

Federal Advisory Committee Act  
Clean Air Act Advisory Committee

## Mobile Sources Technical Review Subcommittee

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Virtual Meeting  
June 15, 2021

### Welcome & Opening Remarks

Due to health and safety concerns regarding the coronavirus, this Mobile Sources Technical Review Subcommittee (MSTRS) meeting was held remotely via Microsoft Teams. The Designated Federal Official (DFO) opened the meeting at 10:30 am. The DFO thanked everyone for their attendance and acknowledged two members of the Clean Air Act Advisory Committee (CAAAC) who were in attendance. The DFO noted that the meeting is open to the public and that there would be time later in the day for public comment. Previous meeting minutes as well as materials associated with this virtual meeting, including a summary of this meeting will be available online on the EPA's MSTRS website (<https://www.epa.gov/caaac/mobile-sources-technical-review-subcommittee-mstrs-caaac>). The DFO welcomed members of the press and invited them to introduce themselves; a reporter from *Politico* did so. The DFO then summarized the meeting agenda, which is provided in Table 1.

**Table 1. MSTRS Virtual Meeting Agenda**

10:30 - 10:45 am	Welcome and DFO Opening Remarks
10:45 - 11:15 am	Remarks from OAR Leadership
11:15 - 11:35 am	Ports Initiative Update
11:35 am - 12:00 pm	Remarks and Future Mobility Report Introduction by Chair
12:00 - 1:00 pm	Lunch Break
1:00 - 1:30 pm	Vehicle Technology Chapter Presentation with Q&A
1:30 - 2:00 pm	Fuels Chapter Presentation with Q&A
2:00 - 2:30 pm	Personal Mobility Chapter Presentation with Q&A
2:30 - 3:00 pm	Goods Movement Chapter Presentation with Q&A
3:00 - 3:15 pm	Break
3:15 - 3:35 pm	Remarks from OTAQ Office Director with Q&A
3:35 - 3:45 pm	Public Comment
3:45 - 4:15 pm	Future Mobility Report Themes Discussion and Next Steps
4:15 - 4:30 pm	Final Remarks and Close Out

A list of meeting attendees is provided in the Appendix. Presentations are posted online at the MSTRS website: <https://www.epa.gov/caaac/mobile-sources-technical-review-subcommittee-mstrs-caaac>.

## **Remarks from OAR Leadership**

The EPA Acting Assistant Administrator (AA) and Principal Deputy Assistant Administrator (DAA) for the Office of Air and Radiation (OAR) began by thanking the attendees and explaining that he would discuss the Biden Administration's priorities. He emphasized that the EPA is extremely committed to these priorities and goals. He noted that the members of MSTRS have been very dedicated and insightful, and the subcommittee's advice and contributions to the MOVES model as well as issues such as ports and SmartWay have been helpful in delivering benefits in both the near and long term.

The AA described the Executive Orders signed by President Biden after his inauguration; he specifically emphasized E.O. 13990, which directed the EPA to focus on public health, climate change, and environmental justice (EJ), which he described as a historic commitment. He noted that E.O. 13990 also directed the EPA to review the actions taken under the previous administration and to consider recent proposals related to big issues like transportation. The AA stated that the EPA is taking this directive seriously and making efforts to adhere to the Biden Administration's vision, which elevates EJ alongside clean air and climate change. He added that the Administration has called for a "whole government approach" on climate change and EJ, meaning that the EPA's work is being complemented by other federal agencies.

The AA explained that the Administration has set a goal of a 50-52% reduction in greenhouse gas (GHG) emissions from the US by 2030 compared to 2005 levels. He noted that reductions from the transportation sector will be instrumental to achieving this goal, as it continues to be the largest GHG emissions source, even larger than the power sector. He stated that transportation has been undergoing a dramatic transformation and bringing improved technology to consumers will require smart policies.

The AA concluded his remarks by reminding the attendees that the EPA is considering all the tools at its disposal to transition the US to a clean, low carbon future. He then introduced the Deputy Assistant Administrator (DAA) for Mobile Sources at EPA.

The DAA provided an update on the EPA's work on emissions from mobile sources. She stated that E.O. 13990 provided strict instructions to reduce emissions from passenger cars and trucks. These make up 28% of US emissions and 60% of transportation emissions. EPA is taking comment on rescinding the 2019 SAFE rule which would effectively restore California's and section 177 State's rights to implement their more stringent GHG emissions standards. EPA held a public hearing on June 2, and the comment period is open until July 6th.

The DAA added that there is also a need for continued emissions reductions from the light duty (LD) fleet beyond 2026, and they are invested in future actions that are likely to affect 2026

model vehicles. EPA is working on a separate action to reconsider the previous administration's final rule titled the SAFE-2 Standards for Model Years 2021-2026. EPA plans to propose this rule in July.

On the heavy duty (HD) front, emission reductions are also needed, especially because they can have a direct impact on certain communities, including communities of color. EPA leadership are still working with their transportation team to formulate a plan to address emissions from HD trucks and buses. She specified that the EPA has clear regulatory authority to create standards to ensure that technologies addressing GHG and criteria pollutants can be phased in. She expects that the EPA will share more information on this topic in the future.

The DAA then identified the Renewable Fuels Standard (RFS) as another regulatory priority for the Air Office. She noted that the has played a central role over the past decade in driving the development and use of cleaner biofuels, and that this will continue under the Biden Administration. She acknowledged that there are many opinions regarding the RFS program and stated that the agency remains actively engaged in this arena and takes its responsibility to implement this program very seriously. She assured the attendees that they are determined to pursue this program in a way that both follows the law and ensures transparency.

On the topic of voluntary programs, the DAA noted that they are primarily working on reducing emissions from diesel engines heavy-duty trucks. She noted that the Diesel Emissions Reduction Act (DERA) continues to be a big priority, and it is one of the most powerful tools for addressing these emissions. She explained that the DERA program provides funding to states, local governments, and tribes to replace outdated, highly polluting diesel vehicles and engines with equipment that meets the EPA's current emission standards. The DERA program is also increasingly providing funding for projects that promote electrification. She added that the 2021 request for applications is currently open, and they plan to award approximately \$5 million to eligible projects. Additionally, for the first time, the EPA will not require tribal and insular area applicants to provide matching funds to be eligible, which they expect will expand opportunities for grants to more people. Applications are due July 9, and awards will be announced this winter.

The DAA then mentioned the Ports Initiative and its work towards reducing emissions in hubs of commerce and transportation. She observed that while these areas are essential to economic prosperity, they also host high concentrations of diesel equipment, including ships, trucks, rail, and non-road machinery. Furthermore, these areas are also frequently located in close proximity to low-income communities and communities of color. The DAA explained that EPA first worked through the DERA program to reduce emissions; in Fiscal Year (FY) 2020, the EPA awarded \$60 million to ports projects, and the agency prioritizes projects in ports or goods movement facilities as well as projects in communities where poor air quality and EJ are concerns. The DAA expressed her gratitude for the recommendations they have received from the MSTRS Ports Initiative Workgroup in 2016 and noted that her team has found their input and feedback to be very valuable. She added that the Ports Initiative will continue to provide tools to help ports identify, prioritize, and implement emissions reductions measur, and that the Ports Initiative Lead from OTAQ would be presenting to the subcommittee later in the day.

