

2020 Mobile Source Strategy

Webinar – March 25, 2020

Presentation Script

Slide 1

Hello everyone. Thank you all for tuning in today. Amongst everything that's going on, we at CARB are happy to have this opportunity to speak to you about the 2020 Mobile Source Strategy, a Vision for Clean Air, and to hear your feedback and ideas in response to what we have to share with you at this stage in the process.

I'm Ariel Fidely, and I work in the Air Quality Planning branch within CARB. Before we get going, I just want to touch on a couple housekeeping things. First, we want everyone to know that this webinar is being recorded and will be available online after we conclude today. As such, please note that questions you write to us will be read out loud and will be a part of this recording, and part of the public record of this webinar going forward.

Regarding GoToWebinar, I also want to add that given the high demand for online and webinar services right now, we have run into technical difficulties on other occasions and even been kicked out of an active webinar, so please bear with us and if that occurs, use the "Join Webinar" link to join the webinar again.

For anybody that is not using GoToWebinar, please know that these slides are available on our website at www.arb.ca.gov/resources/documents/2020-mobile-source-strategy. If you go to CARB's home page and use the search function to search "2020 mobile source strategy" or even type "CARB 2020 mobile source strategy" into google or another search engine, you should find it.

Slide 2

Today, as you see here, we'll be going through a broad overview including background on why we're here and progress made on measures included in the 2016 Mobile Source Strategy, and then moving into discussions of the scenario modeling that is underway and what we are seeing from the preliminary modeling runs, touching on the regulatory concepts that CARB staff have identified to help us get to where we need to be for each mobile sector. We'll also discuss some specifics of the needs and benefits in the South Coast and San Joaquin Valley, the two areas of the state with the most critical air quality challenges and State Implementation Plan timelines that are drivers of many of our strategies.

I'd like to mention up front that we're accepting questions both via email, and through the GoToWebinar application for those of you online today. We prefer you send your questions to the email on the screen here: MSS@arb.ca.gov for organizational purposes and for the sake of the record in case we run into technical difficulties, but

you may also send questions through the chat feature in GoToWebinar. We plan on hearing and addressing all comments and questions at the end of the staff presentation, but please feel free to send us questions throughout the presentation, and we will then address them in order after we conclude our presentation.

Slide 3

Before we get into the background, I want to let everyone know what our timeline looks like for the development of the 2020 Strategy.

Given the State's numerous air quality, climate, and community risk reduction goals, and the ever-evolving vehicle market, California Senate Bill 44, or SB 44, signed by Governor Newsom on September 20, 2019, acknowledged the ongoing need for evaluation of opportunities for mobile source emissions reductions and requires CARB to update our 2016 Mobile Source Strategy by January 1, 2021, and every 5 years thereafter.

More specifically, SB 44 requires CARB to update the 2016 Mobile Source Strategy for the medium- and heavy-duty vehicle sector to include a comprehensive strategy for the deployment of medium and heavy-duty vehicles for the purpose of meeting federal ambient air quality standards and reducing GHG emissions. It also directs CARB to set reasonable and achievable goals for reducing emissions from medium- and heavy-duty vehicles that are consistent with the State's overall goals.

It's because of the SB 44 requirements that we are on the timeline that you see here on this slide, rather than a longer process that we might usually take for this sort of a broad planning document. Scenario modeling is already underway, and as it is an iterative process, will continue throughout development this year. We are planning an update to our Board by mid-year, looking to release a draft of the document in the fall, and go back to our Board for consideration of the Strategy at the end of the year.

Slide 4

One thing we'd like to make clear up front is that the 2020 Mobile Source Strategy is taking a conceptual, scenario approach to planning. The strategy we produce this year will consist of the scenarios and trajectories for the various mobile sectors that we need to see in the State in order to meet our numerous goals, recognizing the programs that are already in development as well as the newly-identified concepts that will help us move forward. More fully fleshed out measures will then be developed in the process of our other upcoming planning documents, including the next iteration of the State SIP Strategy.

Slide 5

Alright, I'll now get a little bit more into the background behind the 2020 Mobile Source Strategy.

Slide 6

As you all know, CARB and California as a whole have a great number of targets and goals we're working to meet over the next thirty years. We have various State Implementation Plan attainment years for South Coast and San Joaquin Valley, the two areas with the most significant ozone and PM2.5 challenges in the nation, including very near-term targets in 2023, 2024, and 2025; and 2031 and '37 for the more recent ozone national ambient air quality standards, or NAAQS. There is also an immediate need to achieve reductions in our AB 617 communities which have target years in 2024 and 2025, as well as reducing emissions in all highly-impacted communities throughout the state. Climate goals include the mid-term target in 2030 for 40 percent GHG reduction below 1990 levels, and then longer-term targets in 2045 for carbon neutrality and 2050 for 80 percent below 1990 levels.

