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U.S. Department of Treasury & The Internal Revenue Service
P.O. Box 7604
Ben Franklin Station
Washington, D.C. 2004

RE: Comments on Department of Treasury and Internal Revenue Service Notice 2022-58 Request for Comments on Credits for Clean Hydrogen and Clean Fuel Production

The Methanol Institute (MI) welcomes the opportunity to comment on the U.S. Department of Treasury (Treasury) and Internal Revenue Service (IRS) implementation of Section 45Z Clean Fuel Production Tax Credits enacted under the Inflation Reduction Act (IRA). We support the IRA's goal of advancing clean energy solutions for U.S. manufacturing, the transportation sectors, and the American people. MI supports market-based and technology neutral solutions for the development of clean fuel credits. To this end, we believe that methanol is uniquely positioned to qualify as a "transportation fuel" under Section 45Z(d)(5), a designation that will establish methanol on equal-footing with other fuels and assist in developing a diverse array of technologies and fuels that will assist in accomplishing the Biden Administration's goal of reducing greenhouse gas (GHG) emissions.

MI was founded in 1989 and serves as the global trade association for the methanol industry. MI has over 70 member companies representing the world's leading methanol producers, consumers, distributors, and technology companies. In recent years, the association has seen rapid growth in the bio-methanol, e-methanol, and marine sectors. In fact, MI now counts four of the world's leading container ship lines as members: Maersk, MSC, CMA-CGM, and COSCO. The growth of methanol as a marine fuel is critical not only to the future of the methanol industry, but also to the goal of reducing global GHG emissions. Based on this experience, the methanol industry is well-positioned to grow its market-share more broadly in the transportation sector, a position that can be further sustained with favorable tax treatment.

The overall economic footprint of the methanol industry is vast. MI member companies employ over 600,000 people across the globe. Methanol is one of the

world's most heavily traded and shipped chemical commodities. For context on the economic impact of methanol on the United States, a typical domestic methanol plant that produces 1.5 million metric tons per annum of methanol drives capital spending of $1.1 billion and has an economic ripple effect worth an additional $1.5 billion. In short, the methanol industry is critical to the American economy. Adopting an inclusive approach to the 45Z credit for which methanol can be considered will not only expand the availability of clean fuels but also drive the American economy.

Background on Methanol Production

Currently, most methanol produced in the United States is made via the steam reformation of natural gas. These conventional natural gas-based plants can reduce their carbon footprint in a variety of ways including by capturing CO2, recirculating CO2, bringing in CO2 over the fence, adding green hydrogen, or replacing natural gas-driven process equipment with electrically driven equipment to produce low-carbon methanol.

A number of companies are already producing low-carbon and carbon-neutral bio-methanol from a variety of widely available renewable feedstocks such as bio-methane, non-recyclable waste, sludge, pulp liquor, sustainable woody biomass and agricultural residues. Production via a variety of technological pathways can achieve 60 to over 90 percent reductions in greenhouse gas emissions. Some methanol production pathways even have a negative GHG footprint, such as methanol produced from biomethane from cow manure or from the organic portion of non-recyclable waste (avoided methane emissions from landfills or avoided GHG emissions from incineration). This means that CO2 is effectively removed from the atmosphere or that the pathway avoids emissions that would have otherwise taken place in other processes.

Other pioneering companies have opted for producing very low or net-carbon-neutral e-methanol, also known as Renewable Fuels of Non-Biological Origins (RFNBOs), by combining hydrogen (H2) produced with renewable electricity with captured CO2 from an industrial flue gas source, biogenic and non-biogenic CO2, or from direct air capture (DAC). Low-carbon Recycled Carbon Fuel (methanol) (RCF) could also be produced from the non-biogenic carbon in the non-recyclable waste. Additionally, methanol could also be used as a feedstock to produce other

low-carbon fuels like sustainable aviation fuel (SAF), as alcohol-to-jet.