Lastly, he DAA mentioned that the EPA's SmartWay program continues to support the cleaner goods movement, with over 3,700 companies participating in the program. She explained that program partners commit to reporting emissions from freight and transport, and they can use the SmartWay resources and tools to learn about, and adopt strategies and technologies, that promote cleaner, more efficient goods movement. She added that SmartWay collaborates with other stakeholders like waterway and railroad associations to support multimodal freight operations as alternatives that can further reduce emissions. This is the 20<sup>th</sup> year of the SmartWay program, and over the years, its partners have reduced air pollutants by over 150 million tons. She added that the program continues to evolve and add new components, such as by providing training and developing new tools that partners can use to quantify emissions from more types of freight such as cargo ships. She then invited attendees to ask questions.

### *Comments and Discussion*

MSTRS member asked for more information about the plan to develop post-2026 light-duty emission standards. The DAA responded that that is a priority for their office, and they are thinking about it and working on a strategy. She added that while they do not have a timeline they can share right now, they hope to do so in the next few months.

MSTRS member advocated for the importance of the heavy-duty low NOx rule, which he described as a big win under the Trump Administration. He also encouraged the EPA to work on the Clean Trucks Initiative, especially as part of the push for EJ. The DAA thanked him, noted that there was no language in E.O. 13990 related to heavy-duty trucks, but agreed that it is a high priority for EPA's Air Office.

CAAAC member explained that he works in Texas on an emissions reduction program, and although they are working on electrification, many legislators are asking for studies that show ozone reduction projections for different scenarios. CAAAC member asked whether the EPA has studies like that or if there is research currently being conducted that would be relevant. The AA responded that they would do their homework on this issue and get back to him. The DFO requested that the CAAAC member email her with that question so she could follow up with the appropriate people.

MSTRS member noted that his home state of Nevada was the latest of a dozen states that have agreed to adopt California's clean car standards. He asked whether the EPA is concerned that more states seem to be taking this route in lieu of federal standards. The AA answered that if you think about the history of federal regulations of tailpipe emissions, the EPA has often worked with and benefitted from state leadership, and this is another example. He explained that going back to the earliest years of the Clean Air Act (CAA), the process of setting national emissions standards was built around the expectation that states like California would play a leadership role, and other states would join and reinforce that role, thus informing the federal government on how it should approach regulatory decisions.

CAAAC member reiterated MSTRS member's comment on the importance and urgency of the heavy-duty truck rule and asked why it was not listed in the spring regulatory agenda. The AA explained that paradoxically, its exclusion is an indicator of its importance. He stated that forming and implementing this initiative is a high priority for the Administrator, and he is working with OAR to develop a strategy for the heavy-duty sector. He also stated that the EPA will present this strategy in the not-too-distant future. The AA emphasized that it is hard to overstate how clearly the EPA has received this message from stakeholders, and they want to do justice to it by creating a well-considered strategy.

MSTRS member added that the lead time on heavy-duty is important, so setting a schedule for the rulemaking should be a priority. He observed that it sounded to him like the EPA is trying to determine how to approach the next generation of emission standards. He asked whether they think they will be able to meet the 2027 target, since many people see that as a natural next step for when the next generation standards should take effect, rather than turning it into a longer-term process. Mr. Goffman replied that this is definitely not the case, and although they are still working on it, people should not assume that they are planning to take more time, as they want to deliver benefits as soon as possible.

MSTRS member asked two questions related to light-duty electrification: first, could they speak to coordination at the higher level of the Administration, since there seem to be efforts to further electrification by multiple agencies; and second, how is EPA thinking about its role to expand market adoption of electric vehicles (EVs) moving forward? The DAA responded that this coordination is happening, and the EPA is having many conversations about investigating all the tools available to them.

## **Ports Initiative Update Presentation**

the DFO introduced OTAQ's Ports Initiative Lead to give an update on the Ports Initiative. The Ports Initiative Lead explained that the Ports Initiative is a partnership program seeking to address the concentration of diesel equipment at ports and rail yards that are often operating in close proximity to where people live and play. She stated that one of the main reasons for why this program exists is concern about environmental justice in nearby communities, which tend to be lower income and largely nonwhite, as well as the fact that ports can be a significant source of local emissions. In 2014, one of the ways in which the EPA sought input from stakeholders was to form a MSTRS workgroup that included representatives from many different stakeholder groups. She noted that the recommendations created by that group in 2016 continue to inform the work that the Ports Initiative does today.

The Ports Initiative Lead then described the five programmatic elements of the Ports Initiative, which mirror the five focal areas listed in the recommendations. These were: (1) helping ports capitalize on funding for clean technologies, (2) providing technical resources, (3) promoting community-port collaboration for effective planning, (4) increasing efficiency through federal government coordination, and (5) creating a communications and knowledge clearinghouse. The Ports Initiative Lead explained that the tools and activities they develop are created with the goal

of accelerating the adoption of cleaner technologies and strategies at ports as well as planning practices that support stakeholders in making informed decisions. The Ports Initiative Lead emphasized that they deliver this program through partnerships, both internally and externally.

The Ports Initiative Lead discussed new developments in the Ports Initiative. They are coordinating with federal partners, such as the Department of Transportation (DOT), to identify opportunities to support emissions reduction projects as part of major federal infrastructure investments. EPA also supports port stakeholders directly to meet these new DOT criteria. The Ports Initiative Lead described the technical resources the EPA has developed. The Ports Initiative Lead also discussed the materials that have been developed by the Ports Initiative for promoting port-community communication and engagement and noted that the Ports Initiative released an in-depth case study of the Ports of Los Angeles and Long Beach in April 2021. She then invited attendees to ask questions.

### *Comments and Discussion*

MSTRS member asked about the size of the small grants program. The Ports Initiative Lead explained that it has two components: small grants and a larger collaborative problem-solving component. In the past, these small grants were around \$30,000 each, and about \$1 million was awarded in total each year. However, this year grants were increased to \$75,000 each, and around \$7 million was budgeted for the program. EPA has committed to try and fund at least 6 projects addressing diesel emissions at ports and rail yards, and should be making announcements in early fall.

MSTRS Chair reminded attendees that the Ports Initiative dates back many years and serves as a model for how MSTRS members can collaborate with EPA's Office of Transportation and Air Quality (OTAQ) to explore emerging and cross-cutting issues as well as think outside the box about how to address site- and community-specific emissions and impacts and come up with a menu of options that can be implemented across a range of scenarios. MSTRS Chair described the Ports Initiative as having on-the-ground benefits for communities near ports. He encouraged MSTRS members to see this as a way to take their work on future mobility and see how it plays out over time as the work deepens and the recommendations are developed and implemented. MSTRS Chair thanked everyone for their work not just on the future mobility report, but also the work that was done in the past and will be done in the future.