Slide 7

Defining the scope of actions necessary to implement a strategic vision to meet all of California's goals and the requirements of SB 44 will require an integrated planning process. In order to identify the strategies and program concepts that will best help us meet all of CARB's goals, it's imperative to look at the goals and potential benefits to all three broad and overlapping groups of pollutants that we're striving to reduce, criteria pollutants, toxics, and greenhouse gases. This type of planning effort is essential to address the interplay between pollutants and sources, and consider the benefits of different technologies and energy sources.

Slide 8

As with the 2016 Mobile Source Strategy, in addition to specific regulatory efforts, there are a number of large planning efforts for which the results of the integrated planning of the Mobile Source Strategy will play an important role. The efforts you see here on this slide are already underway and will be coming to CARB's Board over the next couple years. The attainment plan SIPs for the 2015, 70 ppb ozone standard are due between this year and 2022; CARB's next Climate Change Scoping Plan Update is planned for completion in 2022; and of course Community Emission Reduction Plans and the third round of Sustainable Communities Strategies are in development already, with some of them having already been adopted.

Slide 9

It's important to acknowledge that for all of the planning efforts I just mentioned, strategies to control mobile source emissions will be vital to their success. Mobile sources and the fossil fuels that power them continue to contribute a majority of emissions of oxides of nitrogen, a significant precursor to smog and particulate matter, and are the largest portion of GHG emissions in California. The chart on the left shows 2017 statewide NOx emissions as derived from CARB's 2019 CEPAM planning

inventory, with mobile sources representing 80 percent of the total. The pie chart on the right here shows 2017 statewide GHG emissions, where the transportation sector represents 40 percent of the total. While the terminology used is different between the two charts, I would like to point out that the mobile and transportation categories are analogous on these pie charts.

Slide 10

Controlling emissions from mobile, and all sources, is critically important because of the costs that air pollution has on the health of the residents of California. CARB analyses have concluded that PM2.5 exposure contributes to 5,400 premature deaths due to cardiopulmonary causes per year in California. In addition, PM2.5 contributes to about 2,800 hospitalizations for cardiovascular and respiratory diseases and about 6,700 emergency room visits for asthma each year in California. The subset of PM that is from diesel sources, known as Diesel particulate matter, has been determined to be a toxic and thus also increases cancer risk.

Slide 11

In addition to the health effects on the overall population, studies have shown that disadvantaged communities and people of color in the State are disproportionately affected. As can be seen on this slide, 46 percent of census tracts in the state that are disadvantaged by definition are in the 75th percentile for levels of diesel PM pollution, and black and Hispanic communities are exposed to PM2.5 at concentrations 18 percent above the average from on-road mobile sources.

We at CARB strive to reduce the negative impacts of pollution on everyone in California, but especially since the passing of AB 617 in 2017, we have had the opportunity to take a closer look and dedicate specific resources to reducing these health effects on the most heavily-impacted communities and populations in the state, and reductions in mobile source emissions are a critical piece of that complex puzzle.

Slide 12

Next, I'm going to recap a little of the progress that has been made since the 2016 Mobile Source Strategy.

Slide 13

As many of you know, the 2016 Mobile Source Strategy was released in May of 2016, and it demonstrated how the State can simultaneously meet air quality standards, achieve greenhouse gas emission reduction targets, decrease health risk from transportation emissions, and reduce petroleum consumption through 2031. Elements of the 2016 Strategy were incorporated into the 2016 State SIP Strategy, the 2017 Scoping Plan, the California Sustainable Freight Action Plan, and CARB's Short-Lived Climate Pollutant Reduction Strategy. Each of these plans drew from the Mobile

Source Strategy to incorporate actions and policies necessary to meet individual program goals.

Slide 14

Since the 2016 Mobile Source Strategy was completed, a number of regulatory items that were included as measures in the document have been completed and adopted by CARB's Board. These include the Medium- and heavy-duty GHG Phase 2 Regulation, the Lower Opacity Limits for heavy-duty vehicles, Amended Warranty Requirements for heavy-duty vehicles, the Innovative Clean Transit regulation, and the Zero-Emission Airport Shuttle Bus regulation.

