clean economy chronicles

Comments to the U.S. Department of Energy for the Development of Green Shipping Corridors Between the United States and the United Kingdom (DE-FOA-0003156)

Hoyu Chong
September 29, 2023

info@cechronicles.com 240-670-3562 www.cechronicles.com

clean
economy
chronicles

September 29, 2023

Office of Energy Efficiency and Renewable Energy
U.S. Department of Energy
Forrestal Building
1000 Independence Avenue, SW
Washington, DC 20585

Re: Development of Green Shipping Corridors Between the United States and the United Kingdom (DE-FOA-0003156)

Dear Sir/Madam:

Clean Economy Chronicles is pleased to submit the accompanying comments to the Office of Energy Efficiency and Renewable Energy (EERE) regarding the development of green shipping corridors between the United States and the United Kingdom.

Founded in 2023, Clean Economy Chronicles is a boutique consultancy specializing in clean economy and energy. Its goal is to provide objective and rigorous analysis of complex and challenging issues surrounding net-zero economy.

Clean Economy Chronicles applauds the Department of Energy (DOE) for recognizing the importance of decarbonizing the maritime transportation sector, which has received substantially less attention compared to other transportation sectors.

We appreciate the opportunity to offer our perspective on the challenges and barriers to the development of green shipping corridors, which showcase zero-emission fuels and technologies along maritime trade routes between two or more ports.

If you have questions or would like additional information, please contact me at info@cechronicles.com.

Sincerely,

Hoyu Chong
Clean Economy Chronicles

Green shipping corridors create the possibility to work on specific routes that are more feasible than others. But this also means a limited number of cargo types, vessel types and port calls, which lead to committing certain technologies and fuels.

A challenge in crafting responses to this request for information (RFI) is that it lacks clarity on the potential ports and shipping routes (cargo, ports, destinations). Will each route that DOE and its partners proposed focus solely on one type of ship? Existing feasibility studies on green shipping corridors (e.g., the Australia-Japan iron ore route and the Asia-Europe container route) have different recommendations regarding fuel choice, vessel design, and policy support.[1]

In other words, the selection for initial corridors is absolutely crucial and need to be feasible from an implementation viewpoint as well as capable of generating lessons that can be applied to other routes. That said, based on the information presented in this RFI, it does not appear that he UK-U.S. Green Shipping Corridor Task Force has publicized a shortlist of shipping routes.

Green shipping corridors should lay the ground for the massive reductions that will happen once these solutions roll out globally. That is, if the UK-U.S. partnership is successful, then ultimately zero-emission shipping should be a commercially viable option that can be deployed anywhere and not just on certain routes by 2030.

Therefore, the responses provided below will focus on the general rather than route-specific barriers and challenges for a green shipping corridor between the U.S. and the UK.

Section A.2.: What are the potential barriers or challenges foreseen for a green shipping corridor between the U.S. and UK? In your response, please identify any policy, regulatory, financial, technology, or other types of potential barriers or challenges.

The maritime transportation sector is behind other transportation sectors (namely aviation, on-road medium- and heavy-duty transportation, and on-road light-duty transportation) in terms of decarbonization progress. The decarbonization of the maritime sector faces several barriers and challenges that are complex and unique.

Technology

Sustainable Marine Fuels

[1] Michael Parker, Randy Chen, Johannah Christensen, Faustine Delasalle, and Matt Stone (2021), *The Next Wave Green Corridors*, Getting to Zero Coalition, retrieved from: https://www.globalmaritimeforum.org/content/2021/11/The-Next-Wave-Green-Corridors.pdf.

Unlike the aviation sector, where Sustainable Aviation Fuel (SAF) is the clear fuel of choice for medium and long haul flights, this is not the case for the maritime sector. Instead, there are a few candidate sustainable marine fuels (SMFs) in development for long distance voyages such as bio- and e-methanol, green ammonia, synthetic diesel, bio-based natural gas, and lignin-alcohol mixes.

Similar to SAF, each of these candidate SMFs have several feedstocks (e.g., wood biomass, landfill gas, waste oil, manure, and sludge) and conversion processes (e.g., Fischer-Tropsch, anaerobic digestion, and pyrolysis).

