NESTE

Statement of Jeremy Baines
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House Energy and Commerce Committee, Subcommittee on the Environment and Climate Change
Hearing on "Building a 100 Percent Clean Economy: Solutions for Planes, Trains and Everything Beyond Automobiles"

October 23, 2019

Chairman Tonko, Ranking Member Shimkus and Members of the Subcommittee:

My name is Jeremy Baines. I am President of Neste US, and I appreciate the subcommittee's invitation to discuss opportunities to decarbonize the aviation and heavy-duty sectors with drop-in, scalable, renewable, and low carbon liquid transportation fuels. In order to meet science-based greenhouse gas (GHG) reduction targets and reach net-zero emissions by 2050, significant contributions will be needed from low carbon liquid transportation fuels, particularly in long-distance and heavy-duty applications — those other than light-duty automobiles — which cannot reasonably electrify and will rely on liquid fuels for the foreseeable future. As Congress considers pathways to reduce emissions in difficult to decarbonize sectors like aviation, heavy-duty transport, and maritime, it must both maintain and improve existing policies supporting renewable fuels and develop new sector-specific policies to continue to incentivize development of low carbon liquid transportation fuels.

Neste is a publicly-traded international fuel manufacturer based in Finland with a significant and growing presence in the United States. We are the world’s largest producer of sustainable, low carbon renewable diesel and jet fuel, with over a billion gallons of capacity today and plans to expand to 1.5 billion gallons by 2022. In 2018, our products helped our heavy-duty on-road customers reduce GHG emissions by 7.9 million tons, and we have a goal of reducing emissions by 20 million tons a year by 2030. And in 2019, Neste placed third on the Global 100 list of the most sustainable companies in the world and was ranked as the most sustainable energy company.

But Neste wasn’t always the world’s largest producer of renewable diesel and jet fuel. Neste started as a traditional oil company, and we have proven that an oil company can transform into a climate solution provider. In 2015, Neste dropped “Oil” from our company name to underscore the fact that referring to fossil crude oil no longer gave a correct overall picture of the company. Although renewable products now account for the majority of our business, Neste is more broadly in the business of combating climate change and driving the circular economy by developing solutions where carbon is reused, again and again.

Neste has now set its sights on the challenge of decarbonizing aviation. Today, Neste has ramped up its capacity to produce over 30 million gallons of Sustainable Aviation Fuel (SAF), with plans for over 340 million gallons of capacity by 2022. Neste and our partner Texmark have recently received EPA approval for a new pathway to produce SAF in the U.S., and we plan to start domestic production of significant volumes by the end of the year.

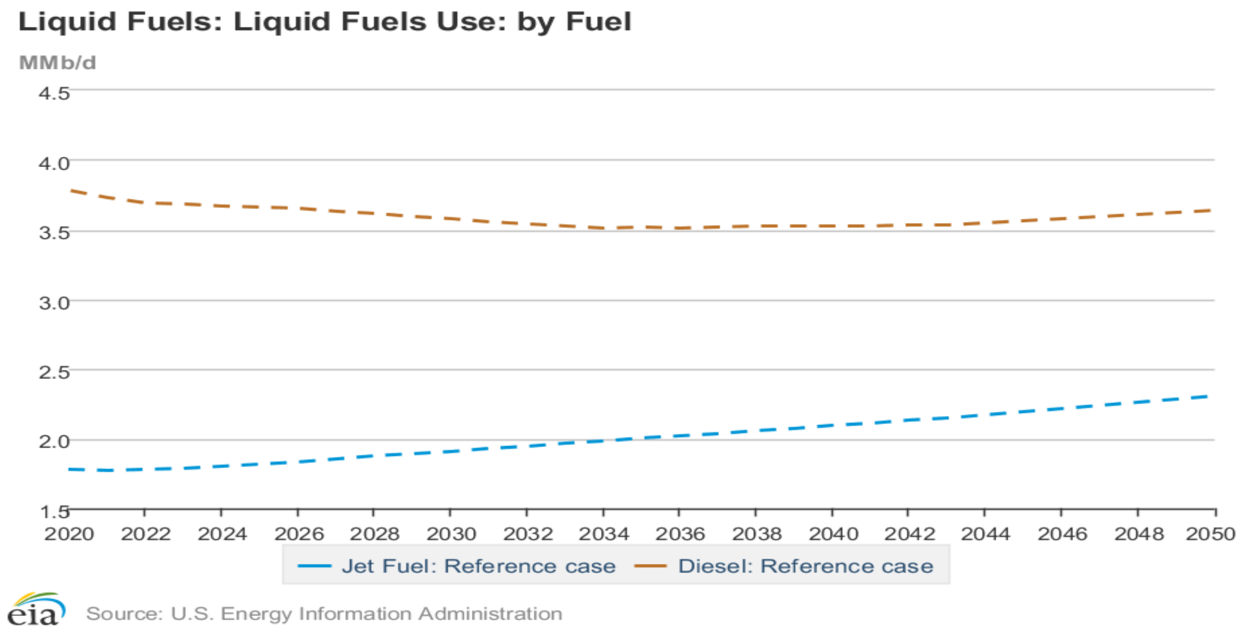
Neste is working with several stakeholders in the aviation industry in the U.S. to expand and promote the use of SAF. For example, Neste has entered into collaboration agreements with

