State of California
Air Resources Board

Public Hearing to Consider the Proposed Amendments to the Airborne Toxic Control Measure for In-Use Diesel-Fueled Transport Refrigeration Units (TRU) and TRU Generator Sets, and Facilities Where TRUs Operate

Staff Report: Initial Statement of Reasons

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Executive Summary

California Air Resources Board (CARB or Board) staff are proposing amendments to the Airborne Toxic Control Measure for In-Use Diesel-Fueled Transport Refrigeration Units (TRU) and TRU Generator Sets, and Facilities Where TRUs Operate (TRU ATCM; title 13, California Code of Regulations, section 2477),[1] hereafter referred to as the "Proposed Amendments." CARB adopted the TRU ATCM in 2004 (and amended it in 2010 and 2011) to reduce diesel particulate matter (diesel PM) emissions from diesel-powered TRUs and TRU generator sets (gen set), and near-source health risk at facilities where TRUs operate. This Initial Statement of Reasons presents staff's proposal to amend the TRU ATCM to achieve additional emission reductions from TRUs by transitioning diesel-powered truck TRUs to zero-emission (ZE), as well as requiring a PM emission standard for newly-manufactured TRUs in the remaining categories, the use of lower global warming potential (GWP) refrigerant, facility registration and reporting, expanded TRU reporting and labeling, and fees. Driven by the Governor's Executive Order (EO) N-79-20,[2] which set a goal for 100 percent ZE off-road vehicles and equipment by 2035, the Proposed Amendments begin the transition of diesel-powered TRUs to ZE technology and are a part of California's holistic plan to meet the State's multiple public health, air quality, and climate goals.

A. What are TRUs and TRU Gen Sets?

TRUs are refrigeration systems powered by integral (inside the TRU housing) diesel engines designed to control the environment of temperature-sensitive products transported in insulated trucks, trailers, shipping containers, or railcars. TRU gen sets are diesel internal combustion engine-powered generators designed to provide electric power to electrically-powered refrigeration units of any kind. This includes, but is not limited to, TRU gen sets that provide electricity to electrically-powered refrigeration systems for shipping containers when they are not plugged into ocean-going ship electric power or dock shore power. TRUs are capable of both cooling and heating.

B. Why are TRUs Regulated in California?

TRUs emit multiple air pollutants, such as diesel PM, fine particulate matter (PM2.5), oxides of nitrogen (NOx), and greenhouse gases (including hydrofluorocarbons and

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[1] California Air Resources Board, Public Hearing to Consider the Adoption of the Proposed Airborne Toxic Control Measure for In-Use Diesel-Fueled Transport Refrigeration Units (TRU), TRU Generator Sets, and Facilities where TRUs Operate, Staff Report: Initial Statement of Reasons, October 2003. (web link: https://ww3.arb.ca.gov/regact/trude03/isor.pdf)

[2] Executive Order N-79-20, State of California Executive Order signed by Governor Gavin Newsom, September 23, 2020. (web link: https://www.gov.ca.gov/wp-content/uploads/2020/09/9.23.20-EO-N-79-20-Climate.pdf)

black carbon). TRUs typically operate at refrigerated warehouses or distribution centers (which include cold storage warehouses), grocery stores, seaport facilities, intermodal railyards, and other locations that are often near sensitive receptors, such as schools, hospitals, senior care facilities, and residential neighborhoods. Emissions from diesel-powered TRUs contribute to community health risk, regional air pollution, and global climate change.

- Diesel PM: In 1998, CARB identified diesel PM as a toxic air contaminant based on its potential to cause lung cancer and other health problems. These health issues include premature death, increased hospital admissions for cardiovascular and respiratory illnesses, and increased emergency room visits for asthma. This is especially true for children, the elderly, outdoor workers, and other sensitive populations.
- PM2.5 and NOx: These pollutants are directly emitted from diesel-powered TRUs and can react in the atmosphere with other chemicals to create regional air pollutants over a larger geographic area. For example, NOx emissions contribute to both regional ozone and PM2.5 levels. The non-cancer health impacts from exposure to PM2.5 are consistent with those described above for diesel PM, with the primary concern being adverse cardiac and respiratory effects.
- Greenhouse Gases (GHG): Hydrofluorocarbons (emitted when refrigerant leaks from TRUs due to normal wear and fatigue of refrigerant fittings), black carbon (a subset of PM2.5), and carbon dioxide from diesel-powered TRUs contribute to climate change. Climate change is one of the most serious environmental threats facing the world today. California is already feeling the effects of climate change, including raging wildfires, coastal erosion, disruption of water supply, threats to agriculture, spread of insect-borne diseases, and continuing health threats from air pollution.[3]
- Impacts on Communities: Many of the communities near facilities where TRUs operate bear a disproportionate health burden due to their close proximity to emissions from the diesel engines that power TRUs. Several communities across the State contain "groups" or "clusters" of facilities where TRUs operate. In many cases, these facilities are in or near communities that the California Environmental Protection Agency (CalEPA) classifies as disadvantaged. CalEPA uses the California Communities Environmental Health Screening Tool to score California communities based on environmental pollution burden and

[3] California Air Resources Board, California's 2017 Climate Change Scoping Plan, November 2017. (web link: https://ww2.arb.ca.gov/sites/default/files/classic//cc/scopingplan/scoping_plan_2017.pdf)

socio-economic indicators.[4] Exposure to diesel pollution is a main contributor to many communities scoring in the top 10th percentile statewide.

C. What are the Current Requirements of the TRU ATCM?

The TRU ATCM requires TRU engines that operate in California to meet specific in-use performance standards that require diesel PM emissions to be reduced in accordance with a phased compliance schedule. The phased compliance schedule is based on the model year (MY) of the TRU engine, and requires compliance with the in-use performance standard seven years after the engine MY. Ultimately, all TRU engines are required to meet the ultra-low emission TRU (ULETRU) performance standard and have 85 percent PM control (compared to an uncontrolled Tier 0 engine) to be fully compliant with the TRU ATCM. TRU owners have the following compliance options under the TRU ATCM:

- Use a TRU equipped with an engine that meets the United States Environmental Protection Agency (U.S. EPA) Tier 4 final off-road emission standards for 25-50 horsepower engines (meets ULETRU).
- Retrofit the existing TRU with a Level 3 Verified Diesel Emission Control Strategy with 85 percent PM control (meets ULETRU).
- Use an alternative technology that eliminates TRU diesel engine operation (and emissions) while at a facility. Alternative technologies include electrification, cryogenic refrigeration systems, alternative fuel systems, exclusive use of alternative diesel fuel, fuel cell-powered refrigeration systems, and other technologies that eliminate emissions while at a facility (meets ULETRU).
- Replace the existing unit (engine and refrigeration system) with a new TRU equipped with an engine that meets the U.S. EPA Tier 4 final off-road emission standards for less than 25 horsepower engines, which would be in compliance until the seventh year after the replacement TRU's engine MY (does not meet ULETRU).

D. Why are Staff Proposing Amendments to the TRU ATCM?

CARB's current programs, coupled with efforts at the local and federal level, have achieved success in reducing emissions and resulted in cleaner vehicles and equipment in operation today. Nonetheless, meeting all of California's public health, air quality, and climate goals will require large reductions beyond those occurring under current programs. Staff are proposing amendments to the TRU ATCM to achieve additional emission reductions from diesel-powered TRUs and increase the use of ZE technology

[4] Office of Environmental Health Hazard Assessment, CalEnviroScreen 3.0, June 25, 2018. (web link: https://oehha.ca.gov/calenviroscreen/report/calenviroscreen-30)

in the off-road sector, which is needed to meet these complementary goals, as well as the directive of EO N-79-20.[5]

Many of the communities near facilities where TRUs operate bear a disproportionate health burden due to their close proximity to emissions generated from activity associated with diesel-powered TRUs. Assembly Bill 617 (C. Garcia, Chapter 136, Statutes of 2017)[6] highlights the need for further emission reductions in communities with high exposure burdens, such as those located near facilities where TRUs operate. In addition, staff performed a health risk assessment (HRA) to evaluate the localized cancer risk impacts attributable to emissions from diesel-powered TRUs operating at cold storage warehouses and grocery stores. The HRA estimated the increase in potential cancer risk that would result under the TRU ATCM and indicated a need for further emission reductions from TRUs to provide public health benefits and reduce the cancer risk burden to communities near facilities where they operate.

Challenges remain in meeting the federal ambient air quality standards for ozone and PM2.5 in two areas of the State: the South Coast Air Basin and San Joaquin Valley. Legally-obligated deadlines require these areas to attain the federal ambient air quality standards. These deadlines are established by the federal Clean Air Act and implemented by U.S. EPA each time a new standard is promulgated based on updated information showing health impacts at increasingly lower levels. The near-term targets for these areas are a 2023 deadline for attainment of the 80 parts per billion (ppb) 8-hour ozone standard, 2024 for the 35 microgram per cubic meter (µg/m3) 24-hour PM2.5 standard, and 2025 for the 12 µg/m3 annual PM2.5 standard. There are also mid-term attainment years of 2031 and 2037 for the more recent 8-hour ozone standards of 75 ppb and 70 ppb, respectively.[7]

Reductions in GHGs, including short-lived climate pollutants like black carbon and hydrofluorocarbons, from TRUs are needed to help achieve the State's multiple GHG emission reduction targets and climate goals required by Senate Bill 32 (Pavley,

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[5] EO N-79-20 set a goal for 100 percent ZE off-road vehicles and equipment by 2035.
[6] California Health and Safety Code § 40920.6, 42400, 42402, 39607.1, 40920.8, 42411, 42705.5, and 44391.2, Division 26, Assembly Bill No. 617, Nonvehicular Air Pollution: Criteria Air Pollutants and Toxic Air Contaminants, July 26, 2017. (web link: https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=201720180AB617)
[7] California Air Resources Board, Revised Draft 2020 Mobile Source Strategy, April 23, 2021. (web link: https://ww2.arb.ca.gov/sites/default/files/2021-04/Revised_Draft_2020_Mobile_Source_Strategy.pdf)

Chapter 249, Statutes of 2016)[8] and Senate Bill 1383 (Lara, Chapter 395, Statutes of 2016).[9]

The Proposed Amendments are also needed to address multiple State policies and plans directing CARB to achieve additional diesel emission reductions, including the 2020 Mobile Source Strategy,[10] the 2016 State Strategy for the State Implementation Plan,[11] California's 2017 Climate Change Scoping Plan,[12] the Sustainable Freight Pathways to Zero and Near-Zero Discussion Document,[13] Executive Order B-32-15,[14] and the California Sustainable Freight Action Plan.[15]

Lastly, the Proposed Amendments are needed to address the emergence and growth in the number of trailer TRUs, DSC TRUs, railcar TRUs, and TRU gen sets equipped with engines less than 25 horsepower, which have less stringent emission standards; strengthen the regulation by including requirements for owners and operators of facilities where TRUs operate and vehicle owners, as well as expanded TRU reporting and labeling to monitor compliance; and collect fees from TRU and applicable facility owners to cover CARB's reasonable costs associated with the certification, audit, and compliance of TRUs, as allowed by Senate Bill 854.

E. Why are Staff Developing Two Rulemakings to Transition Diesel-Powered TRUs to ZE Technology?

In October 2020, staff posted an update on the TRU Regulation website announcing the bifurcation of the draft TRU concept to transition diesel-powered TRUs to ZE technology in two parts. In addition to the ZE truck TRU requirements in the Proposed Amendments (Part 1), staff intend to develop an additional rulemaking to transition

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[8] California Health and Safety Code § 38566, Division 25.5, Senate Bill No. 32, September 8, 2016. (web link: https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=201520160SB32)
[9] California Health and Safety Code § 39730, Division 30, Senate Bill No. 1383, Short-lived climate pollutants: methane emissions: dairy and livestock: organic waste: landfills, September 19, 2016. (web link: https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=201520160SB1383)
[10] California Air Resources Board, Revised Draft 2020 Mobile Source Strategy, April 23, 2021. (web link: https://ww2.arb.ca.gov/sites/default/files/2021-04/Revised_Draft_2020_Mobile_Source_Strategy.pdf)
[11] California Air Resources Board, Revised Proposed 2016 State Strategy for the State Implementation Plan, March 7, 2017. (web link: https://www.arb.ca.gov/planning/sip/2016sip/rev2016statesip.pdf)
[12] California Air Resources Board, California's 2017 Climate Change Scoping Plan, November 2017. (web link: https://ww2.arb.ca.gov/sites/default/files/classic//cc/scopingplan/scoping_plan_2017.pdf)
[13] California Air Resources Board, Sustainable Freight Pathways to Zero and Near-Zero Emissions Discussion Document, April 23, 2015. (web link: https://www.arb.ca.gov/gmp/sfti/sustainable-freight-pathways-to- zero-and-near-ZEs-discussion-document.pdf)
[14] Executive Order B-32-15, State of California Executive Order signed by Governor Edmund G. (Jerry) Brown Jr., July, 17, 2015. (web link: https://www.ca.gov/archive/gov39/2015/07/17/news19046/index.html)
[15] California Department of Transportation, et al., California Sustainable Freight Action Plan, July 2016. (web link: https://ww2.arb.ca.gov/sites/default/files/2019-10/CSFAP_FINAL_07272016.pdf)

trailer TRUs and the remaining TRU categories to ZE technology (Part 2). The decision to bifurcate the TRU rulemaking was made in response to EO N-79-20, which directs CARB, in coordination with other State agencies, U.S. EPA, and local air districts, to develop and propose technologically feasible and cost-effective strategies to achieve 100 percent ZE from off-road vehicles and equipment operations in the State by 2035. Previously, staff presented a draft TRU concept at public workshops held in 2019. Although the draft TRU concept included requirements for ZE truck TRUs, trailer TRUs, DSC TRUs, and TRU gen sets were only subject to ZE requirements while stationary at certain facilities in the State. Staff determined that the ZE-operation-while-stationary requirement did not meet the objective of the EO, and it is necessary to transition trailer TRUs and the remaining TRU categories to ZE like the truck TRUs.

While the return-to-base operations of truck TRUs make them suitable for commercially available ZE technology now, currently questions exist as to the range capability and cost-effectiveness of ZE technology for long-haul transport. Questions include use of ZE in TRUs that do not return to a home base each night as well as questions concerning charging infrastructure availability. The two-part rulemaking allows staff to complete an assessment of ZE technologies for trailer TRUs and the remaining TRU categories to inform the development of requirements to transition all TRUs to ZE that are technologically feasible and cost-effective. Transitioning truck TRUs to ZE in Part 1 also provides a strong signal for the development of ZE TRU technologies, which staff believe will result in technology improvements, such as improvements to battery weight and range, earlier than they would have otherwise occurred. These improvements will enable advanced TRU technologies to expand further into extended range applications and support the development of requirements to transition trailer TRUs and the remaining TRU categories to ZE technology in Part 2.

F. What Amendments to the TRU ATCM are Staff Proposing in this Rulemaking?

Staff are proposing amendments to the TRU ATCM to transition diesel-powered truck TRUs to ZE, as well as require a PM standard for newly-manufactured TRU engines in the remaining categories and the use of lower-GWP refrigerant. The Proposed Amendments also include new requirements for owners and operators of applicable facilities where TRUs operate, as well as TRU reporting, compliance labels, and fees. Key elements of the Proposed Amendments include the following:

By December 31, 2022:

- All newly-manufactured truck TRUs, trailer TRUs, and DSC TRUs that operate in California shall use refrigerant with a GWP less than or equal to 2,200, or use no refrigerant at all.