Importantly, methanol is poised to adopt methods to reduce GHG emissions during production, which is certainly one of the main drivers in the search for alternative fuels. Methanol also showcases as a key enabler with regard to availability, ease of use, performance, and total cost of ownership. We believe that methanol offers significant advantages over other fuels and feedstocks in these regards.

Methanol is used in thousands of everyday products, including plastics, paints, cosmetics, and fuels. Methanol is also an energy resource used in the marine, automotive, and electricity sectors, and as an emerging renewable energy resource. Methanol is a clean-burning, biodegradable fuel. Increasingly, methanol's environmental and economic advantages make it an attractive alternative fuel for powering vehicles and ships, cooking food, and heating homes. Global methanol demand is roughly 100 million metric tons; over the period of the last five years (2017-2020), methanol demand grew at a compound annual growth rate of 3.5 percent.

Methanol is a Critical Piece of the Clean Energy Transition

Currently, methanol is well-positioned in the shipping industry; however, the model adopted in that industry is a useful template for considering methanol for use as a fuel more broadly in the transportation sector. Examining the current application of methanol including the appropriate analyzation of emissions provides a template for a greater introduction of methanol in other forms of transportation. Below we explain the current use of methanol in the shipping industry with the understanding that a broader application of methanol throughout the transportation sector will have additional positive impacts on emissions that originate from the maritime industry.

The shipping industry represents 3 percent of global GHG emissions, roughly the same emissions as the country of Germany.1 Methanol stands ready as both commercially and technically viable as a fuel source that is available today to assist the shipping industry in lowering its carbon footprint. In the absence of mitigation efforts, the inevitable increase in demand for maritime transport will lead to a steady increase in emissions. Most notably this is because the favored

approach to shore-based energy production (power generation) is 'renewable' in nature and, for road transport decarbonization – direct electrification (whether battery electric or hybrid battery electric). However, electrification has only a limited application at sea (short sea shipping or inland waterways), for reasons which are both technical and economic in nature. Thus, the marine sector will continue to remain highly dependent on liquid fuels or fuels which most closely resemble 'drop-in' fuels. The difficulties in decarbonizing the sector may be further highlighted by pointing out that CO2 emissions in shipping increased by 6% in the 2012-2018 period.

Methanol is a fuel that shipping companies can deploy today to meet regulations seeking to curb emissions. Compared to heavy fuel oil (HFO), commercially available methanol made from natural gas can slash emissions of NOx by 80 percent, SOx by 99 percent, PM by 95 percent.

Methanol is easy to handle because it remains liquid at ambient temperature and pressure, unlike other alternative fuels such as LNG, ammonia, or hydrogen. This means that methanol transportation and bunkering is simple and can be achieved largely with existing infrastructure after relatively simple modifications in a cost-effective manner. As one of the world's most widely shipped chemical commodities and fuels, methanol storage capacity is available in over 120 ports.