Slide 15

In addition to those that have been adopted, many other items that were included as measures have progressed through their development process and are slated to come to the CARB board for consideration in the next couple years. As you can see here, these include the Ocean-going Vessels At-Berth and Advanced Clean Trucks regulations, both which had their first hearings this past December and will be brought back to the Board in the coming months. The Heavy-duty Low-NOx Omnibus regulation is planned for Board consideration in mid 2020; this was originally just the Low-NOx standard in the 2016 Strategy, but now includes longer Useful Life Emission Compliance, Longer Warranty Periods, and More Stringent In Use Performance Standards, all which will improve real world emissions performance of heavy-duty vehicles. The Transport Refrigeration Unit, or TRU regulation, and Small off-road engine, or SORE regulations, are set to be considered by the board late this year. And the last three here, the Heavy-duty Inspection and Maintenance Program, or Heavy-duty I&M, Advanced Clean Cars 2.0, and the Low Emission Diesel fuel requirement are planned to be brought to the CARB board in 2021.

With that recap of the 2016 Strategy, I am now going to turn it over to Sara Forestieri to begin our discussion on the scenarios that are being developed as part of the 2020 Mobile Source Strategy.

Slide 16

Hi my name is Sara Forestieri. I'm in the on-road inventory group at the California Air Resources Board.

Before diving into scenarios, we recognize that the COVID-19 pandemic has had a significant impact on different sectors of the economy in California including transportation, and the related shutdowns and restrictions has resulted in a rapid reduction in vehicle activity over the past couple of weeks especially for passenger vehicles. The mobile source scenarios we are presenting today are long-term forecasts and do not account for the near-term impacts of the COVID-19 pandemic on the transportation and off-road equipment sectors. However, as we move forward

with development of the Mobile Source Strategy over the next nine months, we will closely track and monitor the ongoing impacts of COVID-19 and will make any necessary adjustments to the scenarios presented today.

These scenarios are driven by California's air quality goals (in 2031, 2037, and 2045) and climate change goals in 2045 and beyond. These scenarios show what needs to be done in order to achieve them.

Slide 17

Meeting air quality and climate change goals require significant transformations to cleaner technologies in the mobile source sector. No single tool alone will get us to these goals, so meeting them requires multiple tools shown here, like manufacturer requirements or incentives as another example.

Slide 18

We ran scenarios for both the on-road and off-road sectors. Here I'm starting with the on-road sector, which includes light, medium, and heavy-duty vehicles. These pie charts show the contributions of the on-road sector to overall statewide NOx and greenhouse gas emissions. This sector is important in terms of emissions and contributed to 45 percent of NOx emissions and 37 percent of GHG emissions statewide in 2017.

Slide 19

Starting with light-duty vehicles (like passenger cars), CARB has two major programs on the horizon:

The first one is Advanced Clean Cars 2, which focuses on automaker requirements for post-model year 2025 vehicles. This program will build on the first iteration of advanced clean cars and will include enhanced ZEV regulations to move beyond early adopters and enhanced LEV regulations to reduce real-world emissions. This regulation will be considered by the board in 2021.

Another program is the Clean Miles Standard (SB1014) which is part of CARB's strategy for ensuring more sustainable transportation for new mobility options. This regulation will require CARB to develop a greenhouse gas emissions reduction program for ride-hailing companies. There are two targets: one is to reduce grams of carbon dioxide per passenger mile, and the other is to increase electric miles. To meet these targets, potential compliance strategies include electrification, pooling, reducing deadhead miles, and connections to transit/active transportation like cycling. Currently, the base year emissions inventory from which future targets will be set is complete. The board will consider this regulation in late 2020.

Slide 20

For the light-duty sector, we considered a scenario in which 100 percent of sales in 2035 are plug-in hybrids or PHEVs and zero-emission vehicles or ZEVs (includes technologies like battery electric and fuel cell).

The resulting technology population fractions are shown with ZEVs in darker green, PHEVs in lighter green, and gasoline vehicles shown in dark blue. Even with this scenario, we still do not achieve our long-term climate goals, which requires a fully electrified fleet in 2045. About half the fleet still use internal combustion engines in this scenario.

CARB is continuing to explore other scenarios that will help us achieve our long-term climate goals. For example, we can look into synergies with high mileage fleets like transportation network companies. We can also consider mitigating greenhouse gas emissions with either low carbon biofuels or other policies to remove internal combustion engine vehicles from the fleet.

Slide 21

Another important tool for achieving climate change goals for the light-duty sector is through reducing vehicle miles travelled or VMT.

Under SB 375, the Sustainable Communities and Climate Protection Act, California's 18 Metropolitan Planning Organizations, also known as MPOs, develop Sustainable Communities Strategies or SCSs as part of their Regional Transportation Plan to meet greenhouse gas reduction targets for passenger vehicles. CARB reviews and determines whether submitted plans would meet targets when fully implemented.