American Airlines, Alaska Airlines, and UPS to develop scalable solutions for seamless and efficient supply of SAF. Similarly, Neste has signed memorandums of understanding with San Francisco International Airport, Dallas Fort Worth International Airport, and the Port Authority of New York and New Jersey to jointly explore how to increase supply of SAF at these airports. We are also working closely with many industry stakeholders, including airframe and engine manufacturers, to expand the portfolio of approved sustainable aviation fuels.

Need for Liquid Fuels is Not Going Anywhere Soon

While the light-duty transportation sector is already beginning to ramp up electrification and other zero emission technologies, medium- and heavy-duty transport, aviation, maritime, and freight rail will continue to rely on a significant percentage of liquid fuels. As shown below, the U.S. Energy Information Agency (EIA) projects that domestic diesel use will remain relatively constant and jet fuel use will grow significantly.[1] Significant volumes of low carbon, drop-in renewable diesel and jet fuel will be need to displace fossil diesel and jet fuel to meet science-based climate targets.

Figure 1: EIA Reference Case Projections for Domestic Diesel and Jet Fuel Use Through 2050



Clearly, electrification is not a panacea for all transportation emissions and a portfolio of technologies will be required. Electrification is a feasible option in the near term for on-road, light-duty vehicles and in niche applications in the medium- and heavy-duty sector, such as urban buses, which have short routes and return to central locations regularly. In the remainder of the medium- and heavy-duty vehicle sectors, electrification is far more challenging. The National Renewable Energy Laboratory's (NREL) Electrification Futures Study found that even in a "high electrification" scenario, only 52% of medium-duty trucks and 37% of heavy-duty trucks would be electric in 2050 due to the significant challenges associated with electrifying larger vehicles — challenges including

[1] *See* Energy Information Agency, Annual Energy Outlook 2019. For simplicity, only the reference case is shown, but all cases examined by EIA track this general forecast.

battery size, weight, volume, range, and charging duration.[2] Even if technological breakthroughs somehow were to result in 100% electric sales by 2040 or 2050, significant portions of the legacy fleet would still require diesel.

