California Air Resources Board

Appendix C

Summary and Response to Department of Finance Comments on the Standardized Regulatory Impact Assessment

I. Summary and Response to Department of Finance (DOF) Comments on the Standardized Regulatory Impact Assessment (SRIA)

DOF reviewed the SRIA submitted for the Proposed Regulation and responded on June 24, 2022. In their response, DOF mischaracterized some aspects of the Proposed Regulation. CARB has included clarification in addition to responses to DOF comments.

In the June 24, 2022, DOF response to CARB, DOF summarized that the Proposed Regulation intended to reduce locomotive emissions by "(1) generally limiting locomotive idle time to 30 minutes by 2023; (2) requiring operators to make deposits based on their emissions into internal accounts that can only be used to buy cleaner locomotives by 2024." CARB agrees with the characterizations of the emission reduction efforts for the Proposed Regulation. However, DOF mischaracterized the other emission reduction methods by stating the Proposed Regulation is "(3) requiring engines built in 2035 or later to be zero-emission" and "(4) banning train engines older than 23 years beginning in 2030."

In response to (3), staff would like to clarify that the Proposed Regulation is not requiring engines built in 2035 or later to be zero emission (ZE). The Proposed Regulation applies to in-use locomotives operating in California only and does not set standards for engines manufactured by locomotive original equipment manufacturers (OEM). As part of the In-Use Operational Requirements, switch, industrial, and passenger locomotives with engine build dates of 2030 or newer will need to be ZE while operating in California. Then in 2035, line haul locomotives with engine build dates of 2035 or later will need to be ZE while operating in California. Staff anticipates that given the current technology climate, along with the catalyst of investments spurred by the Spending Account, ZE and ZE capable locomotives will start to be commercially available in California by 2030. It is also possible that these operational limits could be achievable by utilization of third-party hybridization or conversion kits without depending on OEMs.

In response to (4), the Proposed Regulation is not a ban on locomotive engines, but rather an operational requirement to prevent continued operation in California of notably old locomotives with older and less effective emission controls. Again, the Proposed Regulation and this requirement applies to in-use locomotives operating in California only and does not set standards for engines manufactured by locomotive original equipment manufacturers (OEM) nor does it impose requirements outside of operation in California.