Ten years have passed since the adoption of SB 375 connected regional planning to State climate goals. A central finding of a recent study conducted by CARB is that CA regions are not on track to meet state climate goals under SB 375.

As shown here, both GHG emissions (in blue) and Vehicle Miles Traveled (in orange) - per person - are not much lower than in 2005, and increasing.

This falls far from the trajectory that we expected to be on based upon adopted plans, as shown by the green dots.

To better understand the rise in VMT, we looked at almost 2 dozen indicators.

- Three out four people drive alone, and this trend is flat or rising in most regions
- Transit ridership (shown on the right) is falling
- RTP/SCS Include over \$1.1 Trillion in Spending over 2-3 Decades with increased spending in road maintenance, transit, and active transportation. However, there has generally been little shift in spending planned by mode between the previous and current plans

- The housing burden has gone up, with noticeable leaps in some income groups, which causing costs to soar and may be lengthening commutes if people have to drive further to find a home they can afford.

Slide 22

So what can we do?

CARB consistently heard concerns over the disconnect between the factors that shape growth and development and the state's environmental, equity, climate, health, economic, and housing goals.

The CARB-conducted study does not conclude that any one particular entity or group is solely to blame for this. These outcomes are the result of all entities carrying out their mandates, and acting within the current structure of incentives, laws, and politics.

So the following opportunity areas were identified:

- Align State Funding for Transportation & Development Projects with health, equity, conservation, and climate goals
- Improve the Jobs Housing Balance through state housing legislation and innovative efforts by various regional agencies
- Fostering New Mobility Options Supportive of Environmental and Equity Priorities
- Improve Transportation Networks and Incentivize Travelers away from single occupancy vehicle travel, especially for low income communities.
- Address Social & Transportation Justice Issues in Under-Served Communities, such as affordable housing
- And updating and strengthening SB375.

Slide 23

Switching gears to the on-road medium-duty sector.

This category consists of vehicles that are 8,500 – 14,000 lbs Gross Vehicle Weight Rating or GVWR. This sector is responsible for 7 percent of NOx and 5 percent GHG mobile source emissions statewide.

CARB has strategies under development for reducing criteria pollutants and greenhouse gas emissions from this sector, some of which have some overlap with light-duty vehicle strategies, and some of which have overlap with heavy-duty vehicle strategies.

These include:

- The transformation of the fleet to zero-emission technology. One example of the agency's efforts is the Advanced Clean Trucks Regulation, which will go to the board this year in the spring/summer timeframe
- It also includes enhanced LEV regulations through Advanced Clean Cars 2.0
- And finally, energy efficiency improvements through Phase 3 greenhouse gas standards for medium and heavy-duty vehicles, which is a continuation of the phase 2 greenhouse gas standards.

Slide 24

Here we considered a scenario to achieve CARB's long-term climate goals, with an ambitious medium-duty ZEV phase-in, which has 100 percent ZEV sales after 2035. The resulting technology mix is shown below with the orange area corresponding to internal combustion engines and the green dashed area for medium-duty ZEVs. In 2045, this scenario results in approximately 700,000 heavy-duty ZEVs, which is 60 percent of the total fleet, and an annual fuel demand of 0.27 billion gallons per year diesel and 0.16 billion gallons gasoline.

Slide 25

For the on-road sector, the heavy-duty part is the most critical one. It consists of vehicles that are >14,000 lbs GVWR. Some examples of heavy-duty vehicles are trucks and buses. These vehicles are responsible for ~33 percent of mobile source NOx emissions and 16 percent of mobile source greenhouse gas emissions.

Similar to the medium-duty sector, deployment of zero-emission technology where possible is one of the most important strategies for heavy-duty sector. One example of the agency's efforts are heavy-duty ZEV sales requirements through the Advanced Clean Trucks regulation that will start in 2024.

Also starting in 2024 is CARB's proposed Low-NOx program will ensure that diesel engines have much lower NOx emissions. This regulation will be considered by the board this summer.

Another strategy is usage of renewable fuels where electrification is not feasible to ensure GHG reduction.

We will also have continued energy efficiency improvements through the Tractor Trailer Greenhouse Gas program and the Phase 3 Greenhouse Gas Standards for medium and heavy-duty vehicles.

In addition to technology and efficiency improvements, we also have a suite of in-use performance measures that ensure criteria pollutant emissions stay low through a vehicle's lifetime, including Heavy-duty Inspection and Maintenance, more stringent in-use performance standards and lengthening engine useful life, warranty, and durability requirements.

Slide 26

What to expect for the 2020 Mobile Source Strategy? Multiple scenarios were designed and explored to meet California's air quality and climate mid-term and long-term goals.