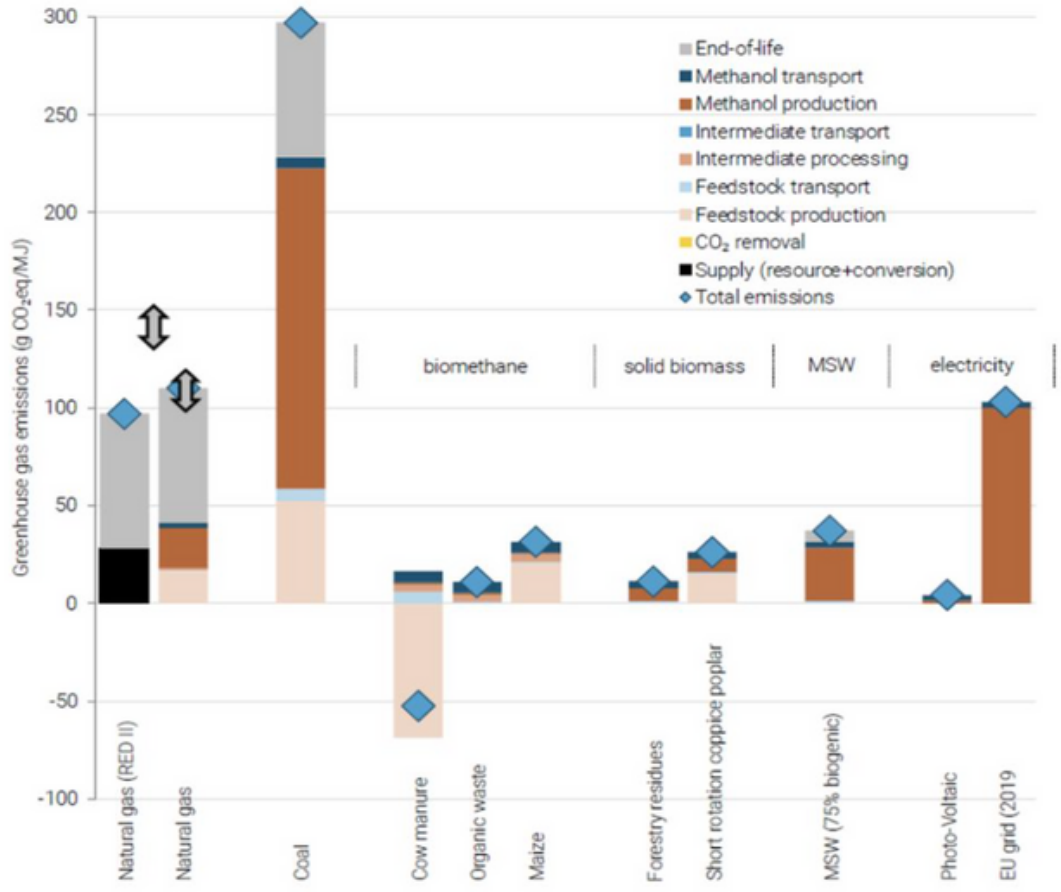
Thanks to its advantages, leading shipping companies have adopted methanol as a marine fuel, with shipping giants AP Moller – Maersk, CMA CGM and COSCO being high-profile examples. At the time of writing, there are more than two dozen methanol-powered vessels in service and more than 100 new two-stroke methanol dual-fuel engines in the order book of MAN Energy Solutions, the leading methanol engine OEM. Other models are now being offered or introduced by established companies such as MAN Energy Solutions, Wärtsilä, Rolls-Royce/MTU, WinGD, ABC, Caterpillar, and Hyundai Heavy Industries. Dual fuel engines that can run on both diesel fuel and methanol are available, making the transition easier for both newbuilds and retrofit of existing vessels.

MI suggests utilizing a 'well-to-wake' approach when analyzing maritime emissions – this approach considers emissions related to the full production cycles of fuels and also the GHG emissions that would have occurred in the absence of the project.

[1] All At Sea, Methanol and Shipping, Longspur Research, Jan. 25, 2022.

For example, when non-recyclable waste is diverted from landfills/incineration facilities to produce methanol instead, a CI credit must be applied like in the California and British Columbia Low Carbon Fuel Standards (CA-LCFS/BC-LCFS). These are real GHG emissions reductions and they must be accounted for. Doing so will present the appropriate options for leading to true carbon neutrality in this industry. Moreover, this methodology of life cycle assessment accurately compares marine fuel performance with regards to the emissions of other greenhouse gases beyond carbon dioxide, such as methane and nitrous oxide. This approach sets a level playing field for maritime fuels, allowing current front runners to compete with available drop-in fuels, such as methanol. Figure 1 shows the carbon footprint of various methanol pathways in grams of CO2 equivalent per megajoule on a well-to-wake basis.