- MY 2023 and newer trailer TRU, DSC TRU, railcar TRU, and TRU gen set engines shall meet a PM emission standard of 0.02 grams per brake horsepower-hour (g/hp-hr) or lower.
    - Note: MY 2022 and older trailer TRU, DSC TRU, railcar TRU, and TRU gen set engines would continue to operate under the current TRU ATCM requirements, in which they shall meet ULETRU by December 31 of the seventh year after the engine MY. For example, a trailer TRU equipped with a MY 2020 engine would have to meet ULETRU by December 31, 2027.

By December 31, 2023:

- Applicable facility[16] owners shall register their facility with CARB, pay registration fees every three years, and report all TRUs that operate at their facility to CARB quarterly, or alternatively attest that only compliant TRUs (i.e., those with a valid CARB compliance label or showing as compliant on CARB's website) operate at their facility.
- TRU owners shall report all TRUs that operate in California to CARB, regardless of where they are based.
- TRU owners shall pay TRU operating fees and affix CARB compliance labels to their TRU every three years, for each TRU operated in California.
- TRU owners shall turnover at least 15 percent of their truck TRU fleet (defined as truck TRUs operating in California) to ZE technology each year (for 7 years). All truck TRUs operating in California shall be ZE by December 31, 2029.

G. What Authority does CARB have to adopt the Proposed Amendments?

Several sections of the California Health and Safety Code (Health & Saf. Code) provide CARB with authority to adopt the Proposed Amendments. More specifically, this regulatory action is proposed under the authority granted to CARB in California Health & Saf. Code sections 39600, 39601, 39618, 39658, 39659, 39666, 39667, 43013, 43018, and 43019.1. This action is proposed to implement, interpret, or make specific, Health & Saf. Code sections 39618, 39650, 39658, 39659, 39666, 39667, 39674, 39675, 42400, 42400.1, 42400.2, 42400.3.5, 42402, 42402.2, 42410, 43013, 43018, and 43019.1.

Health & Saf. Code sections 39600 (General Powers) and 39601 (Standards, Definitions, Rules, and Measures) confer to CARB the general authority and obligation to adopt rules and measures to execute the Board's powers and duties imposed by

[16] An applicable facility is defined in the Proposed Amendments as a refrigerated warehouse or distribution center with a building size greater than or equal to 20,000 square feet, a grocery store with a building size greater than or equal to 15,000 square feet, a seaport facility, or an intermodal railyard if one or more TRUs operate within the legal property boundary of the facility.

State law. In addition, Health & Saf. Code sections 43013 and 43018(a) provide broad authority to achieve the maximum feasible and cost-effective emission reductions from all mobile source categories, including off-road diesel engines.

California's Air Toxics Program, established under California law by AB 1807 (Chapter 1047, Statutes of 1983),[17] and set forth in Health & Saf. Code section 39650 through 39675, mandates the identification and control of air toxics in California. In 1998, CARB identified diesel PM as a toxic air contaminant, and in September 2000, adopted the Diesel Risk Reduction Plan.[18] The Diesel Risk Reduction Plan was the first formal product of the risk management phase and serves as the needs assessment under the AB 1807 process. The plan identified options to reduce diesel PM and the recommended control measures to achieve reductions, including a measure to reduce diesel PM from diesel fueled TRUs and TRU gen sets. The Proposed Amendments fulfill the goals of the Diesel Risk Reduction Plan and complies with the requirements of Health & Saf. Code sections 39666 and 39669.5 to prevent an endangerment to public health. The Proposed Amendments are also in accordance with Health & Saf. Code section 39618, which directs CARB to treat refrigerated trailers as mobile sources and develop regulations to reduce emissions from refrigerated trailers.

Health & Saf. Code sections 39674 and 39675 authorize CARB to impose civil penalties for violations of Health & Saf. Code section 39658, 39659, or Article 4 (beginning with section 39665). Sections 42400 et seq. provide that violation of CARB regulations is a misdemeanor offense and establish different levels of civil penalties for such violations.

Health & Saf. Code section 43019.1 authorizes CARB to adopt a schedule of fees to cover its reasonable costs associated with the certification, audit, and compliance of off-road or non-vehicular engines and equipment, aftermarket parts, and emissions control components sold in the state. The Proposed Amendments include a schedule of fees to recover CARB's reasonable costs associated with these categories.

While the current requirements of the TRU ATCM primarily place compliance obligations on TRU owners and operators, the Proposed Amendments require owners and operators of applicable facilities where TRUs operate to ensure that only compliant TRUs operate on their properties. TRU operations at facilities generate harmful emissions and impact surrounding communities. Therefore, facility owners and operators should bear some responsibility for ensuring TRUs operating on their

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[17] California Air Resources Board, AB 1807 - Toxics Air Contaminant Identification and Control (web link: https://ww2.arb.ca.gov/resources/documents/ab-1807-toxics-air-contaminant-identification-and-control, last accessed May 10, 2021)

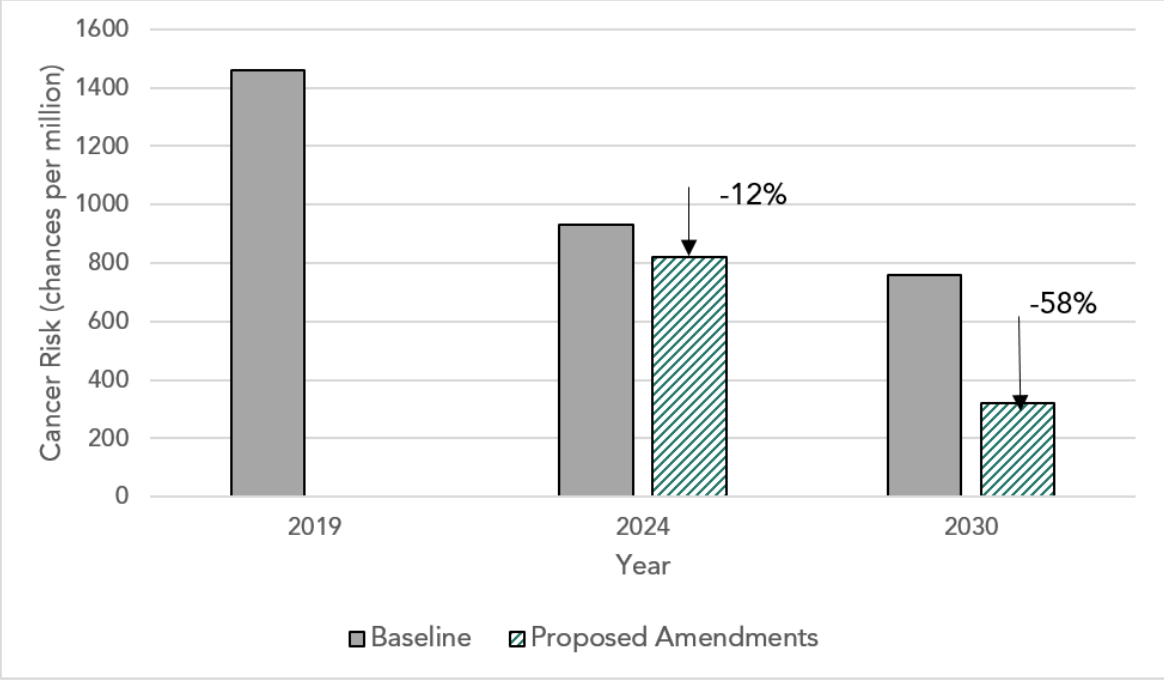
[18] California Air Resources Board, Risk Reduction Plan to Reduce Particulate Matter Emissions from Diesel-Fueled Engines and Vehicles, October 2000. (web link: https://ww2.arb.ca.gov//sites/default/files/classic/diesel/documents/rrpfinal.pdf)

properties are compliant with emissions requirements. CARB's statutory mandates, particularly its air toxics and GHG related mandates, are not limited to vehicular and mobile sources. Therefore, CARB has determined that assigning certain compliance obligations to facility owners and operators, in addition to TRU owners and operators, is necessary and proper for satisfying CARB's statutory mandates to reduce air pollution and the associated health risk from diesel-powered TRUs.

H. What Health Benefits will the Proposed Amendments Provide?

Exposure to pollution from the diesel engines that power TRUs has both potential cancer and non-cancer health impacts. Staff conducted an HRA to evaluate the benefits of the Proposed Amendments regarding potential cancer risk resulting from direct exposure to diesel PM from TRUs operating at cold storage warehouses and grocery stores. Figure ES-1 shows the Proposed Amendments are expected to reduce potential individual residential cancer risk from TRU operations at cold storage warehouses by approximately 12 percent in 2024 and 58 percent after full implementation in 2030.

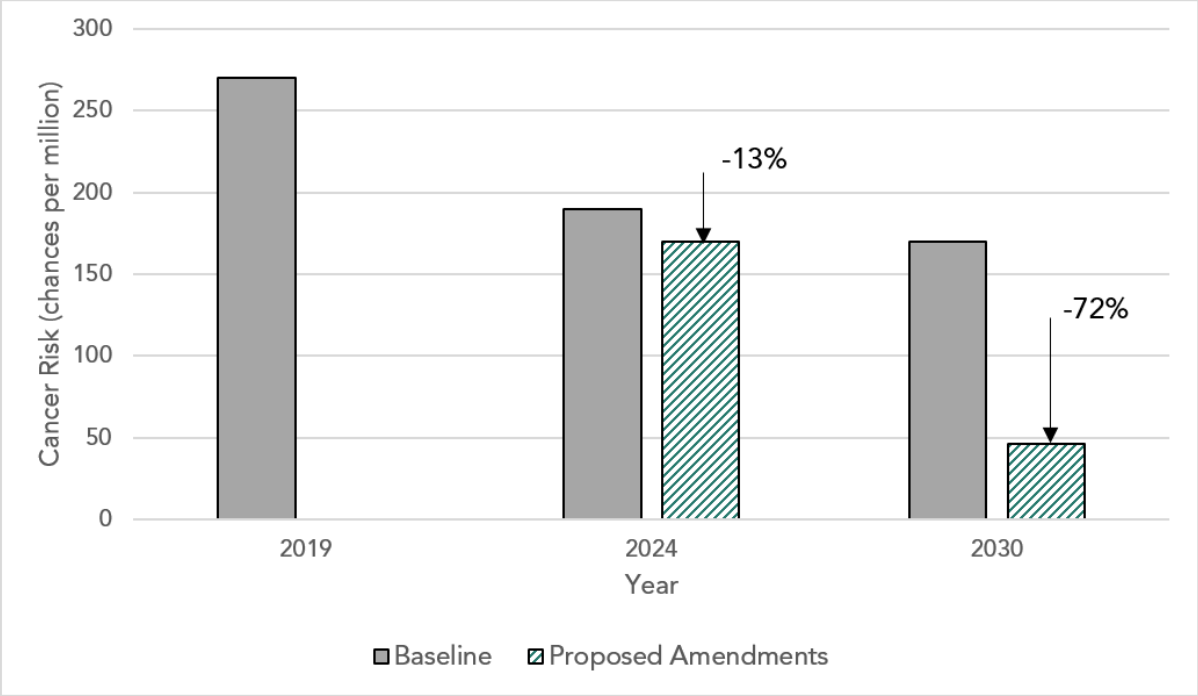
Figure ES-1. Potential Individual Resident Cancer Risk and Risk Reduction for Cold Storage Warehouses[19]



[19] Individual resident cancer risk estimates are based on a 30-year exposure duration using the Risk Management Policy method (95th percentile/80th percentile daily breathing rates. Fraction of time at home equals 1 for age bins <16 years and 0.73 for age bin 16-70 years.

Figure ES-2 shows the Proposed Amendments are expected to reduce potential individual residential cancer risk from TRU operations at grocery stores (with 7 daily trucks, 2 daily trailers, and 1 seasonal trailer) by approximately 13 percent in 2024 and 72 percent after full implementation in 2030.

Figure ES-2. Potential Individual Resident Cancer Risk and Risk Reduction for Grocery Stores (7 Trucks, 2 Trailers, 1 Seasonal Trailer Scenario)[20]



CARB staff evaluated a limited number of statewide non-cancer health benefits associated with reductions in exposure to PM2.5 and NOx emissions resulting from the Proposed Amendments. NOx includes nitrogen dioxide, a potent lung irritant, which can aggravate lung diseases such as asthma when inhaled. However, the most serious quantifiable impacts of NOx emissions occur through the conversion of NOx to fine particles of ammonium nitrate aerosol through chemical processes in the atmosphere. PM2.5 formed in this manner is termed secondary PM2.5. Both directly emitted (primary) PM2.5 and secondary PM2.5 is associated with adverse health outcomes, such as cardiopulmonary mortality, hospitalizations for cardiovascular and respiratory illnesses, and emergency room visits for asthma. As a result, reductions in PM2.5 and NOx emissions are associated with reductions in these adverse health outcomes. Staff estimates that the total reduction in the number of cases statewide

[20] Individual resident cancer risk estimates are based on a 30-year exposure duration using the Risk Management Policy method (95th percentile/80th percentile daily breathing rates. Fraction of time at home equals 1 for age bins <16 years and 0.73 for age bin 16-70 years.

due to the implementation of the Proposed Amendments from 2022 to 2034 would be as follows:

- 177 fewer premature deaths (138 to 217, 95 percent confidence interval (CI))
- 57 fewer hospital admissions for cardiovascular and respiratory illnesses (7 to 106, 95 percent CI)
- 87 fewer emergency room visits for asthma (55 to 119, 95 percent CI)

Table ES-1 shows the total statewide valuation of avoided adverse health outcomes as a result of the Proposed Amendments from 2022 to 2034, which is estimated to be $1.75 billion (compared to approximately $1.04 billion in total net costs).

Table ES-1. Statewide Valuation of Avoided Adverse Health Outcomes as a Result of the Proposed Amendments from 2022 to 2034 (2019$)

Outcome	Valuation
Avoided Premature Deaths	$1,749,747,000
Avoided Hospitalizations	$3,092,000
Avoided Emergency Room Visits	$73,000
Total	$1,752,912,000

Note: Values have been rounded to the nearest thousand.

While CARB's PM2.5 mortality and illness analysis has been, and continues to be, a useful method for valuing the health benefits of regulations, it only represents a portion of those benefits. The full health benefits of the Proposed Amendments are underestimated because not all the adverse health outcomes associated with PM2.5 and additional pollutants such as air toxics are evaluated and monetized. Also, CARB's current evaluation methodology does not take into account all PM2.5 precursor emissions. Expansion of the emissions inputs and health outcomes, including, but not limited to, additional cardiovascular and respiratory illnesses, nonfatal/fatal cancers, nervous system diseases, and work loss days would provide a more comprehensive picture of the benefits from reduced exposure to air pollution.

I. What Air Quality and Climate Benefits will the Proposed Amendments Provide?

The Proposed Amendments will reduce PM2.5, NOx, and GHG emissions from diesel-powered TRUs beyond levels that would be achieved under the current TRU ATCM. From 2022 to 2034, the Proposed Amendments are expected to further reduce cumulative statewide TRU emissions by approximately 1,258 tons of PM2.5, 3,515 tons of NOx, and 1.42 million metric tons of GHGs. Table ES-2 shows the estimated annual emission reductions from the Proposed Amendments from 2022 to 2034.