MSTRS member noted that the Ports Initiative creates lots of tools for evaluating options at ports, and now there is a shift at the federal level towards focusing on rail and locomotive issues. He asked if there are new initiatives being developed on that front, as he has seen in the past that pollution standards on locomotives may first be applied to long-haul engines, but the older ones go to the ports, and those are dirtier. He asked whether something has come out of this initiative that has spurred a different approach or reconsideration or focus on locomotive pollution. The Ports Initiative Lead noted that part of the focus on rail facilities comes from the fact that they are largely similar regardless of their location, and for some central and regional offices, rail is

more dominant than ports. She added that what they see on the ground is that there are similar needs at ports and rail facilities, and they are working to let folks know that there are solutions.

CAAAC member asked about bonnet technology for ships. He explained that he toured the ports of both Long Beach and Los Angeles, and they both use bonnet technology to capture emissions from large container ships in lieu of electrification. They were looking at trying to do the same for large crude and chemical carriers down at the port of Houston, but the emissions profiles are different, and they have not seen any studies that show that the technology works. He asked if the EPA knows about any other ports that are doing this with crude carriers. The Ports Initiative Lead said she has not heard of the use of bonnet technologies outside of Southern California ports. Mr. Karl Simon (EPA) offered that he can talk to staff to see if they have heard anything, but he has not seen anything about this personally. MSTRS member added that the California Air Resources Board (CARB) recently awarded the South Coast a grant to look at this so South Coast is going to be entering into a demonstration project and could share more information about this in the future. Assessments and Standards Division Director (OTAQ) contributed that the bonnet technologies used by LA and Long Beach are for the emissions from their engines. He did not think that a large crude carrier would have a significantly different emission profile from a large container ship since they are both big, slow propulsion engines but use auxiliary generator sets when they are actually in port and capturing those emissions ought to not be too different from the diesel engines. CAAAC member stated that he thinks crude carriers have boilers to heat and pressurize the oil, which might cause a different emission profile.

MSTRS member asked to what extent DERA projects are being prioritized for retrofits of locomotives. He noted that there were some demonstrations back in the early DERA days of retrofitting Tier 2 and older locomotives, and he was wondering if some of that work was continuing. The Ports Initiative Lead responded that they remain eligible, but she has not heard much about locomotive retrofits taking place recently. OTAQ's Transportation and Climate Division Director added that he has seen some applications trickle in, mostly for replacements. In terms of their priorities, he said that they have "a lot of favorite children" in the DERA program.

## **Remarks and Future Mobility Report Introduction**

MSTRS Chair began his remarks by thanking the attendees and expressing his hope that these meetings will resume in person eventually. Reviewing the progress of developing this report so far, he noted that they started out before the pandemic with the idea that the MSTRS ought to channel its members' significant expertise into considering certain challenging issues like fuels, vehicle technology, goods movement, and personal mobility, and that doing so would provide a real service to OTAQ as it explores its own work in the area over the coming years and decades. When they started this work, the EPA told each of the subgroups to consider how the EPA can pursue climate goals using these avenues, and in the eighteen months since then, they have had more virtual meetings, calls, emails, and chats than anyone could count. MSTRS Chair expressed his admiration for how much the members have stepped up and contributed to the multiple drafts

that they have produced for each section of the report, on top of their regular day jobs. He also acknowledged the OTAQ staff time that has gone into this project.

MSTRS Chair noted that the discussion of the report would begin after lunch, and the document will be finalized by the fall meeting. He emphasized that it will help guide, assist, educate, enrich, and enlarge OTAQ's work in the four subject areas for years to come. He thanked the EPA leadership, as well as the monitors, scribes, and MSTRS members. He then described the process for the afternoon, consisting of presentations and Q&A for each of the four sections. He explained that as he reviewed the report drafts and PowerPoints, he noticed many common themes, which he will discuss at greater length after each of the four groups have presented, along with his real time observations from the presentations. He added that following this MSTRS meeting, each group will have approximately 10 days to integrate the comments from discussion (with a deadline of June 25) to wrap things up in advance of summer vacations. Then, the MSTRS Chair will put together the executive summary, with the goal of having a final document for members to review by the end of the summer. Following that review, the report will be submitted to the Clean Air Act Advisory Committee (CAAAC), and then transmitted to the EPA.

MSTRS member asked whether, given the overlap in certain ideas between the different groups, MSTRS Chair wanted to integrate the common themes into a single report rather than keeping them in separate sections. MSTRS Chair responded that each group has worked hard to present their thoughts how they deemed appropriate, so he will not alter that, especially given how long that would take. The sections will stand alone as chapters of the report, and the executive summary will tie it all together and help the reader see the connections.

DFO then announced the beginning of the lunch break and reminded members to reconvene in an hour for the afternoon presentations.

## **Vehicle Technology Chapter Presentation**

DFO welcomed everyone back and introduced two MSTRS members to present on behalf of the Vehicle Technology Workgroup.

The scenario this group was asked to consider was a world in which the majority of new vehicle sales are zero-tailpipe emission technologies.

As the fleet electrifies, emissions will greatly diminish. As a result, the regulatory focus should then shift away from primary tailpipe emissions and towards stationary sources and upstream emissions such as battery mining. Regulators will need to recognize the importance of mitigating these emissions where they are generated. The agency may wish to consider reforms in areas beyond emissions certification and compliance such as the validation of environmentally sound supply chains.



Agencies should consider reimagining the structure of fleet average emissions requirements. Data should be gathered, and cost-benefit analyses conducted to ensure that the EPA focuses on areas that provide the greatest benefits to the public.

The workgroup recommends evaluating where there is a need for electric vehicle efficiency standards and which agencies are best suited to address this issue. Higher efficiency would put downward pressure on grid demands, reducing the need for new generation; but as the grid transitions to increased renewables, this benefit would be more monetary than environmental.

At a high level, the group found that fleets and ride hailing services have the potential to accelerate adoption of electrification and deliver the environmental benefits provided by electrification.

The group identified the equity issues associated with clean transportation. Equity means that clean transportation is provided to everyone. It is critical that that underserved communities also reap the benefits of future requirements. This also includes consideration of stationary sources.

The original charge to this group was to look at a world where EVs constitute the majority of new vehicle sales; however, members felt strongly that while that was important, it was also important to consider the pathway between then and now, since the agency has a huge role to play during that time period as well.

Analyses, especially life cycle assessments (LCA) will be increasingly important to get the full picture of the environmental impact of mobility, including not only in-use emissions but also stationary sources, upstream emissions from fuels, and materials-based impacts. There was a robust discussion on the pros and cons of pursuing additional nearer-term improvements that could deliver environmental gains at higher marginal costs, versus putting investments toward electrification. Those technologies offer potential benefits but there are associated opportunity costs for manufacturers with finite resources.

