance targets of maritime vessels using several key metrics. These include fuel efficiency, often measured in tons of fuel per nautical mile or miles per gallon, which is crucial for cost management and environmental compliance. Emission levels are another critical metric, with a focus on CO₂, NO_x, SO_x, and particulate matter emissions. Regulatory bodies like the IMO set limits on these emissions, and vessel operators must ensure compliance to avoid penalties and contribute to environmental sustainability. Operational uptime, or the percentage of time the vessel is operational versus under maintenance, is essential for ensuring continuous service and maximizing revenue. Maintenance costs are also closely monitored, as they impact the total cost of ownership and the vessel's profitability. Speed and cargo capacity are assessed to ensure the vessel meets performance standards for timely delivery and efficient cargo handling (for more detailed information, Blue Sky Maritime Coalition Comments on the Request for Information on a National Strategy for a Sustainable Ocean Economy, can be provided upon request).

Validation and Qualification:

The performance of maritime vessels is validated and qualified through a combination of sea trials, certifications, and adherence to regulations. Sea trials are conducted to test the vessel's performance under real operational conditions, providing data on fuel efficiency, speed, maneuverability, and emissions. Certification from classification societies such as the American Bureau of Shipping (ABS) or Lloyd's Register ensures that vessels meet established safety and performance standards. These bodies perform rigorous inspections and tests to verify compliance with international and national regulations. Adherence to IMO regulations, such as those outlined in the MARPOL convention for pollution prevention, is essential for operating in international trade, and in waters subject to U.S. jurisdiction under the domestic implementing statute, the Act to Prevent Pollutions from Ships (APPS). Direct emissions measurements, often using onboard

sensors, may store and process data with real-time metrics on the vessel's environmental impact and performance optimization, enabling operators to make informed decisions on performance improvements and predictive maintenance (for more detailed information, Blue Sky Maritime Coalition Comments on EPA Emissions Sinks, can be provided upon request).

c. Regulatory Bodies and Measurement:

Regulatory bodies play a critical role in establishing standards and processes for measuring and enforcing performance and emissions metrics for maritime vessels. The IMO sets global standards for safety, security, and environmental performance of ships, including stringent regulations on emissions. In the United States, the Environmental Protection Agency (EPA) oversees regulations related to air and water quality, with which maritime vessels must comply. The EPA's National Emissions Inventory (NEI) provides comprehensive data on emissions from various sources, including ships, using methodologies such as fuel sales data and Automatic Identification Systems (AIS) data. Classification societies like ABS and DNV also monitor and certify vessel performance, ensuring compliance with technical and safety standards. These organizations utilize a range of tools and methodologies, including direct emissions measurement technologies, to ensure vessels meet established performance and emissions criteria. Collaboration between regulatory bodies and industry stakeholders is essential for developing and maintaining robust measurement and reporting frameworks (for more detailed information, Blue Sky Maritime Coalition Comments on EPA Emissions Sinks, can be provided upon request).

2. Capital Investment in the Maritime Industry

a. Investments in Manufacturing Facilities:

The maritime industry is poised for significant capital investment, both in the short and long term, driven by the need to meet decarbonization goals and regulatory requirements. Investments are planned for new and existing manufacturing facilities to develop and produce advanced technology vessels and components. These include facilities for producing alternative fuels such as hydrogen and ammonia, advanced battery systems for hybrid and electric propulsion, and infrastructure for fuel storage and distribution. For example, investments are being made in hydrogen refueling infrastructure, which is critical for supporting the adoption of hydrogen-powered vessels. Similarly, facilities for producing biofuels and renewable diesel are being expanded to meet increasing demand. Factors influencing these investment decisions include the availability of financing, technological advancements, regulatory requirements, and market demand for sustainable shipping solutions. Companies are also investing in retrofitting existing vessels with new technologies to extend their operational life and reduce emissions. This includes upgrading engines to use cleaner fuels, installing energy-efficient systems, and incorporating digital technologies for real-time monitoring and optimization of vessel performance (for more detailed information, Blue Sky Maritime Coalition's response on the Request for Information for DOE Zero Emission Shipping Mission, can be provided upon request).

b. Volume and Distribution of Vehicles:

The maritime sector anticipates an increase in the volume and distribution of new or modified vehicles utilizing low or zero-emission technologies. Factors influencing procurement decisions

in this sector include regulatory compliance, operational cost savings, availability of alternative fuels, and customer demand for sustainable shipping options. As regulations become stricter and the push for decarbonization intensifies, companies are likely to procure more vessels equipped with advanced technologies. For example, the adoption of LNG (liquefied natural gas) as a transition fuel is expected to rise, with many new vessels being designed to operate on LNG or dual-fuel systems. Additionally, the development and deployment of hydrogen-powered vessels and those using other alternative fuels like ammonia and biofuels are expected to grow. Ports and other maritime infrastructure will need to adapt to support these new technologies, influencing the geographic distribution of advanced technology vessels. Investments in port facilities, bunkering infrastructure, and supply chains for alternative fuels will play a crucial role in determining the distribution and volume of these new vessels (for more detailed information, Blue Sky Maritime Coalition's response on the Request for Information for DOE Zero Emission Shipping Mission, can be provided upon request).