Table ES-2. Estimated Annual NOx, PM2.5, and GHG Emission Reductions as a Result of the Proposed Amendments from 2022 to 2034

Year	PM2.5 (tons)	NOx (tons)	GHG (MMTCO2e)[21]
2022	0	0	0.00
2023	16	0	0.01
2024	32	59	0.03
2025	48	119	0.05
2026	65	181	0.07
2027	83	246	0.09
2028	115	312	0.12
2029	133	381	0.14
2030	148	430	0.16
2031	151	436	0.17
2032	153	443	0.18
2033	155	451	0.19
2034	158	458	0.20
Total	1,258	3,515	1.42

Figure ES-3, Figure ES-4, and Figure ES-5 show the PM2.5, NOx, and GHG emissions impact of the Proposed Amendments relative to the Baseline from 2022 to 2034.

[21] Includes GHG emission reductions from TRU engine and refrigerant in million metric tonnes of carbon dioxide equivalent (MMTCO2E).

Figure ES-3. Statewide PM2.5 Emissions from TRUs in the Baseline and under the Proposed Amendments from 2022 to 2034

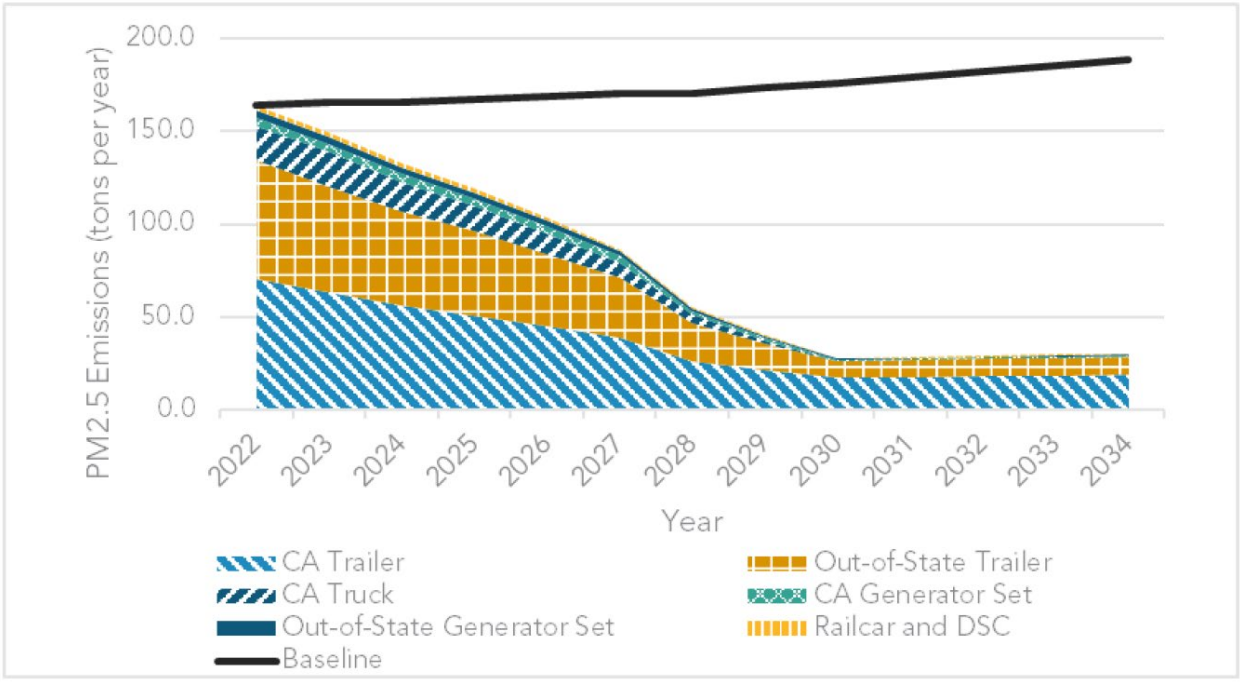


Figure ES-4. Statewide NOx Emissions from TRUs in the Baseline and under the Proposed Amendments from 2022 to 2034

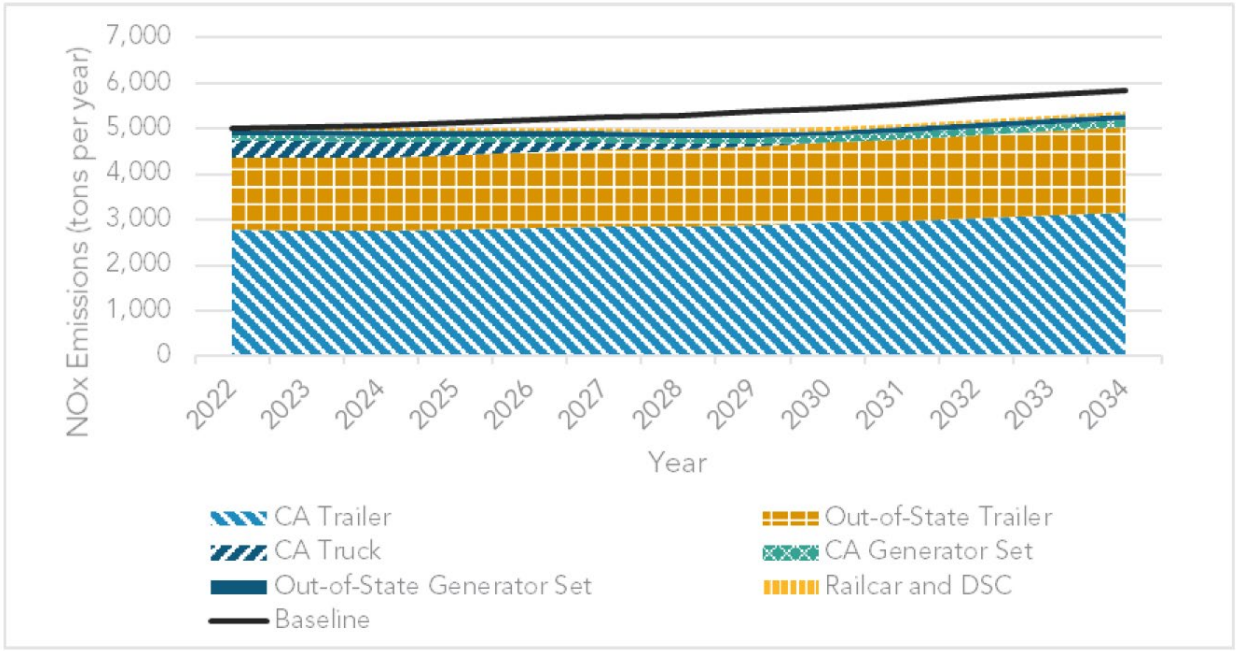
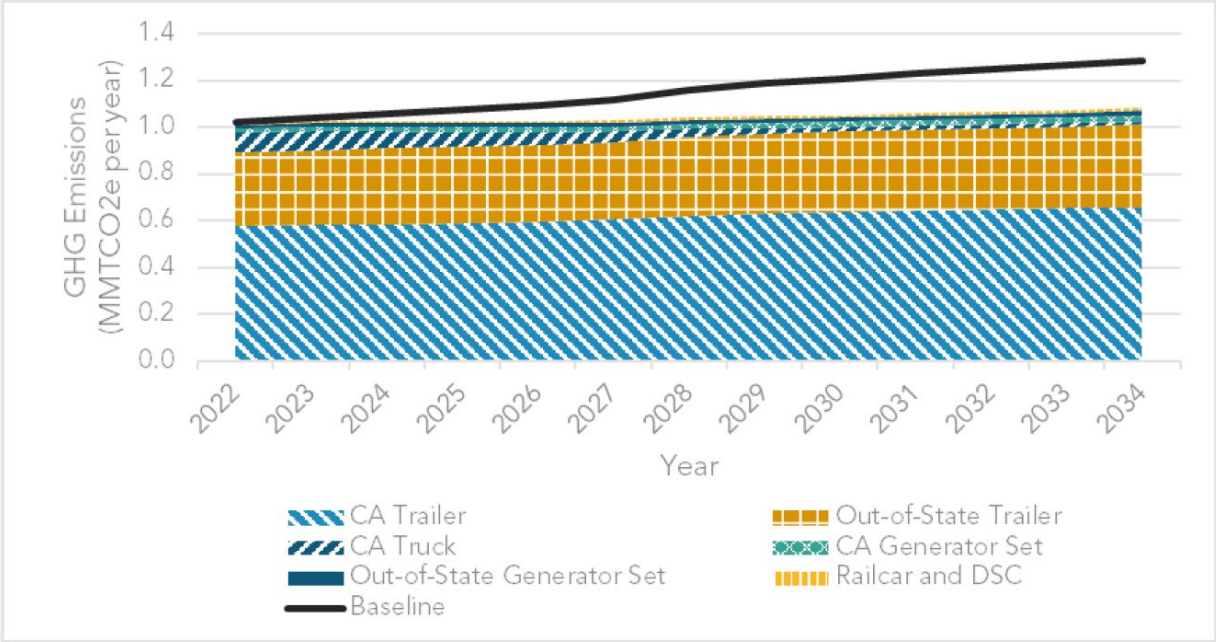


Figure ES-5. Statewide GHG Emissions from TRUs in the Baseline and under the Proposed Amendments from 2022 to 2034



J. What Other Benefits will the Proposed Amendments Provide?

Transitioning diesel-powered truck TRUs to ZE under the Proposed Amendments will provide an opportunity to increase ZE technology in the off-road sector. As more truck TRU fleets use ZE technologies as a result of the Proposed Amendments, industry acceptance of advanced technologies will improve. The state of ZE TRU technology will progress and expand into extended range applications, as well as other off-road sectors. Purchases of ZE truck TRUs will also benefit ZE TRU manufacturers, as well as various businesses in the ZE TRU supply chain, including those involved in battery, fuel cell, cold plate, and solar photovoltaic technology throughout the State.

The Proposed Amendments will increase the installation of electric charging and fueling infrastructure needed to support the use of ZE truck TRUs. Advanced TRU technologies are underutilized due in part to limited access to supporting infrastructure at the facilities where TRUs operate. Additional installations of electric charging and fueling infrastructure will support the use of these technologies, as well as other advanced technology equipment and vehicles onsite.

Electric charging and fueling infrastructure installations will provide opportunities for design, engineering, construction, and project management firms to design new and expanded infrastructure at approximately 1,000 truck TRU home base facilities statewide. The increase in electric charging and fueling infrastructure will also benefit suppliers, equipment installers, electricians, and ZE fuel providers. All of the

installations will be in California, and some of the infrastructure equipment may be manufactured in California.

The increased use of electric charging infrastructure will increase the amount of electricity supplied by utility providers and help the State's investor-owned utilities meet the goals of Senate Bill 350.[22] Senate Bill 350 requires the State's investor-owned utilities to develop programs to accelerate widespread transportation electrification with goals to reduce dependence on petroleum, increase the uptake of ZE vehicles, help meet air quality standards, and reduce GHGs.

Lastly, the Proposed Amendments will result in noise reduction benefits. Diesel-powered TRUs can produce a substantial amount of noise, which also results in adverse health impacts. This is of concern when TRUs operate in and near places where people live, work, and play. Staff have received several noise complaints regarding TRU activity near schools, hospitals, elder care facilities, and residential neighborhoods. The Proposed Amendments will transition diesel-powered truck TRUs to ZE technology, which produces little to no noise. This will eventually eliminate the use of diesel-powered truck TRUs and reduce noise levels.

K. Are the Proposed Amendments Technically Feasible?

The Proposed Amendments require diesel-powered truck TRUs to transition to ZE technology. According to the statewide TRU emission inventory, truck TRUs operating in the State are California-based. Truck TRUs are generally used for local and regional delivery, and return to a home base each night. Based on their daily operational characteristics and operating range of current technologies, TRUs installed on trucks are well suited for ZE, because they would not require additional refueling or recharging infrastructure outside their home terminals or distribution centers before dispatch.

Truck TRU owners can comply with the ZE truck TRU requirement using a combination of commercially available battery-electric, solar, cold plate, and cryogenic ZE technologies. All of the commercially-available ZE truck TRU technologies achieve the key performance parameters required for transport refrigeration with the ability to perform their duty cycles by maintaining optimum set point temperature and providing fast pre-cool of the cargo area. All of the commercially available ZE truck TRUs also achieve the necessary operating range of 8 to 10 hours of daily operation between refueling, which is dependent on factors specific to each operation, including the length of the route, product being transported, temperature of the load, number of door openings on the route, and outdoor temperature. Solar assist may extend the range of battery-electric and cryogenic TRU systems by an additional 1 to 2 hours a

[22] California Legislature, Senate Bill No. 350, signed October 7, 2015. (web link: https://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill_id=201520160SB350)

day. There is minimal impact on the payload capacity because the weight of the battery, solar panels, cold plates, or cryogenic fuel tank is offset by the removal of the diesel engine.

The Proposed Amendments require newly-manufactured trailer TRU, DSC TRU, railcar TRU, and TRU gen set engines to meet a PM emission standard of 0.02 g/hp-hr. The proposed PM standard aligns with the U.S. EPA Tier 4 final PM emission standard for engines greater than 25 horsepower, regardless of horsepower. Both of the two major TRU manufacturers, Carrier Transicold (Carrier) and Thermo King, offer units with engines certified to meet the PM standard.

The Proposed Amendments require newly-manufactured truck TRUs, trailer TRUs, and DSC TRUs that operate in California to use a refrigerant with a GWP value less than or equal to 2,200, or use no refrigerant at all. The current predominant refrigerant used in TRUs is R-404A. Despite being non-ozone-depleting, R-404A refrigerant has a high GWP value of 3,922, which is above the proposed threshold of 2,200. R-452A refrigerant is a hydrofluoroolefin-based replacement for R-404A. Like R-404A, R-452A is non-ozone depleting, but has a lower-GWP of 2,140 and will meet the proposed threshold. R-452A is a "design-compatible" replacement for R-404A because it offers similar levels of refrigeration performance, fuel efficiency, reliability, and refrigerant charge.[23] R-452A can be used in new transport refrigeration equipment and for the retrofit of existing systems. U.S. EPA approved R-452A for use in transport refrigeration applications in 2017[24] and both Carrier and Thermo King offer R-452A refrigerant as an alternative in their units.

Staff have worked closely with TRU manufacturers to ensure the requirements and regulatory compliance dates in the Proposed Amendments are feasible. In addition, the Proposed Amendments retain the provisions in the current TRU ATCM for a compliance extension that may be granted to TRU owners if there is no compliance technology available for a specific TRU within six months of a compliance date, and include new provisions for a compliance extension that may be granted to truck TRU owners for the ZE truck TRU requirements due to unforeseen, temporary, or extenuating circumstances outside of the TRU owner's control that prevents the installation of ZE charging or fueling Infrastructure.