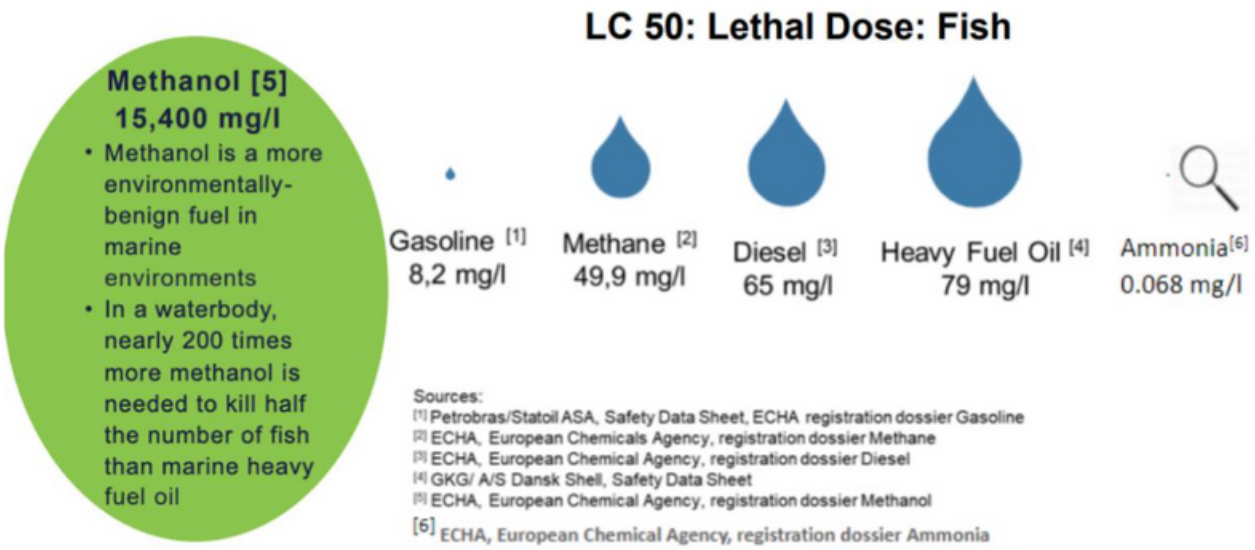
Figure 1: Carbon Footprint of Methanol Pathways (Well-to-Wake in g CO_2-eq/MJ)



Source: Hamelinck & Bunse, 2022

From an environmental pollution perspective, methanol is safer and less toxic than other fuels, both generally and for use in the shipping industry. Methanol is fully miscible in water, meaning that it would easily dilute to low concentrations in case of a spill at sea. Additionally, microbes readily break down methanol into CO2 and water at concentrations of less than 3000 mg/l. Methanol would last between one and seven days in surface water before dissolving completely. Of course, the methanol sector has already taken significant steps to prevent the risk of spills and leaks, but the potential consequences of these mishaps must be weighed against the risks of alternative fuel sources leaking. Compared to other fuel sources, methanol provides a safer alternative.

Figure 2: Amount of each fuel necessary to kill half of the fish in a leakage or spill in a given body of water



Methanol fuel is more practical in comparison to alternatives. Existing engines can be easily retrofitted to use methanol, and methanol can be stored in existing bunkering. The alternatives to methanol each pose varying challenges. Electric batteries are ill-suited for long-haul operations and cargo shipping. LNG is useful as a bridge fuel, but prone to methane leaks. Hydrogen is extremely difficult to store and would require new infrastructure. Ammonia produces N2O leakage and emissions from combustion and also elicits concern due to its extreme toxicity. Utilizing the well-to-wake approach mentioned above, methanol is a potential maritime fuel that adheres to the goal of lowering carbon emissions and is ready for use in shipping now. Outside of the shipping industry, methanol's use in

transportation fuel is growing. Methanol is a versatile, affordable alternative transportation fuel due to its efficient combustion, ease of distribution, and wide availability around the globe. Methanol is used in gasoline blends around the world at low (3-5%), mid (15-30%), and high (50-100%) volume percentages, and as a diesel substitute for use in heavy-duty vehicles. China and other foreign countries are leading the way with 100% methanol and methanol-derived fuels. Today, China has tens of thousands of methanol-fueled passenger cars and hundreds of heavy-duty trucks on the road, as well as commercially-available M100 hybrid-electric vehicles. However, significant opportunities exist for methanol to be used more frequently for transportation fuels in the United States as the demand for lower-carbon fuels increases. In addition to the GHG reduction benefits possible with the use of methanol, when combusted as either a marine or road transport fuel, methanol can also offer significant reductions in Sulfur Oxides (SOx), >99 percent reduction, Particulate Matter (PM) >95 percent reduction, and in Nitrous Oxide (NOx), >80 percent reduction.