3. Barriers to Advanced Technology Vehicle Manufacturing

The implementation of advanced technology vehicle manufacturing projects in the maritime industry faces several key barriers. High initial costs are a significant challenge, as developing and deploying new technologies requires substantial capital investment. The financial risk associated with these investments is high without guaranteed returns, making it difficult for companies to commit to large-scale projects. Regulatory uncertainty is another major barrier. The lack of clear and consistent regulatory frameworks for new fuels and technologies creates uncertainty and delays in adoption. Companies need assurance that their investments will comply with future regulations and that there will be support for transitioning to new technologies. Technological limitations also hinder the widespread adoption of low or zero-emission vessels. Current limitations in energy storage, fuel production, and propulsion technology make it challenging to achieve the desired performance and efficiency levels. Infrastructure gaps, particularly the lack of sufficient infrastructure for alternative fuels and charging systems, further limit the deployment of advanced technology vessels. Addressing these barriers requires coordinated efforts from industry stakeholders, regulatory bodies, and government agencies to develop supportive policies, invest in infrastructure, and advance technological research and development (Blue Sky Maritime Coalition Comments on EPA Emissions Sinks 2023.03.17.pdf; (for more detailed information, Blue Sky Maritime Coalition's response on the Request for Information for DOE Zero Emission Shipping Mission and Comments on EPA Emissions Sinks, can be provided upon request).

4. Supply Chain Issues

The advanced technology maritime industry faces several supply chain issues that impact its ability to transition to low or zero-emission vessels. Currently, the availability of alternative fuels is limited, with challenges in sourcing low carbon intensity feedstocks for biofuels and developing production capacities for hydrogen and ammonia. Inadequate distribution infrastructure for these fuels, particularly in ports, further complicates their adoption. The industry also relies heavily on global supply chains for critical components, which can be disrupted by geopolitical events, trade restrictions, and other external factors. Over time, these supply chain issues are expected to evolve as technological advancements and increased

investment in infrastructure help to address current limitations. For example, the development of larger-scale production facilities for alternative fuels and the expansion of refueling infrastructure in ports will improve the availability and distribution of these fuels. Additionally, advancements in energy storage and propulsion technologies will enhance the performance and efficiency of low or zero-emission vessels. However, achieving these improvements requires sustained investment and collaboration across the industry to build a resilient and efficient supply chain capable of supporting the transition to advanced technology maritime vessels (for more detailed information, Blue Sky Maritime Coalition’s response on the Request for Information for DOE Zero Emission Shipping Mission, can be provided upon request).

5. Regulatory Requirements

a. Certification and Readiness Indicators:

Certification and readiness indicators are essential for ensuring that maritime products meet commercial readiness standards and can be safely and effectively deployed. Certification bodies like the ABS and classification societies such as Lloyd's Register provide certification services that ensure vessels comply with safety, performance, and environmental standards. These certifications are based on rigorous inspections, testing, and validation processes that evaluate a vessel's design, construction, and operational performance. Regulatory frameworks from the IMO and national authorities establish the standards and guidelines that vessels must adhere to. For instance, the IMO's Carbon Intensity Indicator (CII) and other environmental regulations set benchmarks for evaluating the readiness and performance of maritime vessels. Compliance with these regulations is critical for operating in international waters and accessing certain markets. The certification process often involves sea trials, where vessels are tested under real operational conditions to assess their performance, safety, and emissions. These trials provide valuable data that can be used to make necessary adjustments and improvements before the vessel is certified for commercial use. In addition, the use of real-time emissions monitoring equipment can provide continuous data on a vessel's environmental impact, further ensuring compliance with regulatory standards (Blue Sky Maritime Coalition Comments on EPA Emissions Sinks 2023.03.17.pdf; (for more detailed information, Blue Sky Maritime Coalition’s response on the Request for Information for DOE Zero Emission Shipping Mission, can be provided upon request).

Conclusion

The Blue Sky Maritime Coalition and its partners have identified the critical factors influencing the transition to low and zero-emission maritime vessels. Through collaborative efforts with regulatory bodies, industry stakeholders, and technological innovators, the maritime sector can address the challenges and barriers to achieving decarbonization goals. By investing in advanced technologies, developing robust regulatory frameworks, and enhancing supply chain infrastructure, the industry can make significant strides towards a sustainable and environmentally friendly future.