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[23] Refrigerated Transporter, "Carrier Transicold will offer R-452A for reefer transport," July 28, 2017. (web link: https://www.refrigeratedtransporter.com/going-green/article/21721031/carrier-transicold-will-offer-r452a-for-reefer-transport)

[24] United States Environmental Protection Agency, Federal Register, Vol. 82, No. 139, Page 33823, July 21, 2017. (web link: https://www.govinfo.gov/content/pkg/FR-2017-07-21/pdf/2017-15379.pdf)

L. What Cost Impacts will the Proposed Amendments have?

The total net cost of the Proposed Amendments from 2022 to 2034 is estimated to be $1.04 billion, which is less than the approximate $1.75 billion in expected monetized health benefits. Direct costs include capital costs for ZE truck TRUs and supporting infrastructure, new TRUs equipped with engines certified to meet the PM emission standard, lower-GWP refrigerant, TRU refrigerant maintenance costs, truck TRU infrastructure maintenance costs, electricity usage, CARB fees, and administrative costs for registration and reporting. Cost savings include truck TRU capital costs (ZE truck TRUs would no longer need to take compliance action every seven years), truck TRU maintenance cost savings, truck TRU diesel fuel savings, and Low Carbon Fuel Standard credit revenue. Table ES-3 shows the annual direct costs, cost savings, and net cost of the Proposed Amendments from 2022 to 2034.

Table ES-3. Annual Direct Costs, Cost Savings, and Net Cost of the Proposed Amendments from 2022 to 2034 (2019$)

Year	Annual Direct Costs	Annual Cost Savings	Annual Net Cost
2022	$0	$0	$0
2023	$32,800,000	$0	$32,800,000
2024	$47,600,000	(-$4,200,000)	$43,400,000
2025	$70,700,000	(-$9,200,000)	$61,500,000
2026	$111,600,000	(-$13,500,000)	$98,100,000
2027	$144,900,000	(-$20,100,000)	$124,800,000
2028	$155,300,000	(-$24,700,000)	$130,600,000
2029	$159,200,000	(-$29,400,000)	$129,800,000
2030	$151,000,000	(-$32,200,000)	$118,800,000
2031	$134,100,000	(-$32,300,000)	$101,800,000
2032	$113,600,000	(-$38,000,000)	$75,600,000
2033	$113,200,000	(-$50,000,000)	$63,200,000
2034	$116,800,000	(-$57,200,000)	$59,600,000
Total	$1,350,800,000	(-$310,800,000)	$1,040,000,000

M. How will the Proposed Amendments be enforced?

The Proposed Amendments include additional compliance mechanisms beyond traditional inspections and investigations of TRUs alone to ensure industry-wide compliance, maximize emission reductions, and level the playing field between owners of compliant and non-compliant TRUs, as well as in-state and out-of-state TRUs.

These mechanisms include multiple-party responsibilities, added requirements for owners and operators of applicable facilities to ensure that only compliant TRUs operate on their property, and expanded TRU reporting and labeling requirements. In addition to these new requirements, staff will continue to enforce the Proposed

Amendments by conducting unit, fleet, and facility inspections, and fleet and facility investigations. Inspections and investigations may result in corrective actions, including Department of Motor Vehicle registration holds on trucks where authorized, and substantial civil penalties for violations of the Proposed Amendments.

N. What was the Public Process for Developing the Proposed Amendments?

Staff have engaged in an extensive public process since development of the Proposed Amendments began in early 2016. Staff conducted eight public workshops to solicit stakeholder feedback and discuss regulatory concepts, methodology and data used to develop the emission inventory and conduct an HRA, infrastructure considerations, and compliance and enforcement mechanisms. Staff posted information regarding these workshops and any associated materials on the TRU Regulation website[25] and distributed notice of these meetings through several public list serves that include over 17,000 recipients.[26] In addition, staff held three work group meetings to solicit feedback on regulatory concepts, as well as discuss infrastructure and enforcement issues related to the Proposed Amendments.

As of June 2021, staff have conducted more than 160 informal meetings, phone calls, and site visits with a broad group of stakeholders to discuss the Proposed Amendments and gather input and information. This includes members of impacted communities, environmental justice advocates, air districts, TRU owners and operators, trade associations, TRU original equipment manufacturers, TRU dealers and service centers, truck and trailer dealers, truck and trailer leasing companies, freight brokers, forwarders, shippers, receivers, freight facility owners and operators, and other interested parties.

In addition to meeting with a wide range of stakeholders, staff also conducted targeted outreach to potential applicable facilities. This includes mailing over 40,000 postcards to facilities with refrigerated operations potentially affected by the Proposed Amendments to notify them of upcoming workshops and direct them to the TRU Regulation website for more information. Staff also visited several facilities, including refrigerated warehouses, distribution centers, cold storage warehouses, port terminals, and railyards to learn more about their business operations and to better

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[25] California Air Resources Board, New Transport Refrigeration Unit Regulation in Development Website. (web link: https://ww2.arb.ca.gov/our-work/programs/transport-refrigeration-unit/new-transport-refrigeration-unit-regulation, last accessed May 10, 2021)

[26] Number of subscribers for the following CARB lists as of January 28, 2021: Agricultural Activities, Community Air, Environmental Justice ChERRP, Commerce, Environmental Justice ChERRP, Mira Loma, Environmental Justice ChERRP, Wilmington, Goods Movement Emission Reduction Program, Port Truck, Reduction of GHG Emissions from Refrigerated Shipping Containers, Stationary Equipment Refrigerant Management Program, Sustainable Freight Transport Initiative, and Transport Refrigeration Units.

understand potential implementation challenges associated with the Proposed Amendments.

I. Introduction and Background

California Air Resources Board (CARB) staff are proposing amendments to the Airborne Toxic Control Measure for In-Use Diesel-Fueled Transport Refrigeration Units (TRU) and TRU Generator Sets, and Facilities Where TRUs Operate (TRU ATCM; title 13, California Code of Regulations (CCR), section 2477), herein referred to as the "Proposed Amendments." CARB adopted the TRU ATCM in 2004 (and amended it in 2010 and 2011) to reduce diesel particulate matter (diesel PM) emissions and resulting health risk from diesel-powered TRUs used to control the environment of temperature-sensitive products transported in insulated trucks, trailers, shipping containers, or railcars, as well as diesel-powered TRU generator sets (gen set) that provide electric power to electrically-powered refrigeration units of any kind.

This Initial Statement of Reasons (Staff Report) presents the Proposed Amendments. Chapter III provides a detailed summary of the Proposed Amendments. The Staff Report also summarizes the information that staff used in developing the Proposed Amendments. The Staff Report is organized as follows:

- Chapter I provides an introduction and background information.
- Chapter II describes the problem this rulemaking is intended to address.
- Chapter III provides a summary of the staff proposal.
- Chapter IV summarizes the specific purpose and rationale for each amendment.
- Chapter V summarizes the benefits anticipated from the Proposed Amendments.
- Chapter VI summarizes the air quality, climate, and health benefits of the Proposed Amendments.
- Chapter VII presents the Environmental Analysis prepared to comply with the California Environmental Quality Act (CEQA).
- Chapter VIII describes how the proposal is consistent with CARB's environmental justice policies.
- Chapter IX summarizes the technical feasibility of the Proposed Amendments.
- Chapter X summarizes the cost and economic impact analysis for the Proposed Amendments.
- Chapter XI summarizes the alternative proposals considered.
- Chapter XII provides a justification for the adoption of regulations different from federal regulations.
- Chapter XIII describes enforcement and compliance mechanisms for the Proposed Amendments.
- Chapter XIV summarizes the public process for development of the Proposed Amendments.
- Chapter XV lists references used.

A. Need for Proposed Amendments

CARB's current programs, coupled with efforts at the local and federal level, have achieved success in reducing emissions, resulting in significantly cleaner vehicles and equipment in operation today. Nonetheless, meeting all of California's public health, air quality, and climate goals will require large reductions beyond those occurring under existing programs.

Many of the communities near facilities where TRUs operate bear a disproportionate health burden due to their close proximity to emissions from the diesel engines that power TRUs. There are several occurrences across the State where communities contain "groups" or "clusters" of facilities where TRUs operate. In many cases, these facilities are located in or near communities that are classified as disadvantaged by the California Environmental Protection Agency (CalEPA). CalEPA uses the California Communities Environmental Health Screening Tool (CalEnviroScreen) to rank California communities based on environmental pollution burden and socio-economic indicators.[27] Exposure to diesel PM is a main contributor to many communities ranked in the top 10th percentile statewide on CalEnviroScreen. In recognition that air pollution heavily impacts disadvantaged communities in California, the State of California signed into law Assembly Bill (AB) 617 (C. Garcia, Chapter 136, Statutes of 2017)[28] in 2017. AB 617 is a significant piece of air quality legislation that highlights the need for further emission reductions in communities with high exposure burdens, such as those located near facilities where TRUs operate.

Despite progress in improving air quality, challenges remain in meeting the ambient air quality standards for ozone and fine particulate matter (PM2.5) in two areas of the State: the South Coast Air Basin and San Joaquin Valley. The near-term targets for these areas are a 2023 deadline for attainment of the 80 parts per billion (ppb) 8-hour ozone standard, 2024 for the 35 microgram per cubic meter (µg/m3) 24-hour PM2.5 standard, and 2025 for the 12 µg/m3 annual PM2.5 standard. There are also mid-term attainment years of 2031 and 2037 for the more recent 8-hour ozone standards of 75 ppb and 70 ppb, respectively.[29]

In addition, climate change is one of the most serious environmental threats facing the world today. Climate scientists agree that global warming and other shifts in the

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[27] Office of Environmental Health Hazard Assessment, CalEnviroScreen 3.0, June 25, 2018. (web link: https://oehha.ca.gov/calenviroscreen/report/calenviroscreen-30)
[28] California Health and Safety Code § 40920.6, 42400, 42402, 39607.1, 40920.8, 42411, 42705.5, and 44391.2, Division 26, Assembly Bill No. 617, Nonvehicular Air Pollution: Criteria Air Pollutants and Toxic Air Contaminants, July 26, 2017. (web link: https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=201720180AB617)
[29] California Air Resources Board, Revised Draft 2020 Mobile Source Strategy, April 23, 2021. (web link: https://ww2.arb.ca.gov/sites/default/files/2021-04/Revised_Draft_2020_Mobile_Source_Strategy.pdf)

climate system observed over the past century are caused by human activities and that these recorded changes are occurring at an unprecedented rate.[30] California is already feeling the impacts of climate change, including raging wildfires, coastal erosion, disruption of water supply, threats to agriculture, spread of insect-borne diseases, and continuing health threats from air pollution.[31] Projections show that these effects will continue and worsen. The Office of Environmental Health Hazard Assessment documented the impacts of climate change on California in the Indicators of Climate Change Report.[32]

Driven by the Governor's Executive Order (EO) N-79-20,[33] which set a goal for 100 percent zero-emission (ZE) off-road vehicles and equipment by 2035, the Proposed Amendments begin the transition of diesel-powered TRUs to ZE technology and are a part of California's holistic plan to meet the State's multiple public health, air quality, and climate goals.

B. Regulatory Authority

Several sections of the California Health and Safety Code (Health & Saf. Code) provide CARB with authority to adopt the Proposed Amendments. More specifically, this regulatory action is proposed under the authority granted to CARB in California Health & Saf. Code sections 39600, 39601, 39618, 39658, 39659, 39666, 39667, 43013, 43018, and 43019.1. This action is proposed to implement, interpret, or make specific, Health & Saf. Code sections 39618, 39650, 39658, 39659, 39666, 39667, 39674, 39675, 42400, 42400.1, 42400.2, 42400.3.5, 42402, 42402.2, 42410, 43013, 43018, and 43019.1.

Health & Saf. Code sections 39600 (General Powers) and 39601 (Standards, Definitions, Rules, and Measures) confer to CARB the general authority and obligation to adopt rules and measures to execute the Board's powers and duties imposed by State law. In addition, Health & Saf. Code sections 43013 and 43018(a) provide broad authority to achieve the maximum feasible and cost-effective emission reductions from all mobile source categories, including off-road diesel engines.

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[30] Cook et al., "Unprecedented 21st Century Drought Risk in the American Southwest and Central Plains," February 12, 2015. (web link: https://advances.sciencemag.org/content/1/1/e1400082)
[31] California Air Resources Board, California's 2017 Climate Change Scoping Plan, November 2017. (web link: https://ww2.arb.ca.gov/sites/default/files/classic//cc/scopingplan/scoping_plan_2017.pdf)
[32] Office of Environmental Health Hazard Assessment, "Indicators of Climate Change in California," May 2018. (web link: https://oehha.ca.gov/media/downloads/climate-change/report/2018caindicatorsreportmay2018.pdf)
[33] Executive Order N-79-20, State of California Executive Order signed by Governor Gavin Newsom, September 23, 2020. (web link: https://www.gov.ca.gov/wp-content/uploads/2020/09/9.23.20-EO-N-79-20-Climate.pdf)

California's Air Toxics Program, established under California law by AB 1807 (Chapter 1047, Statutes of 1983),[34] and set forth in Health & Saf. Code section 39650 through 39675, mandates the identification and control of air toxics in California. The identification phase of the Air Toxics Program requires CARB, with participation of other state agencies, such as the Office of Environmental Health Hazard Assessment, to evaluate the health impacts of and exposure to substances and to identify those substances that pose the greatest health threat as toxic air contaminants. CARB's evaluation is provided to the public and is formally reviewed by the Scientific Review Panel, established under Health & Saf. Code section 39670. Following CARB's evaluation and the Scientific Review Panel's review, CARB may formally identify a toxic air contaminant at a public hearing. Following the identification of a substance as a toxic air contaminant, Health & Saf. Code sections 39658 and 39665 require CARB, with the participation of the local air districts, and in consultation with affected sources and interested parties, to prepare a report on the need and appropriate degree of regulation for that substance (risk management phase).

In 1998, CARB identified diesel PM as a toxic air contaminant, and in September 2000, adopted the Diesel Risk Reduction Plan. The Diesel Risk Reduction Plan was the first formal product of the risk management phase and served as the needs assessment under the AB 1807 process. The plan identified options to reduce diesel PM and the recommended control measures to achieve reductions, including a measure to reduce diesel PM from diesel fueled TRUs and TRU gen sets.[35] The Proposed Amendments fulfill the goals of the Diesel Risk Reduction Plan and complies with the requirements of Health & Saf. Code sections 39666 and 39669.5 to prevent an endangerment to public health. The Proposed Amendments are also in accordance with Health & Saf. Code section 39618, which directs CARB to treat refrigerated trailers as mobile sources and develop regulations to reduce emissions from refrigerated trailers.

Health & Saf. Code sections 39674 and 39675 authorize CARB to impose civil penalties for violations of Health & Saf. Code section 39658, 39659, or Article 4 (beginning with section 39665). Sections 42400 et seq. provide that violation of CARB regulations is a misdemeanor offense and establish different levels of civil penalties for such violations.

Health & Saf. Code section 43019.1 authorizes CARB to adopt a schedule of fees to cover its reasonable costs associated with the certification, audit, and compliance of off-road or non-vehicular engines and equipment, aftermarket parts, and emissions

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[34] California Air Resources Board, AB 1807 - Toxics Air Contaminant Identification and Control (web link: https://ww2.arb.ca.gov/resources/documents/ab-1807-toxics-air-contaminant-identification-and-control, last accessed May 10, 2021)

[35] California Air Resources Board, Risk Reduction Plan to Reduce Particulate Matter Emissions from Diesel-Fueled Engines and Vehicles, October 2000. (web link: https://ww2.arb.ca.gov//sites/default/files/classic/diesel/documents/rrpfinal.pdf)

control components sold in the state. The Proposed Amendments include a schedule of fees to recover CARB's reasonable costs associated with these categories.