Methanol also is used for electricity generation via methanol fuel cells (either in stationary or marine and on-road applications) for powering turbines (see here for a recent application: https://www.insider.co.uk/news/world-first-liquid-bio-methanol-29271464), and in industrial boilers, kilns and as a clean burning fuel in cookstoves.

Methanol Should be Considered a "Transportation Fuel" Under Section 45Z(d)(5)

The clean fuel production credit, Section 45Z, creates a technology-neutral incentive for the domestic production of clean fuels. For a fuel to be eligible under highway vehicle transportation fuels, the fuel must be "suitable for use as a fuel in a highway vehicle."2 However, the Inflation Reduction Act does not further define the standard, which leaves open the question of whether methanol qualifies. MI believes, that based on similar definitions found in multiple federal statutes and federal agency regulations that consider methanol to be a highway transportation fuel, Treasury and IRS should include methanol in any such definition it promulgates regarding the qualification of fuels for the 45Z credit. It is already the case in many other jurisdictions, including in the European Union, where methanol is blended into the fuel pool under the Fuel Quality Directive's EN228 Standard, and in the United Kingdom, where renewable methanol can be blended into the fuel pool in accordance with the Renewable Transport Fuel

[2] Inflation Reduction Act, P.L. 117-169, Aug. 9, 2022.

Obligation (RTFO).

The Energy Tax Act of 1978 first established a federal excise tax exemption for gasolines containing ethanol or methanol. The Alternative Motor Fuels Act of 1988 codified the role of methanol as an alternative fuel noting that the "Nation's security, economic, and environmental interests require that the Federal Government should assist clean-burning, nonpetroleum transportation fuels to reach a threshold level of commercial application and consumer acceptability at which they can successfully compete with petroleum-based fuels; methanol, ethanol and natural gas are proven transportation fuels that burn more cleanly and efficiently than gasoline and diesel fuel." The Taxpayer Relief Act of 1997 provided a reduced excise tax rate for M85 fuel (85% methanol and 15% gasoline) at 9.25 cents per gallon basing the rate on the energetic content of methanol rather that a volumetric basis.

The federal Clean Air Act demonstrates in several ways that Congress has previously identified methanol as a fuel for use in highway vehicles. In provisions establishing an Urban Bus Standards program to reduce air pollutants from public transportation, methanol is included as a low-polluting fuel.3 Similarly, a program requiring the U.S. Environmental Protection Agency to set Clean Fuel Vehicle standards defines "clean alternative fuel" to mean any fuel, including methanol, that can be used in a "clean fuel vehicle."4

This term is used under standards for light-duty clean-fuel vehicles, showing that Congress envisioned methanol to be used for highway transportation vehicles. Under the Energy Policy and Conservation Act, Congress required the U.S. Department of Transportation to establish Corporate Average Fuel Economy standards for light-, medium-, and heavy-duty "automobiles." As part of this program, Congress defined "alternative fuel" to include "methanol" and blends of methanol up to 85 percent.5

Environmental regulations implementing these same programs provide additional support. EPA has explicitly classified methanol as an alternative fuel under 40 C.F.R. § 86.1803-01 and 40 C.F.R. § 600.002. These provisions relate to (1) control of emissions from new and in-use highway vehicles and engines and (2) fuel economy and greenhouse gas exhaust emissions of motor vehicles, respectively. Both are provisions that regulate highway vehicle fuels.

Based on these laws and regulations, there is a strong argument that methanol has already been shown by both Congress and applicable federal agencies to be suitable for use as a fuel in highway vehicles. Congress has clearly treated it as such in previous provisions, and Section 45Z should be interpreted by Treasury and IRS consistently.