Consumer adoption will also play a big role in the transition to EVs. The EPA should continue being a leading expert in consumer adoption and leverage its influence on consumer adoption of ZEVs. The group recommends that the EPA consider establishing a national Low Carbon Fuel Standards to support ZEV uptake and decarbonization of the transportation sector.

The group noted that public education is critical, and providing factual, unbiased information to businesses, schools, and policymakers is an appropriate role for the agency. Community challenges can be unique and case-specific, and the EPA should work with constituents and community leaders to better understand and address local needs.

It is very important during the transition phase to continue to drive neutral and low carbon fuels, mainly because it takes about fifteen years to turn over the whole fleet. For example, establishing a low carbon fuel standard could be designed to decarbonize liquid fuels, and alternative fuel options could also include some kind of carbon pricing scheme. Whatever fuel is used, there

needs to be adequate infrastructure available for broader consumer adoption. LCA would be a good tool to monitor progress. Policies that support the vehicle-grid integration are also needed.

About 21% of the transportation GHG emissions and half of NOx emissions come from MD and HD vehicles. These vehicles operate near ports, warehouses, and freight areas, which are often located near underserved communities, so this needs to be addressed. However, it is equally important to focus on the work that needs to be done by these vehicles. Areas of consideration include functional capability, infrastructure, model availability, and equity.

At the conclusion of the group's presentation, the floor was opened for Q&A.

### *Comments and Discussion*

MSTRS member noted that there seemed to be lots of discussion about the increasing role of upstream emissions. He asked whether the group discussed continuing particulate matter (PM) emissions directly from the vehicle, such as break and tire wear, and whether the EPA should play a role in that. MSTRS member responded that yes, the agency has a role to play in those kinds of topic areas, and materials-based impacts and supply chain impacts are part of that category. He added that if we are talking about rapidly turning over the vehicle fleet to electrified power trains with large battery packs, that's a nontrivial materials impact worthy of deeper consideration by the agency.

MSTRS member asked how much the group considered opportunities for incentives and regulatory support for "right sizing" of motor vehicles. He described this as complementary to efficiency standards by encouraging the growth of lower speed, lower acceleration EVs for short distance travel in cities, in contrast with industry promotion of greater acceleration, longer ranges, larger batteries, and larger vehicles that are very dangerous. MSTRS member responded that they did not cover vehicle types, although they did cover some topics related to micromobility. They largely left that to manufacturers to decide, as they felt that competition should drive manufacturers to develop certain vehicle types. MSTRS member added that they did discuss a related point, which was the concern that as pickup trucks and other larger vehicles are electrified, there are materials consequences, and potentially that is not the most efficient use of resources. However, the group did not reach consensus on this topic. Overall, the goal is to encourage EV adoption, and some regulators want to focus on big trucks because that is what consumers want, so potentially those products will be appealing despite being inefficient. MSTRS member further noted that in general, the group discussed how competitive manufacturers will want to be as efficient as possible.

MSTRS member also suggested that it would be useful to consider Europe's experience, as research suggests that government incentives for purchasing electric bikes can be vastly more cost efficient as a decarbonization strategy for certain classes of trips compared to subsidies for widespread adoption for LD EVs if they are not used frequently. Trying to take into account the different use cases is important even as we recognize that the eventual goal is to electrify everything.

MSTRS member pointed to slide 3 and asked if the presenters could clarify whether the group recommends keeping zero emission vehicles (ZEVs) in or separating them out. Ms. Williams answered that there are different options and views, and they looked at both rather than honing in on one.

OTAQ's Transportation and Climate Division Director noted that on slide 4, the Department of Energy (DOE) was mentioned as a partner. He asked whether the group looked at other areas of collaboration, agencies, or groups the EPA should be working with in this space where they are not the primary taskmaster. MSTRS member responded that they did not; in this case, the reference to DOE was an acknowledgement that they have longstanding experience with household appliance efficiency, and as the fleet progresses towards electrification with zero tailpipe emissions, "it's starting to look more like a dishwasher." As a result, there are things to learn and efficiencies to be gained by including DOE. On the other hand, the EPA has expertise with emissions, so the group was not making any judgment about who should do what; they were just recognizing that there should be increased communication. MSTRS member noted that from a consumer standpoint, the EPA should also ask if there are other ways to share data with a consumer to help them make a better choice. MSTRS member added that one area they did include in the report is collaborating with DOE's Argonne group on its GREET Life Cycle Assessment (LCA) model and updating it with the most recent data so it can be a useful tool going forward.

## **Fuels Chapter Presentation**

Before beginning his presentation, MSTRS member noted that when you hear similar things from multiple groups, that sends a message, and he expects that many of the ideas he presents will be similar to the technology group.

This subgroup was tasked with describing the EPA's role in reducing emissions from the fuel pool in a world where alternative fuels, such as electricity and hydrogen are used to meet a significant percentage of the light-duty vehicle and heavy-duty vehicle on-road fuel demand.

The group's research found that even under a high Plug-in Electric Vehicle (PEV) adoption scenario, 60% of light-duty vehicles sold in 2040 would be plug-in and that about 73% of the existing light-duty stock in 2040 would still have internal combustion engines. This means that attention to liquid fuels and combustion engine market needs to remain a high priority for the EPA.

The group proposed five over-arching recommendations of actions that the EPA should pursue, regardless of any specific policy recommendations, related to the themes of Leadership, Collaboration, Integration, Coordination, and Equity. In addition, the group identified eight specific recommendations for areas that the EPA should focus on. MSTRS member summarized these recommendations, stating that the EPA should:

- Assert its leadership position, engage with standards setting bodies, collaborate with industry on education and implementation, integrate programs in a holistic manner,

coordinate among regulatory agencies and ensure policies seek to provide all communities with access to affordable and reliable transportation;

- Base regulations on a consistent and transparent life cycle assessment (LCA) and consider fuels and vehicles as a holistic system;
- Build a database of all emissions sources to help prioritize regulatory attention and ensure regulations are proportional to contribution of emissions;
- Develop LCA-based low carbon performance standard, encourage innovation, speed introduction of lower carbon intensity (CI) fuels;
- Monitor the effects of the streamlining rule and evaluate any new changes with a cost-benefits perspective;
- Establish a performance-based strategy for non-road sources and evaluate non-tailpipe emissions, i.e., tire & brake wear;
- Continue improved efficiency of new vehicles, support retirement of the oldest vehicles, and ensure methods for assessing emissions of legacy fleet reflect modern vehicle technologies; and
- Support R&D to leverage renewable electricity and hydrogen to produce zero carbon liquid fuels that can support vehicle classes and use cases that may be extremely difficult to electrify.

At the conclusion of the presentation, the floor was opened for Q&A.