The scenario shown here is designed to meet midterm goals. In particular, this scenario achieves NOx reductions needed to meet the air quality goals over the next two decades while also charting a course to achieve longer-term climate change goals. Below you can see the resulting technology mix for this scenario. The black striped area are vehicles with pre-2010 model year technology, which drops off after 2023 because of Truck and Bus regulation, red corresponds to 2010 certified technology.

Through this scenario all 2010-certified and pre-2010 heavy-duty vehicles will be replaced with cleaner technologies in 2045. Starting in 2024, Low-NOx technology is shown in orange for CA-certified vehicles and in blue for Federal-certified vehicles. The midterm goals also require an ambitious ZEV penetration for newer vehicles combined with accelerated turnover of older vehicles (e.g., 2010-certified) to ZEVs, which is represented by the green dashed area. For new sales, we considered targeting key fleets in the near-term like delivery and drayage fleets, these had ambitious sales to get them to ~100 percent ZEVs by 2040-2045 timeframe and then we assumed that all new vehicle sales after 2035 would be 100 percent ZEVs. We modeled accelerated turnover of older pre-MY 2024 vehicles to meet both the ozone target in South Coast in near-term and our climate goals in the long-term.

We need accelerated turnover to achieve the South Coast ozone target because ZEV and Low-NOx penetration for new vehicles with natural turnover is not enough to meet the necessary NOx reductions. As new vehicles become cleaner, the older vehicles become the most significant contributors to overall NOx emissions. ZEV vehicles and Low-NOx vehicles have much lower NOx emissions than vehicles 2010-certified technology, so we need to transform 2010-certified vehicles to cleaner technologies.

This scenario results in about 600,000 heavy-duty ZEVs total statewide in 2045, which is 58 percent of the fleet, including a necessary phase-in of new ZEVs and those resulting from accelerated turnover.

Slide 27

What else do we need to do to achieve California's long-term air quality and climate goals? We considered a more ambitious scenario to get the NOx reductions necessary to meet near term air quality goals, while also maximizing the number zero-emission trucks for longer term climate goals.

Here, we assume that all vehicles purchased by fleets in CA that are model year 2024 and newer regardless of where they're purchased must meet the ZEV phase-in requirements, so a much larger fraction of the newer vehicles are heavy-duty ZEVs instead of Low-NOx.

Similar to the previous scenario, we model acceleration of pre MY 2024 vehicles to ZEVs to meet the South Coast ozone targets and the long-term climate goals in 2045 and beyond.

This scenario results in about 800,000 ZEVs statewide, which is 76 percent of the total heavy-duty fleet, including an ambitious phase-in of new ZEVs and those resulting from accelerated turnover of older vehicles. This also results in a lower fuel demand than the midterm scenario in 2045 1.01 billion gal per year diesel and 0.08 billion gal per year gasoline.

Taking the ambitious scenarios that we showed earlier for medium-duty vehicles and combining it with this heavy-duty scenario will result in a total of 1.5 million ZEVs in 2045.

Slide 28

That wraps up the on-road sector.

If you would like more information on CARB's on-road programs, please check out the following websites.

Now I will hand it over to Liang to discuss off-road sector scenarios.

Slide 29

Off-road sector includes any type of vehicles that have off-road or marine engines.

This figure shows the statewide NOx emission contribution by sector in 2017. Off-road contributes to 35 percent of NOx, with construction, ag, loco as the biggest emitters.

As our cars and trucks are getting much cleaner, off-road becomes increasingly important. Off-road NOx contribution will grow to 37 percent by 2022, replacing on-road as the largest NOx emitter.

In 2017 off-road makes up for 4 percent GHG emissions, and off-road diesel consumption will rise to 2.1 billion by 2045.

Slide 30

Here are some general strategies to clean up the off-road sector:

- Use zero-emission wherever possible

- Adopt more stringent emission standards for remaining combustion engines, such as Tier 5, on-board diagnostic, and GHG standard, to ensure the engines operate at cleanest possible level throughout entire service lives
- Zero-emission technology wherever possible
- Remaining combustion engines as low-emitting as technically feasible, throughout entire service lives (Tier 5, OBD and GHG standard)
- Use of renewable fuels where electrification is not feasible
- Accelerated turnover of older equipment to cleanest available technology, including hybridization
- Retrofit with after-treatment technologies.

I'll discuss the detailed strategies for each off-road sector in the following slides.

Slide 31

Cargo Handling Equipment or CHE is one of the sectors that's going full electric. (SC SIP value 1.36 tpd in 2017, reduce by 50 percent in 2031).