Renewable diesel and other low carbon liquid transportation fuels (e.g. biodiesel), offer significant climate benefits and can reduce emissions today without any need for infrastructure or equipment upgrades. In California, renewable diesel and biodiesel are currently the single largest contributors to emissions reductions under the Low Carbon Fuel Standard, reducing 4.3 million tons of CO_2 in 2018 — far greater than the 1.2 million tons of CO_2 reduced by electric cars and trucks.[3] The recent "100 Percent Clean Future" report by the Center for American Progress also notes that some transportation sectors will not be able to decarbonize from electrification alone and that liquid fuels, like renewable diesel and SAF, will be needed in heavy-duty trucking, aviation, shipping, construction, and freight rail.[4]

The Case for Sustainable Aviation Fuel

Aviation is broadly understood to be one of the more difficult sectors to decarbonize, as electrification is not feasible in the near- to medium-term for anything other than short-haul regional flights. Fleet turnover is also less rapid in the aviation sector, with planes produced today expected to have a useful life of 25 years or more, compared to useful lives in the on-road sector that can be less than half as long. Thus, climate policy for aviation must be built around technologically feasible developments in the industry, and there is widespread consensus that while aircraft can continue to improve efficiency through use of advanced materials and more efficient engines, the vast majority of use cases (i.e. medium- and long-haul and larger short-haul jets) will require liquid hydrocarbon fuels through at least 2050.

Today, aviation contributes roughly 2.7% to U.S. GHG emissions, with a similar share globally, and aviation activity is growing roughly 5% per year. While our aviation industry partners have a strong record with over 2% annual efficiency improvements in recent years, emissions growth is outstripping efficiency improvements. The United Nations' International Civil Aviation Organization (ICAO) projects that emissions from international aviation could triple by 2050, at which time aviation could contribute a significantly higher percentage of total global emissions.

ICAO is addressing near-term growth in aviation emissions attributable to international flights beyond a 2020 baseline pursuant to its Carbon Offsetting Reduction Scheme for International Aviation (CORSIA), which is the first global, sector-wide program to address GHG emissions. The aviation sector should be applauded for the efforts to offset the growth of international aviation emissions. To date, 81 states, representing 76.63% of international aviation activity, have volunteered to participate in both the pilot phase (2021-2023) and the first phase (2024-2026) of CORSIA. But ICAO's recent analysis of aviation emissions trends, excerpted below, demonstrates the degree to which SAF is a critical "wedge" for long-term decarbonization of aviation.

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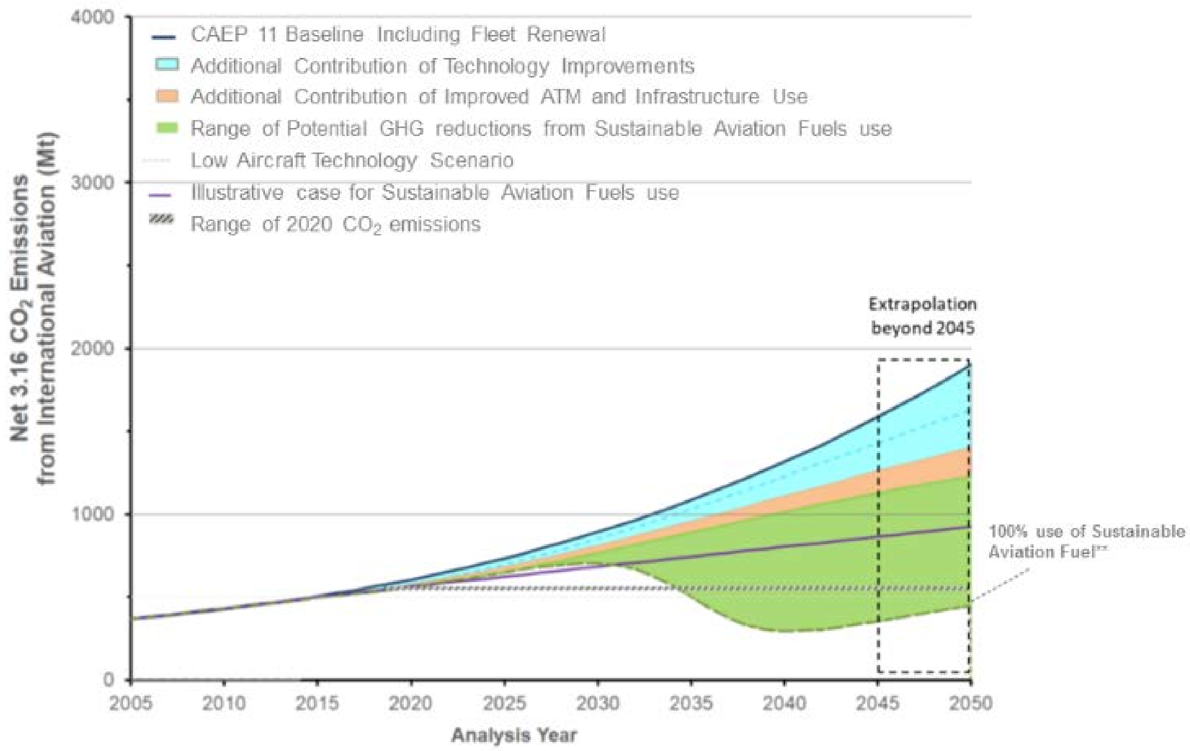
[2] *See* National Renewable Energy Laboratory, *Scenarios of Electric Technology Adoption and Power Consumption for the United States*, p. 45, available at https://www.nrel.gov/docs/fy18osti/71500.pdf