### *Comments and Discussion*

MSTRS member commented that the technology group had many similar discussions, and he was glad that the fuels group delved deeper into these topics. He observed that the group spent a lot of time on liquid fuels and asked what sorts of policy considerations the EPA should have once the fleet is majority EVs and the electrical grid is serving as a type of fuel. MSTRS member responded that they did not look at the grid since they were assigned to liquid fuels and did not want to broaden the scope that much.

MSTRS member asked about the recommendation related to LCA and whether the group focused on battery recycling and repurposing and the role of original equipment manufacturers. MSTRS member stated that they did not, but as they want the LCA to span “cradle to grave” for vehicles and energy sources, including all power chains.

MSTRS Chair asked if the group looked at high octane fuels, not just as an issue for consideration in a blended form for light-duty vehicles, but also as a fuel source for nontraditional vehicles, such as diesel engines or other on- and off-road engines. MSTRS member responded that they did not, although they touched on high octane fuels and concluded that the EPA needs to do an LCA and pointed to a related study. They also did not look at diesel engines, although they referenced some exhaustive studies that could be used.

MSTRS member asked if the group discussed carbon intensity, how it might change over time, and what that means for products. He also asked whether there is a long-term signal for a transition from one fuel to another. Mr. Eichberger answered that they did discuss this, and they

recommend that the LCA uses up to date data. He pointed to a study on the improving carbon intensity of ethanol as evidence that the EPA needs to pay attention to this on an ongoing basis.

OTAQ staff requested that MSTRS member talk more about the emission database that they propose, since the EPA has the National Emissions Inventory (NEI) database already. She asked how this other database would differ from the NEI. MSTRS member clarified that the key thing is looking at the whole landscape, even beyond transportation. For example, is transportation going to be asked to carry the burden to offset emissions from wildfires? He pointed towards the challenge of quantifying where emissions come from and what has the biggest negative impact, then deciding how our mitigation strategies can be as targeted as possible. He noted that he was not sure if the NEI database is as comprehensive as what their group is envisioning; they want it to have the capacity to help the EPA identified the biggest threats in order to focus its attention on those areas. MSTRS member continued that addressing transportation emissions is easy, but the EPA should be careful to control just those emissions that cars are responsible for, and not make transportation carry the load for other sectors.

MSTRS member stated that he was struck by the idea of integrated standards. He noted the EPA already tried integrating vehicle and fuel standards with flex-fuel vehicles and it went very poorly. He asked whether the group wrestled with why things would go differently this time, as well as which regulated entities would be involved. MSTRS member explained that they were picturing eliminating the silos. As an example, the CAFE standard was designed to reduce GHG emissions, but vehicles can only accomplish so much without taking fuels into consideration. In broader terms, if you have an RFS that includes a GHG reduction threshold, and you also have a GHG threshold for fuels, there is not any communication between those, and vehicles cannot benefit from using lower carbon fuels. Thus, the group focused on how to coordinate between multiple programs. MSTRS member responded that there are still no simultaneous benefits from that example. MSTRS member clarified that if the goal is carbon reduction via an efficiency standard and someone uses a low carbon intensity fuel, it's important to see if they're using the same metrics and being unified. MSTRS member contributed that the goal is to create an environment where the market is getting signals based on reducing CO<sub>2</sub> per mile across both the vehicle and fuel system in an integrated way. While there have been less successful attempts to do that in the past, the group is trying to focus on the science and bring all parts of the puzzle together to drive the best result. He pointed out that policies have been implemented in the past for reasons other than sound science, but that is not what the group is recommending. MSTRS member Eichberger added that they are not giving the EPA a specific checklist for what to do, but instead saying that the agency should generally work on this issue.

## **Personal Mobility Chapter Presentation**

The scenario examined by the Personal Mobility Workgroup was: In a world where the majority of people in the US get from point A to point B using a transport mode other than a personally owned vehicle, describe the EPA's work and role in reducing transportation emissions while maintaining mobility and accessibility.

The group considered all forms of shared mobility, active transport, and micromobility. The group aimed to identify options to reduce tailpipe and lifecycle emissions through innovative personal mobility options; integrate environmental justice (EJ) principles to reduce disproportionate health impacts while increasing social equity, affordability, accessibility, and mobility to create economic opportunity; and create an efficient transportation system integrating safety and health concerns while reducing risks to all people. MSTRS member discussed issues that the group wrestled with.

This workgroup recommended that EPA should:

- Prioritize social equity and mobility justice across personal mobility strategies moving forward in all agency actions;
- Engage with federal and state partnerships and cross-agency task forces to ensure emission reductions, environmental justice, and other agency values are represented in the work, especially related to standard setting;
- Continue vital work supporting tailpipe emission regulations within Clean Air Act's mobile source emission control framework, while also considering new regulatory processes;
- Continue collecting best data available to estimate on-road vehicle populations and technologies and non-road equipment;
- Encourage robust bus and rail public transit services (including microtransit, first and last mile connections, mobility wallets, Mobility on Demand, and Mobility as a Service);
- Encourage compact development patterns and policies favoring low-carbon motorized and non-motorized modes (bikes/ scooters) and support related research/metrics/scenario work;
- Adapt something like CARB's Clean Miles Standard (CA SB 1014 ) to promote multi-modal transport, electrification, higher motor vehicle occupancy, reduce deadheading, and shift to active transport modes, with credits, incentives, and new metrics;
- Reinvent and update past work promoting sustainable communities and smart growth, building partnerships;
- Work with DOT and HUD to provide incentives for EVs and shared EV services to improve access for underserved communities;
- Shape rules so autonomous vehicles (AVs) are electric, programmed to comply with state and local traffic laws, and operated to minimize adverse impacts on health and environment;
- Support access by relevant stakeholders to vehicle telematics data to support new methods of emission reductions and promote public health, social equity, and mobility justice goals;
- Continue to improve MOVES model to account for ultra-fine particles and secondary organic aerosol precursors, brake and tire wear, etc.;
- Foster widespread measurement and reporting on community and personal exposure to pollutants, with timely action to reduce near-roadway health and disparate impacts; and
- Work with NHTSA to advance vehicle traffic safety technologies (e.g., automated braking, ped/cyclist recognition systems, intelligent speed assistance) to reduce emissions and boost safety of zero-carbon or low-carbon active transport modes.

At the conclusion of the presentation, the floor was opened for Q&A.

### *Comments and Discussion*

MSTRS member observed that many of the issues discussed in the presentation seem to fall outside the mainstream of traditional EPA activity. He asked whether the recommendations are extensions of the EPA's role as a regulatory agency focused on environmental protection; if they would require redefinition of the EPA's mission; if they have always been a part of the EPA's responsibilities; or if they did not belong to the EPA at all. MSTRS member responded that they definitely fell within the agency's existing authority and noted that the EPA has been active in these areas in previous administrations. There are some new and emerging technologies that were not around when the EPA was formed, but the CAA is quite broad in giving the agency authority to adopt standards and promote regulations and incentives to help various stakeholders responsible for meeting the NAAQS. MSTRS member added that there may be opportunities in the future for the EPA's authority to be extended and clarified through legislation, but the recommendations in question are within its existing authority and are consistent with the values articulated by the current administration.