CHE is important because of its proximity to disadvantaged communities around the ports and railyards, primarily significant in SC and Bay Area.

As zero-emission technologies for some CHE are already commercially viable, the concept is to begin transition to full electric operation in 2026.

The figure shows statewide CHE population distribution under the concept. Just a note that we know there is some electric CHE currently, this figure shows how the existing diesel equipment will transition to electric.

Slide 32

SORE are also going full electric.

Small off-road engines include Lawn & Garden equipment, light commercial equipment such as generators, compressors, etc. They're significant sources of reactive organic gas emissions.

As shown in the right figure, in 2018 the majority of the household Lawn & Garden equipment is already electric.

The concepts are to adopt new standards in 2020 and adopt zero-emission standard in mid 2020s which requires all new sales to be zero-emission.

Slide 33

While pushing for electrification wherever feasible, CARB is also working with contractors to evaluate possible NOx and PM emission reductions for Tier 5 standard.

This figure shows the population distribution from natural turn-over under the Tier 5 concept if it's adopted in 2026, note that this is for all the off-road equipment except for marine and locomotives as they have their own set of standards.

Additional concepts include:

- Off-Road on-board diagnostic (OBD) standards: ensure emissions reduction equipment is working
- More stringent exhaust standards for spark-ignition recreational marine engines
- Potential for off-road diesel GHG standards

Slide 34

For the general off-road equipment, while pushing for electrification and more stringent standards, CARB also works on accelerating the turnover of older equipment.

Construction, industrial and mining equipment is significant contributor in both SJV and SC. (Statewide 9.3 tpd reduction, SC 3.9 tpd reduction in 2031)

- Current regulation allows continued use of Tier 0/2 engines indefinitely as long as they meet the fleet average requirements
- The concept is to fully turnover Tier 0-Tier 2 engines by 2031
- Figure shows NOx emissions by Tier standard from this sector under the concept, dashed line shows baseline emissions. The concept will achieve about 9 tons per day NOx emission reduction statewide by 2031.

Slide 35

Ag is an important contributor in SJV: 18 percent of NOx emissions in 2019.

CARB had incentive-driven programs such as FARMER that has significantly replaced Tier 0-Tier 2 tractors since 2009, and the concepts here are to continue the incentive programs, and to replace diesel all-terrain vehicles (ATVs) with electric vehicles

Figures show SJV tractor population by Tier with and without continued incentives. With continued incentives we can double the adoption of Tier 4f equipment.

Slide 36

Transport Refrigeration Units or TRUs are significant to all local communities.

Current concepts include:

- Zero-emissions for truck TRUs
- Zero-emission operation requirements while stationary for trailer TRUs
- Less than 25 horsepower TRUs and TRU gensets meet standard for 25 to 50 horsepower

The figure shows Statewide NO_x by TRU type under the concepts, dashed line shows baseline emissions. The concepts will start reducing NO_x emissions from TRUs in 2023, and will achieve over 50 percent NO_x reduction by 2031, which is roughly 9 tpd statewide.

Slide 37

Locomotives are significant statewide emitters, and pose great risks to communities near the railyards.

Figure on the left shows SC locomotive energy use by Tier standard. In 2018 Tier 4 (light purple) accounts for only 4 percent, much lower than we expected, and Tier 1/1+ locomotives have actually been increasing from 2010 to 2018.

Current concepts are to increase purchasing of Tier 4 and reduce use of pre-Tier 3 locomotives by mid 2020s, and increase the turnover of Tier 0/0+ switchers in railyards.

However, to achieve the SIP target we need much more ambitious actions, especially from the federal government. We need the adoption of Tier 5 loco standard and significant penetrations of Tier 4/5 locos.

In the right figure, it shows SC NO_x emissions from locomotives. The new baseline, as shown in the blue dashed line, is based on the most recent data sources. The new baseline is higher than what was expected in the SIP emissions, as shown in the solid brown line. Only with significant penetrations of Tier 4/5 locos will we be able to achieve the 3 tpd target as indicated in the 2016 MSS. It requires about 90 percent of all locos to be Tier 4/5 by 2031.

Slide 38

CHCs are important because of their proximity to disadvantaged communities around the ports, primarily significant in South Coast and Bay Area.

Current concepts include:

- In-use short run ferries become zero-emission by 2028 (9 percent of ferries)
- Turn over all vessels except for commercial fishing to cleanest engines and retrofit with DPF
- Enhanced efficiency for new tugs and zero-emission capabilities for new excursion vessels

The left figure shows SC NO_x emissions from CHC under current concepts, similar to locomotives, the new baseline emissions are based on most recent data sources and are higher than the SIP emissions. As a result, the actual NO_x reduction from the SIP emissions in 2031 under current concepts is minimal.