Innovation must stimulate the further development of several fuel options to support a multi-fuel mix future suitable for different modes of operation and geography. But existing constraints on time and investments imply that it may be infeasible and impractical to place many bets. At the same time, DOE and its UK partners should also avoid technology lock-in, as was the case with grid scale energy storage around lithium-ion batteries.[2]

The following table provides a summary of selected candidate marine fuels relative to their technology readiness levels (TRLs). Given that uncertainty on the fuel pathways persists at the global level, DOE should carefully weigh the feasibility, scalability, total cost of ownership, and other factors such as leakage, toxicity, and infrastructure of these fuels.

Table 1. Summary of candidate sustainable marine fuels[3]

Fuel	Description	TRL (fuel production)	TRL (engine)	TRL (vessel)	Notes
Green Methanol	Made from CO_2 and green H_2, it is an advanced fuel.	8	8	8	Low flash point and toxic; production scaling is limited by carbon feedstock procurement from non-fossil fuel sources
Green Ammonia	Made from renewable/low-carbon H_2, it may have	8	7	3	Fuel safety standards are lacking; independent from

[2] David Hart, William Bonvillian, and Nathaniel Austin (April 2018), *Energy Storage for the Grid: Policy Options for Sustainable Innovation*, MIT Energy Initiative, retrieved from: https://energy.mit.edu/wp-content/uploads/2018/04/MITEI-WP-2018-04.pdf.

[3] International Transport Forum (2018), *Decarbonising Maritime Transport. Pathways to Zero-Carbon Shipping by 2035*; Lloyd's Register and UMAS (March 2020), *Techno-Economic Assessment of Zero-Carbon Fuels*, retrieved from: https://www.lr.org/en/about-us/press-listing/press-release/lr-and-umas-publish-techno-economic-assessment-of-zero-carbon-fuels/.

	scalability advantages over other fuels as it has other energy and industrial uses.				carbon feedstock requirement; not cost competitive compared to conventional ammonia.
Synthetic Diesel	Made from CO_2 and green H_2, it is considered to be a drop-in fuel that doesn't require changes to the engine or the storage tank.	7	9	9	Not cost competitive compared to conventional diesel;
Green Hydrogen	Produced through electrolysis from renewable energy. It may have scalability advantages over other fuels as it has other energy and industrial uses.	9	7	2	Technical challenges to store onboard vessels; low volumetric density; not cost competitive compared to grey hydrogen.

An established industry, infrastructure, and operational practices around fossil fuels already exist in the maritime value chain. Green shipping corridors will require significant changes to the existing value chain and/or the creation of a parallel value chain involving new stakeholders and relationships. Gaps on infrastructure, fuel technologies, and vessel design for zero-emission shipping imply the need to integrate new knowledge from other sectors (e.g., fuel production, handling, and distribution), underscoring the necessity of cross value chain collaboration.

Policy

The maritime sector is the backbone of global trade—responsible for over 80% of it, and demand for shipping is expected to grow in line with global economic growth. Similar to the aviation sector, the maritime sector is responsible for about three percent of global emissions. Unfortunately, research, development, and demonstration (RD&D) efforts and progress toward decarbonizing the maritime sector has lagged behind aviation comparatively. Not only is the general funding level lower, but a lack of cross-agency level initiative similar to the SAF Grand Challenge gives the signal (whether justly or not) that the federal government lacks the commitment to decarbonize the maritime sector.

Since policymakers from the rest of the Western world tend to follow the U.S., the lackluster commitment shown thus far could in turn stymie global efforts to curb maritime sector's emissions.

Vessel Types

Since global and concerted attempts to decarbonize this sector did not begin until 2021 (in COP26/First Movers Coalition), the maritime sector has a much shorter timeline to decarbonization than other transportation sectors.

However, so far most of the proposed green shipping corridors focus primarily on container ships, but these make up less than one-fourth of the maritime sector's emissions. Compared to other vessels, container ships tend to have predictable sailing schedule and simple stakeholder mix where owner and operator are one same entity, which means container ships may be one of the easier types of vessels to decarbonize.

In other words, the current approach predominantly focuses on the low hanging fruits without consideration of the various use cases of ships. The UK-U.S. corridors should aim to include different vessel types involving multiple stakeholders.