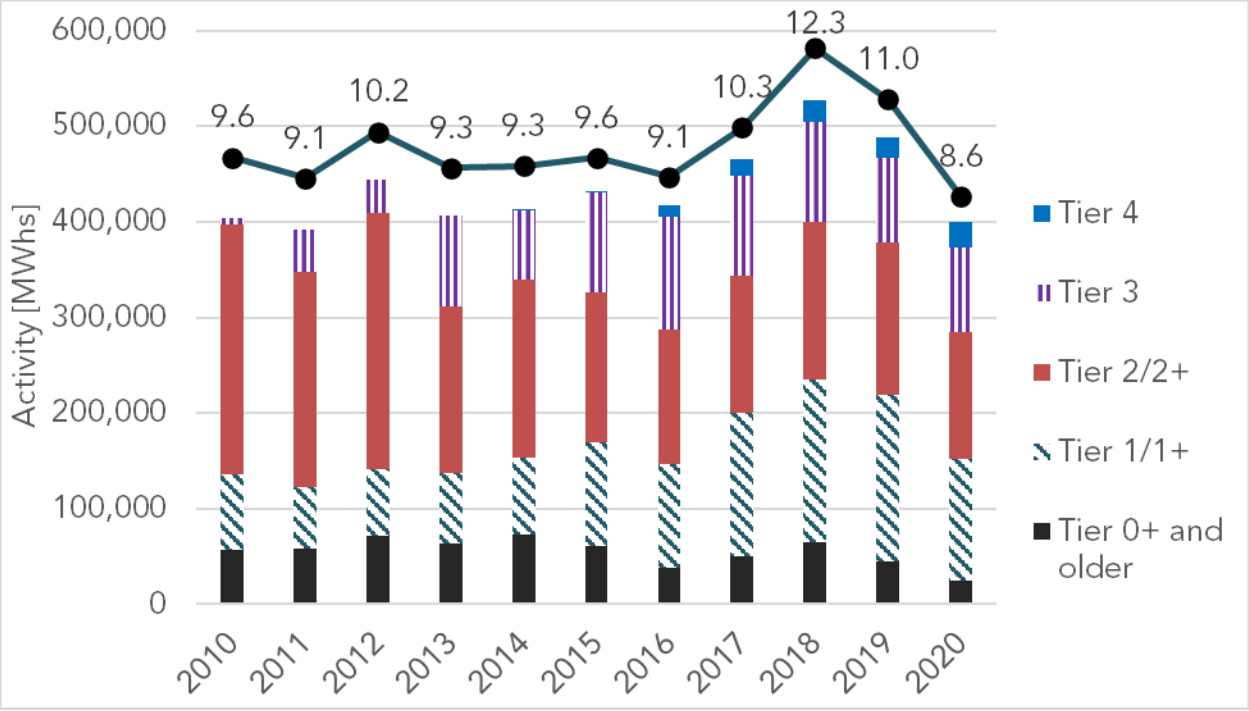
A. DOF Comment #1

"[T]he SRIA assumes that railroads will replace their entire fleets and continue their current practice of sending any available long-haul locomotives to California. However, the SRIA also estimates that the required hydrogen locomotives would cost about 70 percent more than diesel locomotives and that operators will spend more on hydrogen fuel than on diesel fuel, so railroads may have an incentive to replace only the locomotives that run in California and to continue running diesel locomotives in other states. The SRIA should include a sensitivity analysis to show how impacts may vary under different compliance scenarios or provide justification for the current assumption."

B. CARB Response to Comment #1

CARB agrees it is probable that California Class I locomotive operators would not replace their entire national line haul fleet to comply with the Proposed Regulation. Absent more granular data specific to Union Pacific and BNSF Railway operations, staff utilized trends observed from annually reported data collected by the 1998 Memorandum of Mutual Understanding and Agreements, South Coast Locomotive Fleet Average Emissions Program (98MOU). The 98MOU data suggests that Class I locomotive operators prioritized cleaner locomotives in the South Coast Air Basin (SCAB) in the early years of the agreement. Once enough early reduction credits were obtained to achieve the minimum fleet average emissions, the Class I locomotive operators stopped being selective about the SCAB locomotive fleet. Evidence of this can be seen in Figure 1. From 2010 through 2012, 65 percent of SCAB locomotive activity was done with Tier 2/2+ and cleaner locomotives, with Tier 1/1+ and dirtier locomotives accounting for around 30 percent. By 2017, Tier 1/1+ and dirtier locomotives accounted for 43 percent of Class I SCAB activities and have since remained close to that level. This shows that operators have switched from prioritizing certain locomotives for use in California to dispatching locomotives without considering emission levels when possible. Absent Class I input that could inform the fleet operational characteristics, staff provided analysis on both situations.

Figure 1: SCAB Activity (MWhs) and NOx Emissions (line, unit in tpd)



The SRIA provides separate modeling outputs for a California specific fleet and a national fleet turnover. The Proposed Regulation and alternatives reflect the cost to California, to provide values for comparison to the California-specific health benefits presented. Since operations in California represent ten percent of Class I national operations, operators could either send the ten percent of their fleet with the cleanest emissions, similar to their early actions under the 98MOU, or could send locomotives without consideration of their emissions, similar to their current actions. Either way, the cost to California is the same and is

based on ten percent of their national operations used to calculate California benefits. Staff separately provided a sensitivity analysis of the national costs if Class I operators chose to turn over 100 percent of their line haul locomotives.

Also, the Proposed Regulation does not require hydrogen locomotives and is neutral to the technology that achieves ZE or a hybrid ZE capable locomotive. Using currently available technology as a guide, staff assumes hydrogen fuel cell locomotives to be the current preferred ZE locomotive option for line haul locomotives; however, this may change during the span of the Proposed Regulation based on technology advancements.