Since there were no other questions, MSTRS member offered to elaborate more on his discussion of agency collaboration. He explained that the National Highway Traffic Safety Administration (NHTSA) is responsible for vehicle safety standards. These standards also have a significant potential impact on motor vehicle fuel economy and emissions. About two years ago, the European Commission adopted a new legal requirement that vehicles sold in the EU after 2022 must have 15 specific traffic safety technologies, including automated braking, pedestrian/cyclist recognition systems, and intelligent speed assistance. Research from the EU has shown that adoption of these technologies could lead to 10% or more reductions in GHG emissions due to changes in driver behavior that lead to less aggressive driving, reduced crashes, and greater safety for pedestrians and cyclists. He pointed out that this is one way in which the EPA could work with partner agencies to gain public health benefits to meet its CAA mandates in a way that also enhances public safety, health, and welfare. There has been a slow pace of adoption of these technologies in the US, making it a major opportunity for the EPA to work quickly with NHTSA and DOT to promulgate regulations.

MSTRS member asked whether MSTRS member was advocating for some type of credit for products that contain a technology that would improve traffic flow. MSTRS member replied that, on the contrary, he was talking about mandatory standards for all motor vehicles like the EU, since those technologies currently exist, but are optional now. MSTRS member added that a lot of technologies can be used to reduce CO<sub>2</sub> emissions, so even if a vehicle is above a safety threshold, there are still benefits from a pollutant perspective. He pointed towards a possible collaboration between the EPA and the DOT, plus others like DOE and CARB.

EPA staff observed that this group also had recommendations about collecting more data and asked if they could clarify what data they think is needed. MSTRS member answered that having

in-use vehicle data available would help to better estimate emission profiles, in addition to road crash data, safety data, and information about transportation patterns. He explained that these can be used by all levels of agencies and stakeholders to improve the overall management of transportation systems and to design more effective emission management strategies. As an example, he pointed to New York City, where having access to taxi and limousine pickup and drop off data gives the NYDOT the opportunity to better monitor travel speeds across the city. These data are used to facilitate traffic operations and planning as well as to enforce traffic safety and labor standards. MSTRS member explained that these data were used to help understand congestion management and adopt standards that created a financial and regulatory incentive for companies to dispatch their vehicles more efficiently. This resulted in better metering, reduced congestion, and positive emission benefits despite slightly longer wait times. He described this as an example of one way in which access to vehicle data can allow local governments to improve environmental safety and public welfare. He noted that as we move towards vehicle automation, those vehicles are essentially giant data sensors, and getting some of that data, or samples of it, is important so that different levels of government can use it to improve public welfare. MSTRS member added that when the group talked about personal vehicles, they also looked at things like scooters as well as other types of personal vehicle data that is harder to come by and often held by the startups that own them; he identified this as a significant data need.

MSTRS member ) pointed out that we should also look at who data is not being collected from, as part of mobility justice. She noted that as we move to more automated, electrified, and shared systems, many people could be left out, and it will take more cognizance to consider whether we are asking the right questions and collecting the right data to serve underserved populations.

## **Goods Movement Chapter Presentation**

MSTRS member presented on behalf of the Goods Movement Workgroup.

MSTRS member state that this group was charged with determining: What is needed to deploy technology in a manner that achieves emission reductions most efficiently? What would an efficient low-emissions goods delivery system look like? and How can the EPA best utilize, or encourage utilization of, data to enable and optimize low emissions deliveries?

The challenges and issues that came to light during the workgroup's proceedings were itemized. The recommendations for the EPA from this workgroup fell into six categories:

- develop a comprehensive federal strategy for electrification,
- enhance incentive programs,
- identify new and sustainable funding,
- implement regulations to reduce emissions,
- promote sustainability, and
- address pollutions hotspots and health disparities.



MSTRS member then presented a more detailed and specific set of recommendations for the EPA within each of these six categories. These can be found in the presentation materials on the MSTRS website.

MSTRS member then opened the floor for questions.

### *Comments and Discussion*

MSTRS member asked if the group discussed the role of e-cargo bikes, which are playing a big role in many European and Asian cities for the last few miles of freight delivery. MSTRS member responded that they did not cover that specifically, but they did consider that last mile delivery and how electrification in urban and community areas will play a prominent role. He pointed out that their recommendations in the voluntary space might cover that topic. MSTRS member added that it is worth thinking about how the EPA can encourage communities to do curb management; for example, they could sponsor conferences to promote stakeholder engagement.

MSTRS member asked if the group discussed ideas within regulatory programs on heavy-duty vehicles, such as an emission standard or other programs, that could ensure that the cleanest vehicles get deployed in disadvantaged communities most impacted by the freight system. MSTRS member stated that they did discuss that, and that it would be easier to accomplish this where there are strong connections with the prerequisites for electrification. The group also talked about how a regulation could best target those areas, although there is no specific recommendation for standards, programs, or a framework that emphasizes electrification and pushes that technology. MSTRS member mentioned that they could continue to talk about that before the fall meeting, but their general recommendation is for the EPA to move ahead on the Phase 3 HD NO<sub>x</sub>. He added that there is a lot of opportunity for a framework that would put special emphasis on those areas and incorporating last mile delivery would have a positive impact.

MSTRS member noted that the presentation mentioned coordinating with Electrify America and asked whether they considered other infrastructure providers or utilities and the role the EPA can play with the broader set of actors in that space. MSTRS member responded that they singled out Electrify America because of their unique role in the market, but they agree that utilities can play a unique role in this space, so that is an important part of the plan moving forward. She suggested that, as a group, they can think about that and see if they can reach a consensus on a recommendation related to utility involvement.

MSTRS Chair pointed out that the traditional regulatory approach to heavy-duty diesel engines includes standards based on the expectations for performance across all applications. However, as the discussion becomes more nuanced, we end up in different places in terms of available technology, low carbon fuels, regulatory versus non regulatory approaches, etc. MSTRS Chair asked whether the group had any thoughts on how those ideas can be woven into the follow-up work. MSTRS member explained that the recommendations for phase 3 standards built on the

existing performance-based phase 2 standards, and that these standards already recognized multiple types of vehicles and considered which technologies would be most effective for each vehicle type. He noted that the question is which vehicle applications and technologies to factor into the standard setting process. The traditional engine-based standards might not recognize unique uses, but the EPA could address that in the heavy-duty GHG standards.

## **Remarks from OTAQ Office Director**

DFO thanked each of the presenters and introduced the OTAQ Office Director.

OTAQ Office Director thanked the attendees for their time and effort. She noted that in addition to the regulatory initiatives discussed by AA and DAA, OTAQ has also been working to expand its analytical tools and enhance its non-regulatory initiatives focused on public and environmental health. She acknowledged that this work will not be explicitly called out or announced, but it makes up the bread and butter of their work and helps ensure compliance so their programs can deliver results effectively.