While the current requirements of the TRU ATCM primarily place compliance obligations on TRU owners and operators, the Proposed Amendments require owners and operators of facilities where TRUs operate to ensure that only compliant TRUs operate on their properties. TRU operations at facilities generate harmful emissions and impact surrounding communities. Therefore, facility owners and operators should bear some responsibility for ensuring TRUs operating on their properties are compliant with emissions requirements. CARB's statutory mandates, particularly its air toxics and greenhouse gas (GHG) related mandates, are not limited to vehicular and mobile sources. Therefore, CARB has determined that assigning certain compliance obligations to facility owners and operators, in addition to TRU owners and operators, is necessary and proper for satisfying CARB's statutory mandates to reduce air pollution and the associated health risk from diesel-powered TRUs.

C. Background on TRUs and TRU Facilities

1. TRUs and TRU Gen Sets

TRUs are refrigeration systems powered by integral (inside the TRU housing) diesel engines used to control the environment of temperature-sensitive products transported in insulated trucks, trailers, shipping containers, or railcars. TRU gen sets are diesel internal combustion engine-powered generators designed to provide electric power to electrically-powered refrigeration units of any kind. TRUs are capable of both cooling and heating. Table I-1 shows the 2020 population of TRUs and TRU gen sets, and the number operating in California per day.

Table I-1. 2020 TRU and TRU Gen Set Populations

TRU Type	Population	Number Operating in California per Day
Truck TRU	6,930	6,930
CA-Based Trailer TRU	33,550	26,200
Out-of-State-Based Trailer TRU	120,770	14,980
Domestic Shipping Container TRU and Railcar TRU	4,020	760
CA-Based Gen Set	4,920	3,840
Out-of-State-Based Gen Set	24,830	3,080
Total	195,020	55,790

a. Truck TRUs

Truck TRUs are used to control the environment of temperature-sensitive cargo in straight trucks where the trailer is permanently attached to the truck cab. Truck TRUs

are generally used for local and regional delivery, and return to a home base each night. Due to their daily operational characteristics, TRUs installed on trucks are well suited for ZE technologies, such as battery-electric. A straight truck that is equipped with a TRU is shown in Figure I-1.

Figure I-1. Truck TRU

b. Trailer TRUs

Trailer TRUs are used to control the environment of temperature-sensitive cargo in semi-trailers that detach from the truck cab. Trailer TRUs often have longer loading times due to larger cargo capacity. Trailer TRUs are used in long-haul transport, visit other states to deliver or bring in loads, and generally do not return to a home base each night. A trailer TRU is shown in Figure I-2.

Figure I-2. Trailer TRU

c. Domestic Shipping Container TRUs and Railcar TRUs

Domestic shipping container (DSC) TRUs are used to control the environment of temperature-sensitive products transported in DSCs that move by truck and rail. Similar to trailer TRUs, DSC TRUs are used in long haul transport, visit other states to deliver or bring in loads, and generally do not return to a home base each night. Railcar TRUs are used to control the environment of temperature-sensitive products transported in railcars. Railcar TRUs are generally unattended during use and trips may exceed a week. A DSC TRU and railcar TRU are shown in Figure I-3 and Figure I-4, respectively.

Figure I-3. DSC TRU

Figure I-4. Railcar TRU

d. TRU Gen Sets

TRU gen sets are designed and used to provide electric power to electrically-powered refrigeration units of any kind. This includes, but is not limited to gen sets that provide electricity to electrically-powered refrigeration systems for shipping containers when they are not plugged into ocean-going ship electric power or dock shore power. Refrigerated shipping containers are intermodal in that they can be loaded onto ocean-going vessels for marine transport, then upon arrival at a seaport they can be transferred to a chassis for over-the-road truck transport, or transferred to a rail stack car or flatcar, for rail transport.

There are several types of TRU gen sets, including "pin-on" and "under-slung." Pin-on TRU gen sets are pinned onto the front of refrigerated shipping containers, just above the container's all-electric refrigeration system, which is built into the shipping container. A pin-on TRU gen set is shown in Figure I-5.

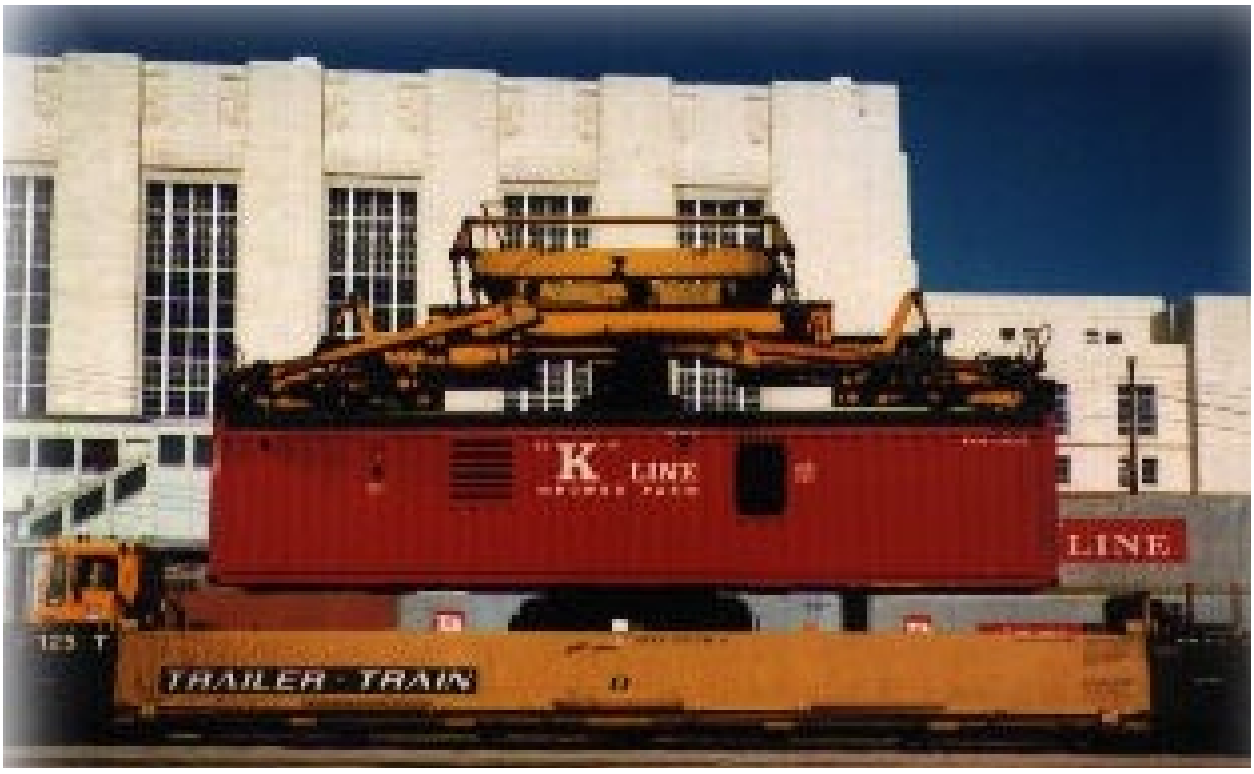
Figure I-5. Pin-on TRU Gen Set

Under-slung TRU gen sets are clamped to the frame rails of a trailer chassis that is designed for the sole purpose of transporting shipping containers on the roadway. This arrangement is also called a "belly mount." An under-slung TRU gen set is shown in Figure I-6. Both pin-on and under-slung TRU gen sets are designed to provide electric power for only one refrigerated shipping container.

Figure I-6. Under-slung TRU Gen Set

A third type of TRU gen set, called a "powerpack," provides power for a number of refrigerated shipping containers, in which several diesel generators are installed on a shipping container. These powerpack containers are loaded onto railcars and connected to multiple refrigerated shipping containers on adjacent railcars. A powerpack TRU gen set is shown in Figure I-7.

Figure I-7. Powerpack TRU Gen Set



2. TRU Applicable Facilities

TRUs emit harmful pollutants while in transit and during stationary operation at facilities that are often in close proximity to sensitive receptors, such as schools, hospitals, elder care facilities, and residential neighborhoods. The Proposed Amendments include requirements for refrigerated warehouses or distribution centers (WHDC) with a building size of 20,000 square feet or greater, grocery stores with a building size of 15,000 square feet or greater, seaport facilities, and intermodal railyards (applicable facilities). The square-foot thresholds are based on the amount of TRU activity and associated health risk relative to facility size; there are no proposed size thresholds for seaport facilities or intermodal railyards because activity is not based on facility size and TRUs operate for longer periods of time at these facility types compared to refrigerated WHDCs and grocery stores.

The Proposed Amendments require owners and operators of applicable facilities to ensure that only compliant TRUs operate on their properties. Not allowing non-compliant TRUs to operate at an applicable facility incentivizes TRU owners to comply with regulatory requirements and achieves immediate emission reductions in impacted communities. As an alternative, owners and operators of applicable facilities may choose to report all TRU activity to CARB. Reporting accurate and comprehensive

information on all TRUs that operate at applicable facilities will help staff better identify non-compliant TRUs operating in California and bring them into compliance.

More information on the applicable facilities included in the Proposed Amendments is provided in Appendix F.

D. Current TRU ATCM

CARB adopted the TRU ATCM in 2004 to reduce diesel PM from TRUs and TRU gen sets, as well as near-source health risk at facilities where TRUs operate. The TRU ATCM requires that TRU engines that operate in California meet specific in-use performance standards that require diesel PM emissions to be reduced in accordance with a phased compliance schedule. The phased compliance schedule is based on the model year (MY) of the TRU engine, and requires compliance with the in-use performance standard seven years after the engine MY. The TRU ATCM includes two levels of stringency that were phased-in over time. The first phase, beginning in 2008, is the low emission TRU (LETRU) performance standards. The second phase, beginning in 2010, is the ultra-low emission TRU (ULETRU) performance standards. Ultimately, all TRU engines are required to meet the ULETRU performance standards and have 85 percent PM control (compared to an uncontrolled Tier 0 engine) to be fully compliant with the TRU ATCM.

CARB subsequently amended the TRU ATCM in 2010 and 2011. The 2010 amendments included additional recordkeeping and reporting requirements for TRU original equipment manufacturers (OEM) that directly or indirectly sell, or offer for sale, TRUs to the California market. The amendments also included more stringent definitions for compliance. The 2011 amendments extended certain TRU performance standard compliance deadlines from those originally contained in the 2004 regulation and included provisions to improve enforceability. The TRU ATCM is fully implemented and TRU owners have the following compliance options:

- Use a TRU equipped with an engine that meets the United States Environmental Protection Agency (U.S. EPA) Tier 4 final off-road emission standards for 25-50 horsepower engines (meets ULETRU).
- Retrofit the existing TRU with a Level 3 Verified Diesel Emission Control Strategy (VDECS) with 85 percent PM control (meets ULETRU).
- Use an alternative technology that eliminates TRU diesel engine operation (and emissions) while at a facility. Alternative technologies include electrification, cryogenic refrigeration systems, alternative fuel systems, exclusive use of alternative diesel fuel, fuel cell-powered refrigeration systems, and other technologies that eliminate emissions while at a facility (meets ULETRU).
- Replace the existing unit (engine and refrigeration system) with a new TRU equipped with an engine that meets the U.S. EPA Tier 4 final off-road emission standards for less than 25 horsepower engines, which would be in compliance

until the seventh year after the replacement TRU's engine MY (does not meet ULETRU).

E. Proposed Amendments

This section presents a broad overview of the Proposed Amendments. Chapter III provides a detailed summary of the staff proposal. Chapter IV provides the specific purpose and rationale for each proposed amendment. Key elements of the Proposed Amendments include the following:

By December 31, 2022:

- All newly-manufactured truck TRUs, trailer TRUs, and DSC TRUs that operate in California shall use refrigerant with a global warming potential (GWP) less than or equal to 2,200, or use no refrigerant at all.
- MY 2023 and newer trailer TRU, DSC TRU, railcar TRU, and TRU gen set engines shall meet a PM emission standard of 0.02 grams per brake horsepower-hour (g/hp-hr) or lower.
    - Note: MY 2022 and older trailer TRU, DSC TRU, railcar TRU, and TRU gen set engines would continue to operate under the current TRU ATCM requirements, in which they shall meet ULETRU by December 31 of the seventh year after the engine MY. For example, a trailer TRU equipped with a MY 2020 engine would have to meet ULETRU by December 31, 2027.

By December 31, 2023:

- Applicable facility[36] owners shall register their facility with CARB, pay fees every three years, and report all TRUs that operate at their facility to CARB quarterly, or alternatively attest that only compliant TRUs (i.e., those with a valid CARB compliance label or showing as compliant on CARB's website) operate at their facility.
- TRU owners shall report All TRUs that operate in California to CARB, regardless of where they are based.
- TRU owners shall pay TRU operating fees and affix CARB compliance labels to their TRU every three years, for each TRU operated in California.
- TRU owners shall turnover at least 15 percent of their truck TRU fleet (defined as truck TRUs operating in California) to ZE technology each year (for 7 years). All truck TRUs operating in California shall be ZE by December 31, 2029.

[36] An applicable facility is defined in the Proposed Amendments as a refrigerated warehouse or distribution center with a building size greater than or equal to 20,000 square feet, a grocery store with a building size greater than or equal to 15,000 square feet, a seaport facility, or an intermodal railyard if one or more TRUs operate within the legal property boundary of the facility.

F. Summary of Public Process

To ensure an open and transparent rulemaking, staff have engaged in an extensive public process since development of the Proposed Amendments began in early 2016. Staff conducted eight public workshops to discuss regulatory concepts, methodology and data used to develop the emission inventory and conduct a health risk assessment (HRA), infrastructure considerations, compliance and enforcement mechanisms, as well as solicit stakeholder feedback. Staff posted information regarding these workshops and any associated materials on the TRU Regulation website[37] and distributed notice of these meetings through several public list serves that include over 17,000 recipients.[38] In addition, staff held three work group meetings to solicit feedback on regulatory concepts, as well as discuss infrastructure and enforcement issues related to the Proposed Amendments.

As of June 2021, staff have conducted more than 160 informal meetings, phone calls, and site visits with a broad group of stakeholders to discuss the Proposed Amendments and gather input and information. This includes members of impacted communities, environmental justice advocates, air districts, TRU owners and operators, trade associations, TRU OEMs, TRU dealers and service centers, truck and trailer dealers, truck and trailer leasing companies, freight brokers, forwarders, shippers, receivers, freight facility owners and operators, and other interested parties.

In addition to meeting with a wide range of stakeholders, staff also conducted targeted outreach to potential applicable facilities. This includes mailing over 40,000 postcards to facilities with refrigerated operations potentially affected by the Proposed Amendments to notify them of upcoming workshops and direct them to the TRU Regulation website for more information. Staff also visited several facilities, including refrigerated WHDCs, cold storage warehouses (CSW), port terminals, and railyards to learn more about their business operations and to better understand potential implementation challenges associated with the Proposed Amendments. A detailed summary of all stakeholder outreach activities is included in Chapter XIV.