Implementation

Timely implementation of fuels that produce zero emissions on a lifecycle basis will be integral to the UK-U.S. partnership's success. The Los Angeles-Shanghai green shipping corridor, involving two of the world's busiest ports, calls for phasing in of low, ultra-low, and zero carbon fueled ships through the 2020s before the transition to zero-carbon fuels by 2030.[4] While a phased approach seems intended to ease the transition, relying on fossil fuels during an interim period may jeopardize the sector's ability to fully decarbonize by 2050.

DOE and its partners need to balance carefully between the ease of transition (feasibility) and timely transition to zero-emission (impact).

Regulatory

Life Cycle Assessment of GHG Emissions

The U.S. and the UK should ideally be on the same page on measure the life-cycle emissions of shipping. Any emission reduction threshold is only as robust as the methods and data used to measure it.

Currently, the Biden administration has yet to decide upon the methodology of measuring the life-cycle emissions of SAF, one year after the passage of the Inflation Reduction Act. Namely, the U.S. Treasury Department and the Internal Revenue

[4] C40 Cities (January 2022), *Port of Los Angeles, Port of Shanghai, and C40 Cities Announce Partnership to Create World's First Trans-Pacific Green Shipping Corridor Between Ports in the United States and China*, retrieved from: https://www.c40.org/wp-content/uploads/2022/01/LA-SH-Green-Shipping-Corridor-PRESS-RELEASE-012822_FINAL.pdf.

Service (IRS) have yet to determine whether any other GHG accounting methods (such as Argonne National Lab's Greenhouse Gases, Regulated Emissions, and Energy Use in Technologies (GREET)) are similar to those used in International Civil Aviation Organization's Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA). Indeed, GREET and CORSIA differ in their estimates of indirect emissions, particularly on indirect land use changes and emission factor.[5]

It is plausible and likely that similar differences exist between GREET and International Maritime Organization's methodologies. To prevent incentivizing fuel pathways with uncertain emissions reduction benefits, both nations need to be in unison on the life-cycle assessment of emissions.

Jones Act

The Merchant Marine Act of 1920, or the Jones Act, is a federal law that restricts water transportation of cargo between U.S. ports to ships that are U.S.-owned, U.S.-crewed, U.S.-registered, and U.S.-built. Jones Act fleet are typically costlier to operate. Although Jones Act does not apply to international water and ships, it is unclear the barriers this act might pose with regards to implementing green shipping corridors.

What is also unclear is the impact of Jones Act along with the infrastructure demand spurred from green shipping corridors on port infrastructure. A recent University Maritime Advisory Services (UMAS) report estimates that it is more economical for 17% of the US' coastal Jones Act fleet to switch to battery power rather than alternative fuels.[6] Furthermore, "scalable zero-emission fuel 'first mover' vessels covering multilateral routes that combine both domestic and international operations account for 7.4% of the total US fleet energy demand, of which 4.8% is for domestic-only shipping and 2.6% is for international voyages." [7] In addition, the study suggests that the demand for electrification is higher in the Gulf and the Northeast of the US and the demand for scalable zero-emission fuels is higher in the west coast and the Great Lakes ports. Given the Jones Act's role in shaping the U.S. fleet, how can the UK-U.S. partnership leverage it (instead of being hindered by it) in terms of implementing green shipping corridors?

---

[5] Jane O'Malley and Nikita Pavlenko (September 2023), *Drawbacks of adopting a "similar" LCA methodology for U.S. sustainable aviation fuel (SAF)*, International Council on Clean Transportation, retrieved from: https://theicct.org/wp-content/uploads/2023/09/ID-16-Briefing-letter-v3.pdf; Hoyu Chong (August 2023), *Sustainable Aviation Fuel: Silver Bullet or Greenwashing Opportunity?*, Clean Economy Chronicles, retrieved from: https://cechronicles.com/index.php/2023/08/08/sustainable-aviation-fuel-industries-meet-corn/.

[6] Jean-Marc Bonello, Camilo Velandia Perico, Joseph Taylor, and Tristan Smith (2022), *The Maritime Fleet of the USA – current status and options for the future*, UMAS, retrieved from: https://oceanconservancy.org/wp-content/uploads/2022/04/oc_jaf_final_report_20220119.pdf.

[7] Ibid.