OTAQ Office Director stated that the ideas and insights already discussed by MSTRS have given OTAQ a rich set of materials to work with as they make decisions. She is looking forward to reading the full report, as she expects that they will be referring to it for years to come.

OTAQ Office Director then offered her reflections on what she had heard from each of the presentations. She praised them for being “powerful, specific, practical, energizing, and much more,” and repeated her comment from the fall 2020 meeting that she was amazed at the work people had done and felt lucky to be able to listen to the reports and engage in real time with the MSTRS members. She observed that the ideas that were emerging in the previous meeting had become more crystallized, the recommendations were more specific, and the themes were clearer.

The first theme that OTAQ Office Director discussed was the need for integration, whether it relates to policy, analysis, life cycle considerations, structures, systems, or the federal government itself. She added that the message of needing to engage with the “whole of government” came across very clearly, and they also see the need to engage with their colleagues at the federal level.

OTAQ Office Director then explained that in addition to the importance of practical and specific ideas, she was struck by the grounding that each group provided in identifying what it is about the emerging trends in each of the four areas that require taking a new or evolved approach. She noted that it is one thing to say that the EPA needs to do something, but another to explain what’s going on and what we anticipate that leads to the need for those kinds of approaches.

Thirdly, OTAQ Office Director noted her appreciation for the discussion and recommendations regarding the need for new data, tools, analysis, and education.

Lastly, OTAQ Office Director touched on the importance of looking at trends from an EJ perspective, as failing to do so risks leaving out incredibly important needs and ideas.

OTAQ Office Director then considered the future of the report. Each group will spend the next couple of weeks working on the final touches. She expressed her excitement about seeing the final product and added that her team across OTAQ is already thinking about the recommendations they have heard so far. She already sees a lot of ways the EPA can take the lead on those ideas, and she anticipates that they will ask the MSTRS to further examine and work on certain areas. She described this as a huge opportunity for defining the next generation of work for the MSTRS. She concluded by repeating her praise and thanks and offering to answer questions.

### *Comments and Discussion*

MSTRS Chair thanked OTAQ Office Director for her leadership and guidance for the team on this unprecedented effort for the MSTRS.

MSTRS member asked if there is enough discretion given to the EPA to adjust the RFS or if Congress would have to provide additional authority to do so. OTAQ Office Director answered that there are other people who should weigh in on that question, but in her perspective, she generally regarded all the recommendations as not being constrained by the EPA's existing authorities, which she described as the right approach. She added that she did see many recommendations that they clearly do have the authority to do and have done before. Her general answer is that there are a range of recommendations, and they plan to take all of them in and work to understand the spirit in which they were made. Some will fall within the EPA's existing discretion and authority, and others may require changes.

### **Public Comment**

DFO invited members of the public to share their comments and questions. No members of the public requested to speak.

### **Future Mobility Report Themes Discussion and Next Steps**

DFO then opened the floor for general discussion about the report. She noted that EPA staff had asked a question in the chat. EPA staff explained that she was wondering whether big data companies like Google might have information that the EPA could use, as she was not sure how the EPA typically gathers emissions data, and that seemed like a simple approach. None of the meeting participants were able to provide an answer at that time.

MSTRS member stated that he wanted to talk about a topic that he saw as relevant to future mobility, but that did not fit cleanly into any of the four chapters. He explained that we are on a pathway toward ever more zero emission vehicles and battery supply chains, meaning that now is a good time to be thinking about the environmental footprint of batteries throughout their life

cycle. He suggested that a good approach would be a comprehensive environmental assessment (CEA), which is more thorough than a regular LCA, and some folks at the EPA might already be familiar with it. He added that it might even be useful to define battery pathways similarly to how we currently define fuel pathways, meaning that it will be possible to calculate carbon intensities and think about other environmental impact intensities. MSTRS member also mentioned that for several years, the EPA has been putting out triannual reports on the environmental impacts of biofuels; he pointed to this as a model that could also be adopted for batteries, as it's clearly in the EPA's wheelhouse.

MSTRS Chair added that he has been saying for years that our grandchildren are going to think we were crazy that we thought the only thing that mattered was tailpipe emissions and that we created a policy architecture reflective of that. In 1970, this may have made sense, but now we are in a very different place. He noted that we have so much more access to data, information, and analytical tools, and we need to make full use of those to address the issues that come up at every stage of the transportation chain. He compared it to the early years of biofuels, when the only thing that mattered was quantity, whereas now we are using much more advanced, less intensive fuels. MSTRS Chair acknowledged that not many people are thinking about what MSTRS member suggested, and he encourages the members of MSTRS to think about this issue and talk about it in the future, because it certainly will become an issue in time. MSTRS member added that the impacts will not necessarily be limited to the United States, as cobalt is mined in many other countries. He described this as an important global issue and a chance to define the parameters and come up with ways to assess issues proactively.

MSTRS member agreed that this issue deserves more analysis, as the need to look at the whole life cycle of the transportation system becomes more apparent. He pointed to OTAQ Office Director's summary of the need for integration and proposed that the same principle applies to integrating across the evolution of mobile sources, especially as we automate. He suggested that the motor vehicle technology industry will seek to apply its products to our cities, suburbs, and communities, and demand that they conform to the new automated technology. We may require new automated technology to adapt to the cities we have, since we have spent a lot of time fighting for things like the right to walk safely, and we want to make sure we don't lose that. He described this as a potential environmental catastrophe and said that pricing networks and network access is an environmental strategy that also needs to be integrated into how we think about mobility structures and their environmental impact. He proposed that this could be another place for the EPA to work with partner agencies as part of a whole of government policy.

MSTRS member noted that as transportation technology evolves, we should certainly seek to understand its full impact, including the full life cycle of all its parts. He cautioned against narrowing the scope too much by just looking at batteries, and instead suggested coming up with a broader, more holistic framework that includes all systems, fuels, and technologies. MSTRS Chair agreed that as we evolve towards more sophisticated analysis of performance standards, each iteration gets us a step closer to fully understanding the impacts of the whole system. He pointed out that choosing to focus on a single narrow lane and excluding everything else does not result in the best policy or experiences; instead, it can be valuable to look as widely as we can to drive the system towards more sustainable outcomes.

DFO suggested that this topic could be added to the agenda of the fall meeting, then turned it over to MSTRS Chair to share some summary thoughts from the day's discussion.