Other federal agencies have also promulgated regulations that consider methanol to be a transportation fuel. The Federal Trade Commission provisions on automotive fuel ratings, certification and positing define automotive fuel as "liquid fuel of a type distributed for use as a fuel in any motor vehicle."6 This definition includes "alternative liquid automotive fuels", such as methanol.7 The Department of Energy similarly includes methanol as an "alternative transportation fuel" under provisions for the assistance of state energy programs.8 These programs are intended to reduce reliance on imported oil and improve energy efficiency and fuel economy.

Adopting an interpretation of transportation fuel that aligns with similar federal statutes and regulations will be critical to the future of the methanol industry and for reducing global greenhouse gas emissions. Methanol deserves equal treatment with other fuels. If other similarly situated fuels, particularly in the shipping and maritime sector, will be eligible to receive the 45Z credit, then methanol deserves to be included. Moreover, the 45Z credit will be particularly important for small methanol producers that are developing innovative production methods that will further reduce the greenhouse gas emissions of methanol production.

Although MI is particularly interested in seeing Treasury and IRS adopt an inclusive approach with regard to methanol as a transportation fuel, this position is sustained by both a major fuel trade association and major fuel producing company. Both the American Petroleum Institute and Shell support the inclusion of methanol in a table that includes a nonexclusive listing of potential transportation fuels that could qualify for the credit. We believe that Treasury and IRS should consider publishing a list of potential transportation fuels that could qualify for the credit that includes methanol.

[3] 42 U.S.C. § 7554(f)(2).
[4] 42 U.S.C. § 7581(2).
[5] 49 U.S.C. § 32901(a)(1).
[6] 16 C.F.R. § 306.0(i).
[7] 16 C.F.R. § 306.0(i)(2).
[8] 10 C.F.R. § 420.2.

Book and Claim Accounting Should be Used When Calculating Emissions of Transportation Fuels

We believe that the IRS should utilize a "book and claim" methodology for calculating the environmental attributes of transportation fuels such as methanol. As noted by the RNG Coalition and the SAF BTC Coalition, book and claim accounting systems encourage the efficient use of pipeline infrastructure, which both facilitates supply chain efficiency and consumer demand for clean fuels. Further, book and claim systems are essential for overall emissions reductions efforts, for they reward the increased use of clean fuels throughout the economy instead of simply rewarding particular industry partnerships. Overall, book and claim accounting mechanisms will be essential to advance the SAF Grand Challenge and to achieve emissions reduction targets.

Specifically for the methanol industry, book and claim will make the market more efficient, reduce costs for the end consumer, and will be the most environmentally responsible way to approach global supply chain problems. Book and claim would remove the need to physically ship green methanol long distances on vessels using fossil fuels given that all methanol molecules, regardless of color (feedstock) or country of origin, are identical. An analogy is the electricity market where a customer buying green electricity may not be physically supplied with the electrons generated by a specific renewable power plant. Rather, they receive electrons from the grid and guarantees of origin or certificates to verify they have paid for green electrons that have been dispatched somewhere in the same grid.

Global emissions accounting can be made transparent by digitalizing each product's unique environmental attributes to enable reliable, traceable emissions data transfer between parties. As one example, a platform could replicate a traditional ledger book based on blockchain technology, which can be used to collect energy and emission data related to each ton of methanol produced. Each ton would be allocated a unique token and then a book and claim can allow tokens to be transferred within the pool of users based on units of CO2, NOX, SOX, Black Carbon/Soot equivalent intensity per energy consumed. This will result in the most efficient supply and demand balances, avoiding unnecessary emissions during transport and will result in cost reduction for the end customers.

Conclusion

The Methanol Institute appreciates the opportunity to comment to the Treasury and the IRS on the implementation of the 45Z tax credit. If you have questions or wish to discuss further, please contact Lawrence Navin at lnavin@methanol.org.

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