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[37] California Air Resources Board, New Transport Refrigeration Unit Regulation in Development Website. (web link: https://ww2.arb.ca.gov/our-work/programs/transport-refrigeration-unit/new-transport-refrigeration-unit-regulation, last accessed May 10, 2021)

[38] Number of subscribers for the following CARB lists as of January 28, 2021: Agricultural Activities, Community Air, Environmental Justice ChERRP, Commerce, Environmental Justice ChERRP, Mira Loma, Environmental Justice ChERRP, Wilmington, Goods Movement Emission Reduction Program, Port Truck, Reduction of GHG Emissions from Refrigerated Shipping Containers, Stationary Equipment Refrigerant Management Program, Sustainable Freight Transport Initiative, and Transport Refrigeration Units.

G. Funding Opportunities

The State of California is committed to providing incentives to help with the transition to advanced technologies. Several incentive funding programs exist to reduce the incremental costs associated with zero and near-zero emission technologies, as well as supporting infrastructure. Table I-2 lists available incentive programs that may provide funding for cleaner TRUs, as well as supporting electric charging or fueling infrastructure. Note that many of these programs are competitive and some fund a variety of projects other than TRUs.

Table I-2. TRU Funding Programs

Program	Description
AB 617 Community Air Protection Incentives https://ww2.arb.ca.gov/our-work/programs/community-air-protection-incentives	Incentives directed by local air districts to put advanced technologies, including ZE TRUs, to work for cleaner air in the California communities that are most heavily impacted by air pollution.
Carl Moyer Memorial Air Quality Standards Attainment Program https://ww2.arb.ca.gov/our-work/programs/carl-moyer-memorial-air-quality-standards-attainment-program	Grant funding for cleaner-than-required engines, equipment, and other sources of air pollution, implemented as a partnership between CARB and California's 35 local air districts.
Clean Diesel and Diesel Emissions Reduction Act Programs https://www.epa.gov/dera	Incentive program that provides support for projects that protect human health and improve air quality by reducing harmful emissions from diesel engines. This program includes grants and rebates funded under the Diesel Emissions Reduction Act.
Clean Off-Road Equipment Voucher Incentive Project https://californiacore.org	A streamlined voucher process for buyers to receive funding to offset the higher costs of clean, commercial ready ZE TRUs, supporting infrastructure, and other equipment.
Electric Utility Transportation Electrification Programs https://www.cpuc.ca.gov/sb350te/	Many of California's electric utilities provide incentives that support transportation electrification activities, including TRUs and supporting infrastructure. Opportunities vary by region.
Low Carbon Fuel Standard https://ww2.arb.ca.gov/our-work/programs/low-carbon-fuel-standard	Electricity utilized for electric TRUs may generate Low Carbon Fuel Standard credits that can offset costs for facility upgrades.
Proposition 1B: Goods Movement Emission Reduction Program https://ww2.arb.ca.gov/our-work/programs/proposition-1b-goods-movement-emission-reduction-program	Partnership between CARB and local agencies to reduce air pollution emissions and health risk from freight movement through financial incentives to reduce the cost of cleaner freight equipment.

II. The Problem that the Proposal is Intended to Address

In the coming years, California needs to continue to build upon its successful efforts to meet critical risk reduction, air quality, and climate goals. Achieving these goals will provide needed public health protection for the millions of Californians that still breathe unhealthy air, reduce exposure to air toxics in disadvantaged communities, and help to meet State Implementation Plan (SIP) commitments. Additionally, meeting California's GHG emission reduction targets is an essential part of the global action needed to slow global warming and achieve climate stabilization. The Proposed Amendments will achieve PM, oxides of nitrogen (NOx), and GHG emission reductions from diesel-powered TRUs and increase the use of ZE technology in the off-road sector, which will help to meet these complementary goals. This chapter provides a description of the problems the Proposed Amendments are intended to address. Chapter IV provides the description, purpose, and rationale for each proposed amendment.

A. Need to Reduce Risk

Many of the communities near facilities where TRUs operate bear a disproportionate health burden due to their close proximity to emissions from the diesel engines that power TRUs. There are several occurrences across the State where communities contain "groups" or "clusters" of facilities where TRUs operate. In many cases, these facilities are located in or near communities that are classified as disadvantaged by CalEPA. CalEPA uses CalEnviroScreen to rank California communities based on environmental pollution burden and socio-economic indicators.[39] Exposure to diesel PM is a main contributor to many communities ranked in the top 10th percentile statewide on CalEnviroScreen. Additionally, AB 617 highlights the need for further emission reductions in communities with high exposure burdens, such as those located near facilities where TRUs operate.

Staff performed an HRA to evaluate the localized cancer risk impacts attributable to emissions from the diesel engines that power TRUs at a CSW and grocery store. The HRA estimated the increase in potential cancer risk that would result under the baseline scenario and emphasizes the need for further emission reductions from TRUs to provide public health benefits and reduce the cancer risk burden to communities surrounding facilities where they operate. The complete health analyses can be found in Appendix I.

[39] Office of Environmental Health Hazard Assessment, CalEnviroScreen 3.0, June 25, 2018. (web link: https://oehha.ca.gov/calenviroscreen/report/calenviroscreen-30)

B. Need to Reduce PM2.5 and NOx Emissions

Diesel-powered TRUs emit multiple pollutants, including PM2.5 and NOx. While NOx emissions are harmful, NOx is also a precursor to ozone, which can cause irritation and damage lung tissue, worsen asthma and chronic illnesses including obstructive pulmonary disease and reduce lung function. Studies have linked short-term ozone exposure with increased risk of death.[40] In addition to contributing to ozone, the biggest impact on health from NOx emissions occurs when atmospheric processes convert NOx into fine particles of ammonium nitrate. PM2.5 formed in this manner is termed secondary PM2.5.

PM2.5 pollution contributes to more fatalities than other air pollutants and can lodge deep in the lungs or pass through the lungs to enter the blood stream and affect the heart, brain, and other organs. Short-term exposure to PM2.5 pollution is associated with increased hospitalizations and emergency room visits for heart and lung illnesses and can lead to premature death. Adverse health effects from long-term exposure to PM2.5 pollution include increased risk of heart attacks and heart disease, impaired lung development in children, the development and exacerbation of asthma, and premature death.[41]

Despite progress in improving air quality, challenges remain in meeting the federal ambient air quality standards for ozone and PM2.5 in two areas of the State: the South Coast Air Basin and San Joaquin Valley. Legally-obligated deadlines require these areas to attain the federal ambient air quality standards. These deadlines are established by the federal Clean Air Act and implemented by U.S. EPA each time a new standard is promulgated based on updated information showing health impacts at increasingly lower levels. The near-term targets for these areas are a 2023 deadline for attainment of the 80 ppb 8-hour ozone standard, 2024 for the 35 µg/m3 24-hour PM2.5 standard, and 2025 for the 12 µg/m3 annual PM2.5 standard. There are also mid-term attainment years of 2031 and 2037 for the more recent 8-hour ozone standards of 75 ppb and 70 ppb, respectively.[42] Additional PM2.5 and NOx reductions from diesel-powered TRUs are needed to help meet these air quality standards.

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[40] U.S. EPA, Policy Assessment for the Review of the National Ambient Air Quality Standards for Particulate Matter, External Review Draft, 2019. (web link: http://blogs.edf.org/climate411/files/2019/12/EDF-PM-PA-Comments-11-12-FINAL.pdf)
[41] U.S. EPA, Integrated Science Assessment for Ozone and Related Photochemical Oxidants (External Review Draft), 2019. (web link: https://cfpub.epa.gov/ncea/isa/recordisplay.cfm?deid=344670)
[42] California Air Resources Board, Revised Draft 2020 Mobile Source Strategy, April 23, 2021. (web link: https://ww2.arb.ca.gov/sites/default/files/2021-04/Revised_Draft_2020_Mobile_Source_Strategy.pdf)

C. Need to Reduce GHG Emissions

Climate change is one of the most serious environmental threats facing the world today. Climate scientists agree that global warming and other shifts in the climate system observed over the past century are caused by human activities and that these recorded changes are occurring at an unprecedented rate.[43] California is already feeling the impacts of climate change, and projections show that these effects will continue and worsen. The impacts of climate change on California have been documented by the Office of Environmental Health Hazard Assessment in the Indicators of Climate Change Report.[44]

Diesel-powered TRUs emit black carbon (soot) and carbon dioxide (CO2), while leakage of TRU refrigerant contributes to emissions of hydrofluorocarbons (HFC). Black carbon and HFCs are short-lived climate pollutants (SLCP) which are powerful climate forcers that remain in the atmosphere for a much shorter period of time than longer-lived climate pollutants, such as CO2, but are more potent when measured in terms of GWP, which can be tens, hundreds, or even thousands of times greater than CO2.[45]

To date, California has made significant progress towards meeting the goals of AB 32 (Nuñez, Chapter 488, Statutes of 2006),[46] including a reduction in GHG emissions to 1990 levels by 2020. Senate Bill (SB) 32 (Pavley, Chapter 249, Statutes of 2016)[47] furthered the goals of AB 32 and set a 2030 goal of reducing statewide GHG emissions 40 percent from 2020 levels, while SB 1383 (Lara, Chapter 395, Statutes of 2016) set targets for statewide reductions in short-lived climate pollutant (SLCP) emissions of 40 percent below 2013 levels by 2030 for methane and HFC) and 50 percent below 2013 levels by 2030 for black carbon.[48] Reductions in GHGs, including SLCPs like black carbon and HFCs, from diesel-powered TRUs are needed to achieve the State's multiple GHG reduction targets and related climate goals.

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[43] Cook et al., "Unprecedented 21st Century Drought Risk in the American Southwest and Central Plains," February 12, 2015. (web link: https://advances.sciencemag.org/content/1/1/e1400082)
[44] Office of Environmental Health Hazard Assessment, "Indicators of Climate Change in California," May 2018. (web link: https://oehha.ca.gov/media/downloads/climate-change/report/2018caindicatorsreportmay2018.pdf)
[45] California Air Resources Board, Short-Lived Climate Pollutant Reduction Strategy, March 2017. (web link: https://ww2.arb.ca.gov/sites/default/files/2018-12/final_slcp_report%20Final%202017.pdf)
[46] California Health and Safety Code § 38500 - 38599, Division 25.5, Assembly Bill No. 32, California Global Warming Solutions Act of 2006, September 27, 2006. (web link: https://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill_id=201920200AB32)
[47] California Health and Safety Code § 38566, Division 25.5, Senate Bill No. 32, September 8, 2016. (web link: https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=201520160SB32)
[48] California Health and Safety Code § 39730, Division 30, Senate Bill No. 1383, Short-lived climate pollutants: methane emissions: dairy and livestock: organic waste: landfills, September 19, 2016. (web link: http://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill_id=201520160SB1383)

D. Need to Address Increase in Population of Less than 25 Horsepower Units

The Proposed Amendments are needed to address the emergence and growth in the number of units equipped with engines less than 25 horsepower. The 2021 update to the statewide TRU emission inventory (Appendix H) indicates growing sales of units with less than 25 horsepower engines, which contrasts with previous inventories where all trailer TRU engines were over 25 horsepower. The California and federal PM off-road emission standard for engines less than 25 horsepower is 15 times higher (i.e., less stringent) than the standard for engines greater than 25 horsepower. As a result, diesel PM emissions have not been reduced under the TRU ATCM as expected. Similar trends are also expected for DSC TRUs, railcar TRUs, and TRU gen sets. Based on the TRU emission inventory, the number of units equipped with engines less than 25 horsepower will become responsible for the majority of PM emissions from TRUs in the near future, if current trends continue. The Proposed Amendments address this growth in emissions by requiring all MY 2023 and newer trailer TRU, DSC TRU, railcar TRU, and TRU gen set engines to meet a PM standard that aligns with the U.S. EPA Tier 4 final PM emission standard for engines greater than 25 horsepower, regardless of horsepower.

E. Need to Address State Policy and Plans Directing CARB to Achieve Additional Diesel Emission Reductions

The Proposed Amendments are needed to address the State policies and plans summarized below directing CARB to achieve additional diesel emission reductions.

1. Executive Order N-79-20

In September 2020, Governor Newsom issued EO N-79-20, which directs CARB, in coordination with other State agencies, U.S. EPA, and local air districts, to develop and propose technologically-feasible and cost-effective strategies to achieve 100 percent ZE from off-road vehicles and equipment operations in the State by 2035. The Proposed Amendments support the directive of the EO by transitioning diesel-powered truck TRUs to ZE technology.

2. 2020 Mobile Source Strategy

CARB released the Revised Draft 2020 Mobile Source Strategy (MSS)[49] in April 2021. The strategy document looks at existing and emerging technologies to reduce emissions from California's transportation sector, including cars, trucks, trains, ships, and other on-road and off-road sources. The strategies laid out in the MSS illustrate the technology mixes needed for the State to meet its various clean air goals,

[49] California Air Resources Board, Revised Draft 2020 Mobile Source Strategy, April 23, 2021. (web link: https://ww2.arb.ca.gov/sites/default/files/2021-04/Revised_Draft_2020_Mobile_Source_Strategy.pdf)

including federal ambient air quality standards, community risk reduction, and ambitious mid-and long-term climate change targets. The MSS includes a rapid electrification scenario for TRUs, increasing 10 percent each year beginning in 2024, highlighting the need to transition diesel-powered TRUs to ZE.

3. 2016 State Strategy for the State Implementation Plan

The federal Clean Air Act requires areas that exceed the health-based ambient air quality standards to develop SIPs that demonstrate how they will attain the standards by specified dates. In March 2017, the Board adopted the State Strategy for the SIP (State SIP Strategy), which outlined CARB's comprehensive strategy to reduce emissions from mobile sources to meet critical air quality and climate goals over the next 15 years and outlined statewide control measures CARB committed to bring to the Board for adoption to achieve the NOx reductions needed for attainment by 2023 and 2031.[50] The Proposed Amendments are one of the control measures that is committed in the SIP.

4. Assembly Bill 617

The State of California placed additional emphasis on protecting local communities from the harmful effects of air pollution through the passage of AB 617, which highlights the need for further emission reductions in communities with high exposure burdens. AB 617 requires CARB to pursue new community-focused and community-driven actions to reduce air pollution and improve public health in communities that experience disproportionate burdens from exposure to air pollutants. The Proposed Amendments will reduce diesel TRU emissions and exposure statewide and will be of particular benefit in disadvantaged communities experiencing disproportionate burdens.

5. California's 2017 Climate Change Scoping Plan

In 2006, Governor Schwarzenegger signed AB 32 to address global climate change. AB 32 directed CARB to develop a scoping plan identifying integrated and cost-effective regional, national, and international GHG reduction programs. CARB adopted the AB 32 Scoping Plan in 2008 and subsequent updates in 2013 and 2017. California's 2017 Climate Change Scoping Plan[51] outlines the State's strategy to achieve its 2030 GHG target and includes control measures for high-GWP refrigerants and diesel-powered TRUs.