MSTRS Chair explained that he went through the report drafts and the presentations from each of the workgroups and identified ten common themes, most of which were touched on by all four groups. These themes are as follows:

- To meet our GHG, criteria pollution, and other future mobility goals, we will need to electrify where we can, decarbonize everything else, and find ways to move people and goods in as sustainable and equitable a way as possible.
- Good data and analysis will be critical to meeting our future mobility goals.
- We will need to integrate principles of social equity, environmental justice, and mobility justice in ways that have never been done before.
- We will need increased collaboration across agencies and levels of government.
- We will need to consider solutions that are outside OTAQ's traditional regulatory authority.
- Fuel-neutral, technology-agnostic performance standards will continue to be critical for both fuels and vehicles.
- Incentives, public education, and outreach programs will continue to be critical to accelerate deployment.
- We will need to consider new approaches to solve new *and* old problems, some of which are beyond the EPA's traditional role.
- Additional strategies will be needed for hard-to-electrify components of the legacy and future fleets.
- There is no "silver bullet."

DFO thanked MSTRS Chair and noted that it was comforting to know that the EPA had not missed some big, obvious silver bullet, and that these issues really are complicated.

OTAQ's Transportation and Climate Division Director stated that he was already thinking about next steps, and it looks like there are years of work ahead. He pointed out that a major challenge is figuring out what transportation will actually look like in two or three decades and emphasized that the EPA team is very aware that decisions being made today have extremely long-term implications. He identified one question being, What are the ambitious activities that the EPA should be paying attention to, either so they can provide structure or get out of the way to let them develop on their own in a meaningful and equitable way? He thanked everyone for their work, praised them for exceeding expectations, and expressed his desire to drill down on these issues and learn more from members going forward.

## **Final Remarks and Close Out**

DFO thanked everyone for a very productive day and acknowledged the significant progress that has been made despite the challenges of the pandemic and the complicated nature of the topic at

hand. She explained that there will be a few weeks for groups to make final tweaks in response to the conversations and ideas discussed in the meeting. Then the EPA team will be checking in around June 25, with the goal of tying things off before the Fourth of July. The report will be presented to the CAAAC for formal adoption and submission to the EPA. In the meantime, she encouraged members to reach out to her or anyone on the EPA team and also to nominate new members to MSTRS. More information and instructions on how to apply can be found at <https://www.epa.gov/caaac/mstrs-membership-information>. The deadline to nominate new members is August 2<sup>nd</sup>. She added that the EPA values and welcomes diversity and encourages nominations from all backgrounds and that the Administrator will make the final decisions about appointments. DFO finally thanked everyone again and adjourned the meeting.

## Appendix

<b>MSTRS Virtual Meeting Attendance List<sup>1</sup></b>	
<b>Name</b>	<b>Organization</b>
<b>Subcommittee Members and Presenters</b>	
Robert Anderson	Chevron
Dr. Mathew Barth	Institute of Electrical and Electronics Engineers
Dr. Rasto Brezny	Manufacturers of Emission Controls Association
Julia Burch	U.S. Environmental Protection Agency
Blair Chiksauye	Hewlett Packard
Dr. Dave Cooke	Union of Concerned Scientists
Dr. Elena Craft	Environmental Defense Fund
Sarah Dunham	U.S. Environmental Protection Agency
John Eichberger	Fuels Institute
Sarah Froman	U.S. Environmental Protection Agency
Joe Goffman	U.S. Environmental Protection Agency
Peg Hanna	New Jersey Department of Environmental Protection
Dr. Kent Hoekman	Desert Research Institute
Michael Iden	Association of American Railroads
Dr. Tracy Jacksier	AIR LIQUIDE Research & Development
Rich Kassel	Tri-State Transportation Campaign
James Kliesch	American Honda Motor Co., Inc.
Nancy Kruger	National Association of Clean Air Agencies
George Lin	Caterpillar, Inc.
Dr. Matt Miyasoto	South Coast Air Quality Management District
Alejandra Núñez	U.S. Environmental Protection Agency
Elaine O'Grady	Northeast States for Coordinated Air Use Management
Michael Replogle	NYC Department of Transportation
Joanne Rotondi	Hogan Lovells US LLP
Dr. Susan Shaheen	International Journal of Sustainable Transportation
Matthew Spears	Cummins, Inc.
Luke Tonachel	Natural Resources Defense Council
Cynthia Williams	Ford Motor Company
<b>Other Attendees</b>	
Noelle Baker	Hyundai Kia
Erin Birgfeld	U.S. Environmental Protection Agency
Amy Bunker	U.S. Environmental Protection Agency
Byron Bunker	U.S. Environmental Protection Agency
Susan Burke	U.S. Environmental Protection Agency

<sup>1</sup> This list of meeting attendees is not comprehensive due to a number of unidentified call-in participants.

Cheryl Caffrey	U.S. Environmental Protection Agency
William Charmley	U.S. Environmental Protection Agency
Ann Chiu	U.S. Environmental Protection Agency
Richard Corey	California Air Resources Board
Jessica Daniels	U.S. Environmental Protection Agency
Dominic DiCicco	Ford Motor Company
Keesha Esqueda	Flint Hills Resources
Timothy French	Engine Manufacturers Association
Robert Fronczak	Association of American Railroads
Diana Galperin	U.S. Environmental Protection Agency
Alex Guillen	Politico
Michael Hartrick	Alliance for Automotive Innovation
Barbara Hayes	Hyundai Kia
Julie Henning	U.S. Environmental Protection Agency
Aaron Hula	U.S. Environmental Protection Agency
Riley Keehn	Hyundai Kia
Brian Kelly	Wabtec Corporation
Jeanette Lightfoot	U.S. Environmental Protection Agency
Kaye Lynch-Sparks	National Automobile Dealers Association
Andrea Maguire	U.S. Environmental Protection Agency
Britney McCoy	U.S. Environmental Protection Agency
Joseph McDonald	U.S. Environmental Protection Agency
Eric Miller	Transport Topics
Rachel Muncrief	International Council on Clean Transportation
Robert O'Keefe	Health Effects Institute
Grace Olscamp	The Healthy Environment Alliance of Utah
Kimberly Oswald	U.S. Environmental Protection Agency
Patricia Paff	U.S. Environmental Protection Agency
Stuart Parker	IWP News
Christy Parsons	U.S. Environmental Protection Agency
Russell Pildes	Northeast States for Coordinated Air Use Management
Clay Pope	Clay Pope Consulting, Member of CAAAC
Dawn Reeves	Inside EPA
Julia Rege	Alliance for Automotive Innovation
Sarah Roberts	U.S. Environmental Protection Agency
Benjamin Sarver	U.S. Environmental Protection Agency
Prentiss Searles	American Petroleum Institute
Michael Shell	U.S. Environmental Protection Agency
Karl Simon	U.S. Environmental Protection Agency



Lisa Snapp	U.S. Environmental Protection Agency
Susan Stilson	U.S. Environmental Protection Agency
Chien Sze	U.S. Environmental Protection Agency
Cristina Valderrama	U.S. Environmental Protection Agency
Thomas Van Heeke	General Motors
Diep Vu	Marathon Petroleum Co.
Alex Wang	U.S. Environmental Protection Agency
<b>Contractor Support</b>	
Maureen Mullen	SC&A, Inc.
Margaret Overton	SC&A, Inc.