[3] *See* Diesel Technology Forum, *Climate Change and Diesel Technology*, available at https://www.dieselforum.org/policy/climate-change-and-diesel-technology

[4] *See* Center for American Progress, *A 100% Clean Future,* p. 39, available at https://www.americanprogress.org/issues/green/reports/2019/10/10/475605/100-percent-clean-future/

Figure 2. ICAO Trends Analysis Presented at 40th ICAO Assembly.[5]



Moving beyond CORSIA, the global aviation industry has committed to reducing emissions by 50% from a 2005 baseline by 2050. Rapid deployment and scale-up of SAF will be critical to achieving this goal or even more ambitious targets.

SAF offers a promising pathway to decarbonization. It is compatible with existing aircraft and infrastructure and can currently be blended with conventional jet fuel as high as 50%. There are currently five approved pathways under ASTM D7566[6] covering a variety of feedstocks and production processes. Fuel meeting one of the annexes to D7566 is deemed equivalent to the conventional jet fuel specification, ASTM D1655, and is fungible with other jet fuel throughout the fuel distribution system.[7]

SAF can provide substantial lifecycle GHG emissions of 80% or more compared to conventional petroleum jet fuel. In addition, with zero sulfur and no aromatics, SAF also significantly reduces conventional pollutants, which would benefit disadvantaged communities near airports that are subject to high pollution burdens. A recent federally-funded study by the Airport Cooperative Research Program found that a 50% SAF blend could reduce emissions of particulate matter (PM),

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[5] *See* Council of ICAO, Working Paper 54, ICAO Global Environmental Trends – Present and Future Aircraft Noise and Emissions, *available at* https://www.icao.int/Meetings/a40/Documents/WP/wp_054_en.pdf

[6] ASTM International, *Standard Specification for Aviation Turbine Fuel Containing Synthesized Hydrocarbons*

[7] Comprehensive information on SAF can be found on the website of the Commercial Aviation Alternative Fuels Initiative (CAAFI), a public-private partnership co-sponsored by the Aerospace Industries Association (AIA), Airports Council International-North America (ACI-NA), Airlines for America (A4A) and the Federal Aviation Administration (FAA). *See* ww.caafi.org. *See also* Atlantic Council, Ready for Takeoff: Aviation Biofuels Past, Present, and Future, available at https://www.atlanticcouncil.org/in-depth-research-reports/report/ready-for-take-off-aviation-biofuels-past-present-and-future/; Airlines for America, Deployment of Sustainable Aviation Fuels in the United States, available at https://www.airlines.org/wp-content/uploads/2019/08/A4A-Sustainable-Fuel-Report_FINAL.pdf

sulfur oxides (SOx), and carbon monoxide (CO) from jet aircraft by up to 65, 37, and 11 percent, respectively.[8] Emerging research further suggests that SAF's PM reductions also deliver additional climate benefits, both from a reduction of black carbon emissions that accelerate Arctic warming[9] and from reduced contrail formation, as contrails have a radiative forcing impact.[10]

SAF can be made from a wide variety of sustainable and scalable feedstocks and technologies. These feedstocks include oily waste and residues like animal fat and used cooking oil, lignocellulosic forestry residues, municipal solid waste, waste steel mill gases, cover crops that do not compete with food production, surplus ethanol (or other alcohols), and even captured CO_2 itself. Many of these feedstocks can also be co-processed at conventional refineries, providing an additional opportunity to scale SAF production.