We need a lot more reductions to achieve our air quality goals. More actions include adding commercial fishing into the regulated categories, introduce Tier 4 to all vessels in 2023 and Tier 5 in 2027, and use plug-in hybrid technology for excursions and diesel electric for tugboats by 2030.

The right figure shows SC NO_x emissions under these ambitious actions, NO_x reduction in SC will become 3 tpd in 2031.

Slide 39

Ocean-Going Vessels are significant emitters around the ports and coastal shipping lanes. The at-berth rule requires certain vessels to plug in while parking at shore in certain locations.

Current concepts are focused on diesel PM exposure in local communities, including expansion of at-berth regulation to cover more vessel types and locations, and advocate at IMO Tier 4 standards. The figure on the left shows at berth NO_x emissions from port of LA/LB under current concepts compared with the baseline emissions.

However much more reduction is needed from the OGV sector to reach the SIP target. We need to address transit, anchorage, and maneuvering emissions as well. The right figure shows SC NO_x emissions from OGV if Tier 4 marine standards are adopted in 2028 and significant penetrations of Tier 3/4 vessels begin in 2025, combined with the expansion of at-berth rule for non-covered visits. These ambitious actions will achieve about 38 tpd NO_x reduction in SC in 2031.

Slide 40

For more information about each off-road program, feel free to check out these CARB websites listed here and email us for questions.

Slide 41

Regarding energy and infrastructure, California is also going zero-emission wherever possible.

We need a streamlined system that allows for massive infrastructure buildout to enable zero-emission vehicles.

AB 2127 requires CEC (California Energy Commission) to prepare infrastructure assessment for accommodating 5 million ZEV by 2030, and reducing GHG 40 percent below 1990 by 2030. The assessment will include both on-road and off-road categories.

Also significant investments have been made in infrastructure

CEC invests up to \$100 million annually in a broad portfolio of transportation and fuel projects through its Clean Transportation Program.

CPUC (California Public Utilities Commission) has authorized IOUs (investor owned electric utilities) more than \$1 billion on transportation electrification infrastructure through 2023.

CPUC is requesting almost another \$1 billion for future infrastructure programs over the course of 2018 and 2019.

Next I'll turn it over back to Ariel to discuss more about how our efforts are especially important in the South Coast & San Joaquin Valley.

Slide 42

Thanks Liang.

I'm now going to dive a little into the details of things for the South Coast and the San Joaquin Valley, the two regions of the state with the most critical air quality challenges, including very near-term SIP deadlines that are drivers of many of our strategies.

Slide 43

As I mentioned earlier, the South Coast Air Basin and San Joaquin Valley have a number of upcoming deadlines to meet the national ambient air quality standards. For ozone standards, these areas are both classified as Extreme and must meet the 80 parts per billion 8-hour ozone standard in 2023, the 75 ppb standard in 2031, and the latest 70 ppb standard in 2037. For PM2.5, the San Joaquin Valley must meet the 65 microgram per cubic meter 24-hour standard, and 15 microgram per cubic meter annual standard this year. Both the Valley and the South Coast must also meet the newer 35 microgram per cubic meter 24-hour standard in 2024, and 12 microgram per cubic meter annual standard in 2025.

There is also the statewide AB 617 requirements to implement Best Available Retrofit Control Technology, or BARCT, on industrial sources that are subject to the Cap-and-Trade program by the end of 2023. And these two regions, along with others with selected communities under CARB's Community Air Protection Program, have communities with emission reduction goals in the 2024 and 2025 timeframe.

Slide 44

While NOx has been reduced dramatically in the South Coast Air Basin in the past two decades, to meet the upcoming federal ozone standards, it must be reduced further. This graph shows the NOx emissions in the South Coast since 2000, as were in the SIP inventory included in the 2016 South Coast Air Quality Management Plan. To meet the 80 ppb ozone standard in 2023, NOx must still be significantly reduced from today's levels. If NOx reductions can be achieved to meet the 80 ppb ozone standard, it will set the South Coast on target to meeting the more stringent ozone standards in subsequent years.

Slide 45

The same goes for San Joaquin Valley and meeting the PM2.5 standards in 2024 and 2025. As can be seen on the graph here, NOx has been reduced significantly in the Valley since 2000, but there is still a lot that must be done in the next 5 years. Reductions to meet the PM2.5 standards will put the Valley on track to meeting the ozone standards in 2031 and 2037.