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[50] California Air Resources Board, Revised Proposed 2016 State Strategy for the State Implementation Plan, March 7, 2017. (web link: https://www.arb.ca.gov/planning/sip/2016sip/rev2016statesip.pdf)
[51] California Air Resources Board, California's 2017 Climate Change Scoping Plan, November 2017. (web link: https://ww2.arb.ca.gov/sites/default/files/classic//cc/scopingplan/scoping_plan_2017.pdf)

6. Executive Order B-32-15 and Sustainable Freight Action Plan

In July 2015, Governor Brown issued EO B-32-15,[52] which directed the secretaries of the California State Transportation Agency, CalEPA, and California Natural Resources Agency to lead other relevant State departments in developing an integrated action plan by July 2016 that "establishes clear targets to improve freight efficiency, transition to ZEs technologies, and increase competitiveness of California's freight system." In response to the directive, the California State Transportation Agency, CalEPA, California Natural Resources Agency, CARB, California Department of Transportation, California Energy Commission, and Governor's Office of Business and Economic Development developed the "California Sustainable Freight Action Plan." The plan establishes clear targets to improve freight efficiency, transition to ZE technologies (deployment of over 100,000 freight vehicles and equipment capable of ZE operation and maximize near-ZE freight vehicles and equipment powered by renewable energy by 2030), and increase competitiveness of California's freight system. The 2016 California Sustainable Freight Action Plan includes a measure to reduce emissions from diesel-powered TRUs as a State agency action to advance the objectives of the EO and the California Sustainable Freight Action Plan.

7. Sustainable Freight Pathways to Zero and Near-Zero Discussion Document

In April 2015, CARB released the "Sustainable Freight Pathways to Zero and Near-Zero Discussion Document" (Discussion Document) in response to Board Resolution 14-2, which directed CARB to engage with stakeholders to identify and prioritize actions to move California toward a sustainable freight transport system.[53,54] The Discussion Document set out CARB's vision of a clean freight system, and listed immediate and potential near-term CARB actions that staff would develop for future Board consideration. The near-term CARB measures identified in the Discussion Document included the development of a regulation to achieve additional emission reductions from diesel-powered TRUs.

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[52] Executive Order B-32-15, State of California Executive Order signed by Governor Edmund G. (Jerry) Brown Jr., July, 17, 2015. (web link: https://www.ca.gov/archive/gov39/2015/07/17/news19046/index.html)

[53] CARB Board Resolution 14-2, Sustainable Freight Strategy Update, January 23, 2014. (web link: https://arb.ca.gov/board/res/2014/res14-2.pdf)

[54] California Air Resources Board, Sustainable Freight Pathways to Zero and Near Zero Emissions Discussion Document, April 23, 2015. (web link: https://ww2.arb.ca.gov/sites/default/files/2020-09/Sustainable%20Freight%20Pathways%20to%20Zero%20and%20Near-Zero%20Emissions%20Discussion%20Document.pdf)

III. Summary of Proposed Action

The Proposed Amendments will achieve additional emission reductions by transitioning diesel-powered truck TRUs to ZE, as well as requiring newly-manufactured TRUs in the remaining categories to meet a PM emission standard and the use of lower-GWP refrigerant. The Proposed Amendments apply to TRU owners and operators, owners and operators of applicable facilities where TRUs operate, TRU OEMs, as well as vehicle owners and drivers who share responsibility in the operation of compliant TRUs. The Proposed Amendments are summarized below.

A. ZE Truck TRUs

Truck TRUs are generally used for local and regional delivery, and return to a home base each night. Based on their daily operational characteristics and the operating range of current technologies, TRUs installed on trucks are well suited for ZE technology because they would generally not require additional refueling or recharging infrastructure outside their home terminals or distribution centers before dispatch. The Proposed Amendments require TRU owners to transition 15 percent of their truck TRU fleet to ZE technology each year beginning December 31, 2023. Table III-1 shows the phase-in compliance schedule for ZE truck TRU fleets required by the Proposed Amendments.

Table III-1. Phase-in Compliance Schedule for ZE Truck TRU Fleets

Compliance Date as of December 31	Required ZE Truck TRU Fleet Percentage
2023	15%
2024	30%
2025	45%
2026	60%
2027	75%
2028	90%
2029 and thereafter	100%

The annual 15 percent ZE truck TRU requirement aligns with the seven-year compliance schedule already established by the TRU ATCM, in which TRU owners have been required to meet more stringent in-use performance standards at seven-year intervals until the TRU meets ULETRU; and generally aligns with the 7-to-10-year useful life for a truck TRU. The Proposed Amendments require all truck TRUs operating in California to be ZE by December 31, 2029.

B. PM Emission Standard

The 2021 update to the statewide TRU emission inventory (Appendix H) indicates growing sales of trailer TRUs with less than 25 horsepower engines, which contrasts

with previous inventories where all trailer TRU engines were over 25 horsepower. The California and federal PM off-road emission standard for engines less than 25 horsepower is 15 times higher (i.e., less stringent) than the standard for engines greater than 25 horsepower. As a result, diesel PM emissions have not been reduced under the TRU ATCM as expected. Similar trends are also expected for DSC TRUs, railcar TRUs, and TRU gen sets. Based on the TRU emission inventory, the number of units equipped with engines less than 25 horsepower will become responsible for the majority of PM emissions from TRUs in the near future, if current trends continue. Staff are proposing to address the higher PM emissions from smaller TRU engines by requiring newly-manufactured engines to meet a PM standard that aligns with the U.S. EPA Tier 4 final PM emission standard for engines greater than 25 horsepower, regardless of horsepower. The Proposed Amendments require TRU owners and operators to meet the following requirement:

- Beginning December 31, 2022, newly-manufactured (MY 2023 and newer) trailer TRU, DSC TRU, railcar TRU, and TRU gen set engines shall meet a PM emission standard of 0.02 g/hp-hr or lower.

MY 2022 and older trailer TRU, DSC TRU, railcar TRU, and TRU gen set engines would continue to operate under the seven-year compliance deadline provided in the current TRU ATCM, in which they shall meet ULETRU by December 31 of the seventh year after the engine MY. For example, a trailer TRU equipped with a MY 2020 engine would have to meet ULETRU by December 31, 2027. Truck TRUs are not subject to the PM emission standard because they will be required to transition to ZE as described above.

C. Lower-GWP Refrigerant

TRUs produce HFC emissions when refrigerant leaks from the unit due to normal wear and fatigue of refrigerant fittings. Requiring the use of lower-GWP refrigerant will reduce HFC emissions from TRUs. The Proposed Amendments establish a refrigerant requirement for TRUs operating in California. Beginning December 31, 2022, newly-manufactured truck TRUs, trailer TRUs, and DSC TRUs will be required to use refrigerant with a GWP less than or equal to 2,200, or use no refrigerant at all.

TRUs using R-452A refrigerant, which has a GWP of 2,141, are commercially available from both of the two major TRU manufacturers.[55,56] Staff are proposing a GWP limit of 2,200 to ensure a quick transition to a lower-GWP alternative that is commercially available for the three equipment types (truck TRU, trailer TRU, and DSC TRU). The refrigerant requirement for truck TRUs, trailer TRUs, and DSC TRUs aligns with the U.S. EPA's approval of the use of R-452A for transport applications, which does not include railcar TRUs or TRU gen sets.[57]

D. TRU Reporting, Operating Fees, and Compliance Labels

Staff are proposing to amend the TRU reporting requirements to include out-of-state-based units. Beginning December 31, 2023, TRU owners will be required to report all TRUs operating in California to CARB, regardless of where they are based. Reporting of all TRUs that operate in California will enable CARB enforcement staff, as well as applicable facility owners and operators, vehicle owners, drivers, and freight contractors, to look-up the compliance status of a given TRU. Amending the TRU reporting requirements to include out-of-state based units will also help to level the playing field between TRUs based in-state and out-of-state.

The Proposed Amendments also include new operating fee and compliance label requirements for TRUs operating in California. Beginning December 31, 2023, for each TRU operated in California, TRU owners will be required to pay TRU operating fees and affix a CARB-issued compliance label to both sides of the TRU housing every three years.

The proposed TRU operating fees will offset the costs to CARB as allowed by Health & Saf. Code section 43019.1,[58] which authorizes CARB to adopt a schedule of fees to cover all or part of CARB's reasonable costs associated with certification, audit, and compliance of off-road or non-vehicular engines and equipment, aftermarket parts, and emission control components sold in the State.

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[55] Carrier Press Release, Carrier Transicold Strengthens Sustainability Initiatives with Lower GWP Refrigerant for North America Truck and Trailer Systems, December 15, 2020. (web link: https://www.carrier.com/truck-trailer/en/north-america/news/news-article/carrier_transicold_strengthens_sustainability_initiatives_with_lower_gwp_refrigerant_for_north_america_truck_and_trailer_systems.html)

[56] Fleet Owner, Thermo King offers products to help reduce emissions, July 28, 2017. (web link: https://www.fleetowner.com/running-green/emissions/article/21696418/thermo-king-offers-products-to-help-reduce-emissions)

[57] United States Environmental Protection Agency, Federal Register, Vol. 82, No. 139/Friday, July 21, 2017/Rules and Regulations. (web link: https://www.govinfo.gov/content/pkg/FR-2017-07-21/pdf/2017-15379.pdf)

[58] California Health and Safety Code § 43019.1, Division 26, Senate Bill No. 854, July 27, 2018. (web link: https://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill_id=201720180SB854)

Compliance labels will assist both CARB enforcement and applicable facility staff to easily determine the compliance status of a TRU. Non-compliant units will not be issued a new compliance label. This will help to ensure that non-compliant TRUs are brought into compliance in a timely manner.

E. Applicable Facility Registration, Registration Fees, and Reporting

Applicable facilities include refrigerated WHDCs with a building size greater than or equal to 20,000 square feet, grocery stores with a building size greater than or equal to 15,000 square feet, seaport facilities, and intermodal railyards. The square foot thresholds are based on the amount of TRU activity and associated health risk relative to facility size; there are no proposed size thresholds for seaport facilities or intermodal railyards because activity is not based on facility size and TRUs operate for longer periods of time at these facility types compared to refrigerated WHDCs and grocery stores.

Applicable facility owners will be required to register their facility with CARB and pay a registration fee every three years beginning December 31, 2023. Applicable facility registration requires information about the facility, including address, owner contact information, and building size. The Proposed Amendments also require applicable facilities to ensure that TRUs operating onsite are compliant with the TRU ATCM. There are two ways applicable facilities may fulfill this requirement:

- Option 1: Report all TRUs that operate within the applicable facility property boundary to CARB (or)
- Option 2: Provide a declaration to CARB, under penalty of perjury, that non-compliant TRUs subject to the Proposed Amendments will not be permitted to operate within the property boundary.

Reporting all TRUs (compliant and non-compliant) ensures accurate and comprehensive data from facilities. As an alternative to reporting, an applicable facility may choose to not allow non-compliant units to operate at their facility. Staff are proposing to include applicable facility registration, registration fee, and reporting requirements because TRU emissions are generated at applicable facilities and impact surrounding communities. The proposed registration fee offsets CARB's cost in ensuring compliance of TRUs operating at these facilities. Applicable facility owners and operators should bear some responsibility for the TRU activity at their facility and ensure that TRUs are compliant with regulatory requirements.

F. Vehicle Owner and Driver Requirements

The Proposed Amendments include new compliance responsibilities for vehicle owners. Vehicle owners of TRU-equipped trucks or tractor-trailers equipped with a TRU will be required to ensure the TRU is compliant (i.e., those with a valid CARB compliance label or showing as compliant on CARB's website). Drivers will be required

to allow CARB enforcement staff to conduct a visual inspection of TRUs to determine whether emission control components have been tampered with, inadequately maintained, or are defective. Adding responsibilities for all of the key parties playing a role in the operation of TRUs is needed to ensure compliance and achieve the emission reduction and health benefit goals of the Proposed Amendments.

G. OEM Requirements

Staff are proposing to add the following TRU OEM requirements to ensure newly-manufactured TRUs are compliant with the TRU ATCM:

- Beginning May 31, 2023, TRU OEMS shall not manufacture, for sale or use in California, a trailer TRU, DSC TRU, railcar TRU, or TRU gen set, unless it is equipped with an engine that meets the PM emission standard.
- Beginning December 31, 2023, TRU OEMS shall not manufacture, for sale or use in California, a truck TRU, unless it is a ZE truck TRU.

The requirements will help to ensure that only compliant TRUs are manufactured for sale or use in California. The May 31, 2023, date provides TRU OEMs sufficient time to use leftover stock of MY 2022 TRU engines that are not required to meet the PM emission standard.

Additionally, staff are proposing to amend the OEM reporting requirements. OEMs are currently required to report unit and engine data for the coming production year and prior production years, as well as provide monthly production reports. Staff are proposing to remove the requirements for current and prior production reports. OEMs would only be required to submit monthly production reports. The monthly production report will enable staff to verify information reported by TRU owners and lessen the burden on OEMs to comply with reporting requirements.

H. Compliance Extension Based on Infrastructure Delays

Staff have worked closely with the electric utilities to ensure the regulatory compliance dates and annual ZE truck TRU percentages required by the Proposed Amendments are feasible. Although delays to the installation of charging or fueling infrastructure needed to support ZE truck TRUs are not anticipated, staff understand that there are various circumstances that may prevent infrastructure from being installed in a timely manner.

The Proposed Amendments include a compliance extension, in which truck TRU owners may apply for a year-long extension, up to a maximum of two years, due to unforeseen, temporary, or extenuating circumstances outside of the truck TRU owner's control that prevents the installation of ZE infrastructure at the truck TRU home base facility. This may include delays in the manufacture and shipment of infrastructure equipment, obtaining construction permit(s), obtaining power from a utility, private

financing, installation of infrastructure, or due to a natural disaster or discovery of archeological, historical, or tribal cultural resources under CEQA. An additional compliance extension beyond the first two year-long extensions may be granted due to a delay in obtaining power from a utility.

IV. The Specific Purpose and Rationale of Each Adoption, Amendment, or Repeal

Government Code section 11346.2(b)(1) requires CARB to describe the specific purpose for each proposed amendment and a description of the rationale for CARB's determination that each proposed amendment is: 1) reasonably necessary to carry out the purposes that the action is implementing, interpreting, or making specific, and 2) reasonably necessary to address the problems described in Chapter II. This chapter provides the specific purpose and rationale for each proposed amendment.

The full text of the Proposed Amendments can be found in Appendix A.1 and Appendix A.2. For ease of reference and readability, Appendix A.1 will show complete proposed regulation text with amendments in underline to show additions and strikeout to show deletions, and Appendix A.2 will be a Microsoft Word version showing complete proposed regulation text amendments in "Track Changes" (underline/strikeout to show amendments), with the option to view the document with all amendments integrated into the text for a cleaner/more accessible version to improve readability.

General Proposed Amendments:

Staff are proposing to add "California" to each mention of the "Air Resources Board" throughout the regulatory text to reflect the current identification of the State Board within CalEPA and to be consistent with how the Agency is referring to itself generally. Therefore, staff are also proposing to modify uses of "ARB" to "CARB" as the acronym for the California Air Resources Board throughout the regulatory text. These proposed amendments are non-substantive, and will not change the meaning, interpretation, or implementation of the Proposed Amendments.