Widespread deployment of SAF, in conjunction with continuing aircraft technology improvements and operational efficiencies, holds the promise of decoupling aviation emissions from global passenger growth and ultimately significantly reducing global aviation emissions. However, significant policy support will be needed in order to incentivize production and feedstock development.

SAF is a Viable Solution to Decarbonize Aviation

SAF must be a substantial pillar in aviation decarbonization and can do so with technologies that are already commercialized or on the cusp of commercialization. United Airlines, Lufthansa, KLM, Gulfstream, Airbus and others are using SAF in regular operations today. Additional domestic capacity beyond World Energy's Paramount, California, facility is coming online soon, with Fulcrum Bioenergy and Red Rock Biofuels currently constructing facilities in Nevada and Oregon, respectively. And Neste is making commercial quantities of SAF in Europe and will do so in the U.S. this year with our partner, Texmark. Lanzatech, Velocys, Gevo, and World Energy have all announced intentions to expand commercial capacity in the next few years.

SAF is technically proven, safe, and sustainable, but volumes are currently limited and the pace of commercialization, although increasing, is insufficient to put the industry on a glidepath to achieving the scale needed to meet targets to decarbonize aviation. But substantial scale-up is feasible with policy support. Work conducted for the FAA's ASCENT Center of Excellence found that 100% replacement of global jet fuel use with SAF by 2050 is technically feasible but would require significant incentives for bioenergy and waste feedstocks and policy prioritization for aviation.[11] A follow-on study specific to the U.S. found that up to 38% of U.S. jet fuel demand in 2050 could be satisfied by SAF from wastes and residues alone.[12] Another analysis led by NREL found that 6 billion gallons of SAF production is possible in 2030 with aggressive policy incentives.[13]

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[8] *See* Airport Cooperative Research Program, *Alternative Jet Fuels Emissions: Quantification Methods Creation and Validation Report*, available at http://www.trb.org/Publications/Blurbs/179509.aspx

[9] https://www.neste.com/releases-and-news/sustainability/neste-my-renewable-jet-fuel-wins-award-reduction-black-carbon-emissions

[10] *See* Patrick Leclerq and Bruce Anderson, E*CLIF - Emission and Climate Impact of Alternative Fuels and ND-MAX – NASA/DLR Multi-Disciplinary Experiment,* Presentation at CAAFI Biennial meeting, December 6, 2018, available at http://www.caafi.org/resources/pdf/3.2_SAJF_Benefits.pdf

[11] *See* Staples, M. D. *et al*., *Aviation CO_2 Emissions Reductions From the Use of Alternative Jet Fuels*," Energy Policy (2018), available at https://www.sciencedirect.com/science/article/pii/S0301421517308224

[12] *See* Mark Staples, *Long term CO2 Emissions Reduction Potential of Aviation Biofuels in the U.S,* presentation at CAAFI Biennial General Meeting, December 5, 2018, available at http://www.caafi.org/resources/pdf/2.3_Future_Production.pdf

[13] *See* Newes, E., J. Han, and S. Peterson, *Potential Avenues for Significant Biofuels Penetration in the U.S. Aviation Market*; National Renewable Energy Laboratory (2017), available at http://www.nrel.gov/docs/fy17osti/67482.pdf

Landscape for SAF

What can the federal government do to help scale the SAF industry? It is important to acknowledge the important work that has already been done. The SAF industry would not be commercialized today without the federal research and development policies that have been critical to deployment, particularly with regard to supply chain development, testing, and technical approvals of SAF. In particular the FAA Center of Excellence for Alternative Jet Fuels and the Environment (ASCENT), the Continuous Lower Energy, Emissions & Noise (CLEEN) program, and the Commercial Aviation Alternative Fuels Initiative (CAAFI) have been instrumental in developing the SAF industry. These activities should continue as further development and analysis of new feedstocks, technologies, and supply chains will be needed to continue to scale the industry.