Slide 46

To achieve the level of NOx reductions needed in both regions, all sources of NOx must be reduced, and we can't do this without action at the federal level. As can be seen here, primarily-federally regulated sources represent 31 percent of 2020 NOx emissions in the South Coast, and 22 percent of NOx emissions in the San Joaquin Valley, according to the planning inventory included in the recent SIPs. While NOx from sources under State authority are currently the larger portion, emissions from primarily-federally regulated sources are still substantial and are expected to increase to become the larger portion of mobile source NOx emissions in the next decade.

While these sources are primarily regulated at the federal level, I want to reiterate that CARB is taking the actions we can to reduce emissions from sources in these categories. As Liang talked about a few minutes ago, CARB is using the tools we have available to us to lower emissions levels from locomotives, ocean-going vessels, and other sources in orange here on the pie charts.

Slide 47

As a part of reducing emissions from mobile sources, dirty vehicles and engines must be replaced with newer, cleaner technologies, and incentives are a necessary tool to make this happen, and to achieve the NOx reductions in the time frame needed in both the South Coast and San Joaquin Valley. The South Coast Air Quality Management District determined in their 2016 Air Quality Management Plan that achieving the 80 ppb ozone standard in 2023 would require at least 1 billion dollars a year in incentive funding. The San Joaquin Valley Air Pollution Control district estimated in their 2018 PM2.5 Plan that to attain the PM2.5 standards in 2024 and 25, they would need more than 800 million dollars per year in incentive funding. As can be seen here, funding through the available programs is not currently at the levels needed.

Slide 48

Regardless of federal action or available funding, CARB is moving forward and is doing what it can to lower emissions now. For the near-term 2023 and 2024/25 deadlines, we will get reductions from adopted programs including the Innovative Clean Transit and Zero-Emission Airport Shuttle Bus regulations, as well as others coming to the board in the near future with implementation dates planned for the

next few years. Regulations that the Board will consider soon include the Heavy-duty Inspection & Maintenance program, the Heavy-duty Low-NOx Omnibus, the Advanced Clean Trucks regulation, the Clean Miles Standard, and the Locomotive emission reduction measure.

Slide 49

In addition, the Board is scheduled to consider a number of amendments and new regulations that will provide additional NOx reductions by 2031, as seen on this slide. These include Advanced Clean Cars 2.0, Zero-Emission Forklifts and Cargo-Handling Equipment regulations, and new regulatory concepts including potential off-road diesel standards, off-road on-board diagnostics requirements, and new recreational marine boat standards.

Slide 50

Alright, we're just about done, so I'm going to wrap things up a little before we start getting to your questions.

Slide 51

As I mentioned a few minutes ago, federal action is critical and will become even more so into the future. As can be seen on the plot on this slide, mobile source NOx emissions in the South Coast from sources under State control had decreased 75 percent by 2019 since 2000, and will continue to do so going forward as we implement the programs CARB has on the books and adopt additional regulations. Mobile sources that are primarily under federal control have also seen some reduction since 2000, but without new standards at the federal level, emissions from primarily federally regulated sources are expected to grow over the next decade and surpass emissions from California-regulated mobile sources before 2030. Achieving reductions from these sources is critical to meeting the health protective air quality standards and other goals in the South Coast, and throughout the State.

Slide 52

In addition to action at the federal level, increased levels of incentive funding are needed Statewide, and specifically in the South Coast and San Joaquin Valley to attain the very near-term deadlines for ozone and PM2.5 attainment. AB 617 funding is also of great importance and will provide the critical reductions in impacted communities throughout California.

Slide 53

Amongst the great needs across the State, CARB continues to push forward to look for new controls strategies in all mobile sectors. As we have described throughout this presentation, there are new regulatory concepts that have recently been identified,

and as the process on these new concepts and our other regulatory efforts continue, there will be many opportunities for public and stakeholder feedback.

Slide 54

For the 2020 Mobile Source Strategy, as I mentioned in the beginning of the presentation, we are on a timeline that requires this to be completed by the end of the year. We will be continuing the iterative scenario modeling process throughout development, and are planning the board items and document release according to the schedule here.

Slide 55

If you have questions after today's webinar, please feel free to reach out to myself, Ariel Fidely, for general questions, or to Sara or Liang for questions about scenario modeling. We also have the website shown on the slide here which we will be using to post updated information and the document itself when we get to that stage in the process.

Slide 56

So, that concludes our presentation for today. If you have questions or comments right now, please send them to the email address here on the screen, MSS@arb.ca.gov; or, as I mentioned earlier, you can use the chat feature in GoToWebinar.

Please give us a second to organize, and then we'll start reading the written questions we have received over the webinar and CARB staff will do our best to answer and address your questions.