The SRIA currently assumes yard switchers and road switchers operated by Class I, Class III, and industrial operators will eventually transition to battery-electric ZE locomotives. Class I line haul and passenger locomotives are presumed to use hydrogen fuel cell locomotives due to their increased operational range needs. In 2016, CARB published a report analyzing economic impacts of operating locomotive exchange points outside California to swap out battery-electric ZE locomotives with diesel locomotives. The report concluded that operation of exchange points would cause delays that may lead to mode shift to trucks, and railroads could lose approximately $1.1 billion in revenue. Hydrogen fuel cell locomotives can meet Class I line haul operational needs better than battery-electric locomotives without locomotive exchange points due to their longer range. As mentioned previously, it is possible Class I operators could choose to have a designated California fleet of cleaner locomotives and continue to use diesel elsewhere. However, discussions with Class I operators have not indicated whether this was a viable option. Additionally, CARB could not determine what the California fleet would be comprised of, whether battery-electric or hydrogen, and thus absent input from Class I operators more analysis is not likely to yield an improved impact assessment.

C. DOF Comment #2

"The SRIA assumes that incidence-per-ton factors calculated for the period from 2014 to 2016 will hold in the future, while it may be that additional years of data might change these factors and/or causal relationships and hence change the estimated benefits. The SRIA should explain why the period from 2014 to 2016 was used or update the analysis with additional years of data."

D. CARB Response to Comment #2

The SRIA uses the most updated incidence-per-ton (IPT) factors available to estimate future health benefits. CARB will be updating the IPT factors and underlying data in the future, but additional analyses are needed to ensure that the IPT factors for human-made sources of air pollution are not affected by events such as the occurrence of high wildfire seasons after 2016. There is a strong body of epidemiological research supporting the causal and likely causal relationships between PM2.5 exposure and the adverse health outcomes CARB evaluated, and this research has grown over the years. Additionally, recent studies continue to show that exposures to even low PM2.5 concentrations, below the levels of current air quality standards, can lead to adverse health outcomes. Therefore, the causal and likely causal relationships reflect the most recent science.

E. DOF Comment #3

"The SRIA evaluates cancer risk impacts for only the population living within a mile of a railyard. As moving from just inside the 1-mile radius to just outside may not eliminate the cancer risk, the SRIA should include a sensitivity analysis to show how health benefits may vary for different proximities or explain why the 1-mile rule is the best approximation to evaluate changes in cancer risk from reduced locomotive emissions."

F. CARB Response to Comment #3

Between 2007 and 2009, CARB conducted railyard health risk assessments (HRA) for 17 major railyards in California. The railyard HRAs showed that the diesel PM (DPM) emission from locomotives operating within a railyard resulted in elevated cancer risks in the communities adjacent to the railyards, and beyond. The HRAs also indicated that the zone of impact can extend to an area of several miles from the boundary of the railyard. DPM has been identified as a toxic air contaminant by CARB and there is no acceptable level of exposure for all communities either adjacent to or around the railyards.

For the Proposed Regulation, staff updated the 2007-2009 HRAs. The updated Health Risk Characterization (HRC) averaged the cancer risk, with a region extending out one mile from the railyard boundary as a reference area to evaluate the relative reduction in cancer risk that would result from the Proposed Regulation. Staff further broke down the one-mile area into bands of 0-0.25, 0.25-0.5, and 0.5-1.0 miles, and the estimated average cancer risks within these areas. The results showed a strong association between the cancer risk level and the distance from emission sources, which is consistent with the findings of previous HRAs.

As presented in the HRC document, the locomotive DPM emission reductions from the Proposed Regulation indicate that there would be substantial reductions of health impacts within communities near railyards. The residents exposed to the elevated cancer risks within areas beyond one-mile from the railyard boundaries would also have similar risk reductions from the Proposed Regulation. Using the one-mile boundary to show that cancer risk from DPM emitted by locomotives directly correlates with the distance from the emission source, means that additional analysis of boundaries beyond one mile was not necessary for the Proposed Regulation.