But we must not rely only on R&D and "someday" solutions, whether they be aviation electrification or future SAF feedstocks and technologies. As noted above, a suite of scalable feedstocks and technologies can begin to be scaled today, provided there is a supportive, long-term policy framework that incentivizes investment and deployment. That framework can, in turn, facilitate continued improvement and commercialization of future technologies. We cannot wait and must begin to reduce emissions and scale the industry today.

Unfortunately, the existing policy landscape does not adequately incentivize SAF deployment. In fact, there are both structural and policy disincentives to the production of SAF versus on-road renewable fuels. Policies like the Renewable Fuel Standard (RFS) were designed for ground transportation fuels, and while SAF qualifies under many of these policies, SAF generally generates fewer credits. For example, under the RFS, SAF receives 1.6 RINs per gallon while similar renewable diesel receives 1.7. And while states like California and Oregon have also sought to allow SAF to participate on an opt-in, credit-generating basis in low carbon fuel standards, SAF also generates fewer credits under these programs. Diesel historically commands a higher spot price than jet, further disincentivizing jet replacements as compared to diesel replacements. In sum, the significant opportunity costs for renewable fuel producers to produce SAF versus similar ground transportation fuel applications has been a headwind for the SAF industry.

Because of these significant structural and policy disincentives surrounding the production of SAF, the industry is unlikely to sufficiently scale and reach its full potential absent policy and price parity with ground transportation fuels. Given aviation's dearth of other options to decarbonize, the relative immaturity of the SAF industry, and the need to rapidly scale production, there is a compelling policy justification for additional, SAF-specific policies. Congress is uniquely positioned to develop these policies given its primacy over aviation.

Policy Suggestions

Although an economy-wide price on carbon would be helpful, this alone will not be sufficient to decarbonize transport, much less aviation. Continued policy support for low carbon liquid fuels will be required throughout the transportation sector and targeted, sector-specific policies will also be needed, particularly in aviation where there are many win-win opportunities to incentivize SAF and enable rapid scale-up.

Understanding the need for increased low-carbon fuels for all hard to decarbonize sectors generally, policymakers should consider a long-term extension of the Renewable Fuel Standard (or a similar successor policy) for twenty years or more. Such longer-term stability will send an investment signal that closely tracks the need for continued decarbonization in line with IPCC targets. Such a policy should focus on emissions reductions rather than volumes and should incentivize maximum GHG reductions. Today, the RFS does not incentivize reductions beyond those necessary to meet minimum lifecycle GHG reduction thresholds. Congress should also eliminate barriers to the use of sustainable feedstocks and develop common definitions for sustainable feedstock across federal programs. Finally, a carbon-reducing fuels policy should be feedstock-neutral and performance-based. Although there is great potential for cellulosic fuels, there are many other feedstocks, some not even biogenic in origin (e.g. waste industrial gases and captured CO_2), that can deliver substantial volumes of low carbon or even carbon-negative fuels. In sum, Congress should consider performance-based policies similar to state low carbon fuels standards and allow the market to determine the most efficient way to achieve reductions.

For SAF, one compelling sector-specific option is tax policy. The ethanol and biodiesel industries were successfully supported by now-lapsed production and blending tax credits.[14] The nascent SAF industry is precisely situated to similarly benefit from a long-term or permanent blender's or investment tax credit which could attract significant investment to the sector, provided the investment signal extends far enough into the future. Another tax policy option to consider is an exemption for SAF from jet fuel excise taxes.[15] Although an excise tax exemption alone would not be sufficient to spur significant investment, it could help close the above-mentioned incentive gap with fuels for the ground transportation sector.[16]

Beyond tax policy, there are numerous other policies that can be enhanced to help scale the SAF industry. A **RIN multiplier under the RFS of 1.5 - 2.5x for credits generated from SAF** could significantly increase the pace of SAF commercialization. Indeed, there is precedent under the RFS for such an approach, as Congress directed EPA to give cellulosic ethanol a 2.5x RIN multiplier under the RFS I program. In Europe, SAF is currently eligible for a 1.2x multiplier under the EU Renewable Energy Directive (RED II), although this is widely considered to be insufficient to support SAF growth and the International Air Transportation Association (IATA) and other stakeholders advocated for a 2x multiplier.[17] Maximizing SAF volumes under the RFS through a multiplier would have co-benefits from alleviating blend-wall issues associated with ethanol and reducing conventional pollutants. Finally, Congress could incentivize SAF by monetizing the substantial air quality benefits of SAF, potentially through eligibility for the FAA's Voluntary Airport Low Emissions (VALE) program grants, which are currently geared towards equipment and not fuels. There are many other policy options to consider, and it is important to begin a robust discussion of the most efficient way to scale the SAF industry.

Policies Supporting Medium-Duty and Heavy-Duty Transport

For medium- and heavy-duty transport, beyond general policies to increase volumes of low carbon transportation fuels discussed above, Congress should ensure that vehicle and fuel regulations are considered holistically. There are considerable opportunities for renewable diesel to deliver GHG and conventional emissions benefits cost-effectively in the legacy fleet, and Congress should consider including fuel switching as an option in programs like the Diesel Emission Reduction Act (DERA), which like VALE for airports, currently does not include drop-in fuels and only funds

[14] The biodiesel tax credit, active from 2005 through 2017, gave tax credits of $1/gal for blending of pure biodiesel or renewable diesel into diesel. Similarly, the Volumetric Ethanol Excise Tax Credit (VEETC), active from 2004 to 2011, gave tax credits of $0.45/gal for blending ethanol in gasoline.

[15] 26 U.S.C. § 4081(a)(2)(C) provides for an excise tax on jet fuel of 4.3 cents per gallon for commercial aviation and 21.8 cents/gallon for other aviation uses.

[16] Exemption of SAF from excise tax would have a negligible impact on the Airport and Airway Trust Fund, as less than 5% of proceeds currently come from jet fuel excise taxes.

[17] *See* https://www.iata.org/whatwedo/environment/Documents/SAF-note-to-press.pdf

equipment upgrades and replacement. In addition, as next generation GHG standards are developed for medium- and heavy-duty vehicles, policymakers should examine the ability of highly-efficient diesel engines to deliver GHG reductions in conjunction with renewable diesel and biodiesel, as recommended by a recent National Academies of Sciences report.[18]

Maritime

For maritime, which like aviation cannot electrify long distance use cases, low carbon liquid fuels will need to be a key part of the portfolio. Currently, renewable fuels used in ocean-going vessels are ineligible under the RFS program. Congress should ensure that future low carbon fuels policies include eligibility for maritime uses, which would have substantial conventional emission co-benefits near ports as well.

Conclusion

While heavy-duty, aviation, and maritime are more difficult to decarbonize than light-duty transport in that they cannot easily electrify, there are in fact significant opportunities to decarbonize these sectors without the need for additional infrastructure or new equipment. A low carbon fuels-centered approach for these sectors offers significant advantages, and the needed technologies and feedstocks are available. With appropriate policy support, these sectors can meet science-based decarbonization goals.

Thank you again for the opportunity to testify. I look forward to your questions

Sincerely

Jeremy Baines
President, Neste US, Inc.

[18] *See* National Academies of Sciences, Engineering, and Medicine, *Reducing the Fuel Consumption and Greenhouse Gas Emissions of Medium- and Heavy-Duty Vehicles, Phase Two: Final Report* (2019), available at https://doi.org/10.17226/25542