Staff are proposing to replace the words "can," "may," "must," and "will" with "shall." The current regulatory text uses "can," "may," "must," "shall," and "will" interchangeably. The change is necessary to make the regulatory text consistent by using the word "shall" throughout the regulatory text. These proposed amendments are non-substantive, and will not change the meaning, interpretation, or implementation of the Proposed Amendments.

Staff are proposing to amend the authority cited in each section of the regulatory text by removing reference to Health & Saf. Code section 40717.9 and adding Health & Saf. Code section 43019.1. Health & Saf. Code section 40717.9 relates to employee trip reduction programs and does not confer to CARB any authority related to the regulation of TRUs or TRU gen sets. The addition of Health & Saf. Code section 43019.1 is needed to identify the provision authorizing CARB to collect the reasonable costs to cover all or a portion of CARB's costs associated with the certification, audit, and compliance of off-road or nonvehicular engines and equipment, aftermarket parts,

and emissions control components sold in the State, as proposed in section 2477.5(h) and section 2477.17(d).

§ 2477 Airborne Toxic Control Measure for In-Use Diesel-Fueled Transport Refrigeration Units and Transport Refrigeration Unit Generator Sets, and Facilities Where Transport Refrigeration Units Operate

Purpose of section 2477

This amendment adds language to specify that title 13, CCR, section 2477 through 2477.22 shall be known as the Transport Refrigeration Unit Regulation, or TRU Regulation.

Rationale of section 2477

This amendment is necessary because the regulation is codified in CCR, title 13, division 3, chapter 9, which also includes the "Regulation for Mobile Cargo Handling Equipment at Ports and Intermodal Rail Yards."

A. Section 2477.1 – Purpose

Purpose of section 2477.1

This amendment adds NOx and GHG and deletes "in-use."

Rationale of section 2477.1

This amendment is necessary to include all the pollutants the Proposed Amendments aim to reduce. While the purpose of the current regulation is to reduce diesel PM emissions from TRUs and TRU gen sets, the purpose of the Proposed Amendments is to reduce PM, NOx, and GHG emissions needed to help meet the State's multiple risk reduction, air quality, and climate goals. The deletion of "in-use" is necessary because staff are proposing amendments to reduce emissions from both in-use and newly-manufactured TRUs.

B. Section 2477.2 – Applicability

Purpose of section 2477.2

This amendment adds language to specify that the exemptions provided in section 2477.3 apply to all regulated entities.

Rationale of section 2477.2

This amendment is necessary to specify that the exemptions provided in section 2477.3 apply to all regulated entities. As currently written, the exemptions only apply to owners and operators.

Purpose of section 2477.2(a)

This amendment deletes the reference to section 2477.4.

Rationale of section 2477.2(a)

This amendment is necessary to delete unneeded wording and limit redundancy. It is inherent that the definitions are in section 2477.4 and not necessary to reference as such every time a defined word is used in the regulatory text.

Purpose of section 2477.2(b)

This amendment deletes applicability of the regulation to terminal operators and adds applicability to vehicle owners.

Rationale of section 2477.2(b)

This amendment is necessary because staff are proposing to delete the terminal operator requirements. The current regulation includes provisions for operators of TRUs that are assigned to California terminals where these units are operated, garaged, maintained, or dispatched from, requiring them to submit an operator report. In addition to providing basic information about the operator's company and contact information, the terminal address, and a list of all CARB IDN's for units assigned to the terminal are required. Staff are proposing to replace the terminal operator requirements with applicable facility owner and operator requirements. Please see the rationale of section 2477.2(m) on the addition of applicability to applicable facility owners and operators.

This amendment is also necessary to establish applicability of the regulation to vehicle owners. The Proposed Amendments would require vehicle owners of trucks or tractors pulling TRU equipped trailers or shipping containers that use TRUs or TRU gen sets on California highways to ensure the TRU or TRU gen set is compliant (i.e., those with a valid CARB compliance label or showing as compliant on CARB's website). Adding responsibilities for all the key parties playing a role in the operation of TRUs, including vehicle owners, is needed to ensure compliance and achieve the emission reduction and health benefit goals of the Proposed Amendments.

Purpose of section 2477.2(c)

This amendment deletes the reference to section 2477.4 and adds the word "tractor."

Rationale of section 2477.2(c)

This amendment is necessary to delete unneeded wording and limit redundancy. It is inherent that the definitions are in section 2477.4 and not necessary to reference as such every time a defined word is used in the regulatory text.

This amendment is also necessary to correct incorrect wording in that a driver cannot drive a trailer.

Purpose of section 2477.2(d) and (e)

These amendments delete the reference to section 2477.4.

Rationale of section 2477.2(d) and (e)

These amendments are necessary to delete unneeded wording and limit redundancy. It is inherent that the definitions are in section 2477.4 and not necessary to reference as such every time a defined word is used in the regulatory text.

Purpose of section 2477.2(f) and (g)

These amendments delete language specifying that the regulation only applies to "California-based" shippers and receivers; and deletes the reference to section 2477.4.

Rationale of section 2477.2(f) and (g)

These amendments are necessary to expand the applicability of the regulation to any shipper or receiver that arranges, tenders contracts for, or dispatches the transport of perishable goods that requires the operation of TRU-equipped or TRU gen set-equipped trucks, trailers, shipping containers, or railcars in the State of California, regardless of whether the shipper or receiver is based in California. This will help to ensure all TRUs operating in California are compliant to achieve the emission reduction and health benefit goals of the Proposed Amendments.

This amendment is also necessary to delete unneeded wording and limit redundancy. It is inherent that the definitions are in section 2477.4 and not necessary to reference as such every time a defined word is used in the regulatory text.

Purpose of section 2477.2(i)

This amendment deletes the reference to section 2477.4 and adds applicability to OEMs of ZE truck TRUs.

Rationale of section 2477.2(i)

This amendment is necessary to delete unneeded wording and limit redundancy. It is inherent that the definitions are in section 2477.4 and not necessary to reference as such every time a defined word is used in the regulatory text.

This amendment is also necessary to establish applicability to OEMs that direct ZE truck TRUs sales to the California market. As defined, a TRU is a refrigeration system powered by an integral internal combustion engine. Thus, the OEM requirements would not apply to ZE truck TRU OEMs because ZE truck TRUs do not have a diesel-powered engine. Staff are proposing to require ZE Truck TRU OEMs to report the same information to CARB that is currently required for TRU and TRU gen set OEMs. This will enable staff to verify information reported by TRU owners on the ZE truck TRUs used to comply with section 2477.5(b).

Purpose of section 2477.2(m)

This amendment deletes applicability of the regulation to facilities and adds applicability to owners or operators of an applicable facility located in California.

Rationale of section 2477.2(m)

This amendment is necessary because staff are proposing to delete applicability of the regulation to facilities. The current regulation requires large facilities with 20 or more doors serving refrigerated storage areas to submit a Facility Report in January 2006 for TRU activity that occurred in 2005. The compliance date for these requirements has passed. Staff are proposing new requirements for owners and operators of an "Applicable Facility," as well as a new definition for the facilities that will be subject to the requirements. Applicable facilities include refrigerated WHDCs with a building size greater than or equal to 20,000 square feet, grocery stores with a building size greater than or equal to 15,000 square feet, seaport facilities, and intermodal railyards. There are no size thresholds for seaport facilities or intermodal railyards. The square foot thresholds are based on the amount of TRU activity and associated health risk relative to facility size; there are no proposed size thresholds for seaport facilities or intermodal railyards because activity is not based on facility size and TRUs operate for longer periods of time at these facility types compared to refrigerated WHDCs and grocery stores.

Purpose of section 2477.2(o)

This amendment deletes section 2477.2(o).

Rationale of section 2477.2(o)

This amendment is necessary to make the regulatory text consistent. Staff are proposing to move section 2477.2(o) in its entirety to be with the other defined terms in section 2477.4(b).

C. Section 2477.3 – Exemptions

Purpose of section 2477.3(a)

This amendment adds "TRU."

Rationale of section 2477.3(a)

This amendment is necessary to specify that the exemptions in section 2477.3 apply to the TRU Regulation that is codified in title 13, CCR, section 2477 through 2477.22.

Purpose of section 2477.3(b)

This amendment specifies which sections non-operational TRUs or TRU gen sets are exempt from and deletes the language in section 2477.3(b) that defines a non-operational TRU or TRU gen set.

Rationale of section 2477.3(b)

This amendment is necessary to specify that non-operational TRUs or TRU gen sets are exempt from the regulation, except that the prohibitions in section 2477.18 apply. As currently written, it was unclear as to which sections non-operational TRUs or TRU gen sets are exempt from.

This amendment is also necessary to make the regulatory text consistent. Staff are proposing to move the language in section 2477.3(b) that defines what a non-operational TRU or TRU gen set is to be with the other defined terms in section 2477.4.

Purpose of section 2477.3(c)

This amendment adds language to specify that ZE truck TRUs used to comply with the requirements in section 2477.5(b) are not exempt from the regulation.

Rationale of section 2477.3(c)

This amendment is necessary because as defined, a TRU is a refrigeration system powered by an integral internal combustion engine. Thus, the regulation would not apply to ZE truck TRUs because they do not have a diesel-powered engine. TRU owners will be required to report ZE truck TRUs to CARB and comply with TRU

compliance label requirements, which will enable staff to determine the compliance status of truck TRU fleets with the ZE truck TRU requirements.

Purpose of section 2477.3(d)

This amendment replaces "in-use performance standards" with "requirements," updates the reference to section 2477.5 "(a)" to "(a), (b), (c), and (d)" and section 2477.5 "(j)" to "(l)," deletes the emergency exemption expiration date, deletes "California-based," replaces "ARBER registration" with "TRU reporting," updates the reference to section 2477.5 "(e)" to "(g)," and makes other non-substantive changes for grammar.

Rationale of section 2477.3(d)

The replacement of "in-use performance standards" with "requirements" is necessary because staff are proposing new refrigerant and ZE truck TRU requirements that do not fall in the category of "performance standards," that TRUs used during an emergency would be exempt from.

The update of the reference to section 2477.5 "(a)" to "(a), (b), (c), and (d)" is necessary to specify that TRUs used during an emergency are exempt from all the above requirements, not just the in-use performance standards.

The update of the reference to section 2477.5 "(j)" to "(l)" is necessary because new items were added to section 2477.5 and the subsection that contains the mobile catering company exemption requirements has been updated.

The deletion of the emergency exemption expiration date is necessary because as currently written, the exemption provided to TRUs used during an emergency would expire on January 1, 2025. This amendment is needed to provide the emergency exemption to TRUs past January 1, 2025.

The deletion of "California-based" is necessary to reflect that TRUs used during an emergency are not exempt from the TRU reporting requirements, regardless of whether they are based in California or not. Reporting of all TRUs, regardless of where they are based, is needed to ensure robust compliance monitoring and enforcement of all TRUs operating in California and help to level the playing field between TRUs based in-state and out-of-state.

The replacement of "ARBER registration" with "TRU reporting" is necessary because staff are proposing to delete the ARB IDN requirements in section 2477.5(e) that require ARBER registration and add TRU reporting requirements in section 2477.5(g). Please see the rationale of section 2477.5(g) on the addition of TRU reporting requirements.

Purpose of section 2477.3(e)

This amendment updates the numbering of section 2477.3(e)(1) to 2477.3(e), 2477.3(e)(2) to 2477.3(e)(1), 2477.3(e)(3) to 2477.3(e)(2), 2477.3(e)(4) to 2477.3(e)(3), and 2477.3(e)(5) to 2477.3(e)(4); adds "a compliance plan shall include a" to section 2477(e)(2)(B), updates the reference to section 2477.3 "(e)(2) and (e)(3)" to "(e)(1) and (e)(2)" in section 2477.3(e)(3); and makes other non-substantive changes for grammar.

Rationale of section 2477.3(e)

This amendment is necessary because items in section 2477.3(e) were deleted and the numbering of this subsection has been updated. The words "a compliance plan shall include a" is being added to section 2477(e)(2)(B) to be consistent with the rest of the regulatory text.

D. Section 2477.4 – Definitions

Purpose of section 2477.4

This amendment deletes numbering from section 2477.4.

Rationale of section 2477.4

This amendment is necessary to facilitate future amendments to section 2477.4 because numbering the defined terms in the regulatory text requires updates each time a new term is added or deleted.

Purpose of section 2477.4(a)

This amendment adds "TRU" to specify that the definitions in section 2477.4 apply to the TRU Regulation that is codified in title 13, CCR, section 2477 through 2477.22.

Rationale of section 2477.4(a)

This amendment is necessary because the regulation is codified in CCR, title 13, division 3, chapter 9, which also includes the "Regulation for Mobile Cargo Handling Equipment at Ports and Intermodal Rail Yards."

Affiliate or Affiliation

Purpose

This amendment deletes the definition of "Affiliate or Affiliation."

Rationale

This amendment is necessary because staff are proposing to delete the definition of "Facility" and "Facility Control (of TRUs or TRU Gen Set)" in which the term "Affiliate or Affiliation" was referenced, thereby removing the term from the regulatory text. Therefore, the definition of affiliate or affiliation is no longer needed in the regulation. Please see the rationale of the deletion of "Facility."

Alternative Diesel Fuel

Purpose

This amendment moves the definition of "Alternative Diesel Fuel" to follow the definition of "Affiliate or Affiliation."

Rationale

This amendment is necessary because "Alternative Diesel Fuel" was not listed in correct alphabetical order.

ARB

Purpose

This amendment deletes the definition of "ARB."

Rationale

This amendment is necessary because staff are proposing to update the acronym for the California Air Resources Board, from ARB to CARB, thereby removing the term "ARB" from the regulatory text. The definition of ARB is no longer needed in the regulation.

ARBER

Purpose

This amendment deletes the definition of "ARBER."

Rationale

This amendment is necessary because staff are proposing to delete the definition of "ARBER" and replace it with "CARB online system," thereby removing the term "ARBER" from the regulatory text. The definition of ARBER is no longer needed in the regulation.

Applicable Facility

Purpose

This amendment adds the definition of "Applicable Facility" as any refrigerated WHDC with a building size greater than or equal to 20,000 square feet; grocery store with a building size greater than or equal to 15,000 square feet; seaport facility or intermodal railyard any of the following facilities if one or more TRUs operate within the facility fence line or legal property boundary.

Rationale

This amendment is necessary because the Proposed Amendments place specific requirements on owners and operators of an "Applicable Facility." As such, it is necessary to establish what constitutes an applicable facility, so that readers understand who is subject to the requirements of the Proposed Amendments. This is a new definition, as the current regulation does not have specific requirements for owners and operators of an applicable facility. Please see the earlier rationale of section 2477.2(m) on the addition of applicability to applicable facility owners and operators.

Applicable Facility Operator

Purpose

This amendment adds the definition of "Applicable Facility Owner" as any person who leases, operates, controls, or supervises an applicable facility.

Rationale

This amendment is necessary because the Proposed Amendments place specific requirements on "Applicable Facility Operators." As such, it is necessary to establish what constitutes an applicable facility operator, so that readers understand who is subject to the requirements of the Proposed Amendments. This is a new definition, as the current regulation does not have specific requirements for applicable facility operators.

Applicable Facility Owner

Purpose

This amendment adds the definition of "Applicable Facility Owner" as the person legally holding title (or its equivalent) to an applicable facility.

Rationale

This amendment is necessary because the Proposed Amendments place specific requirements on "Applicable Facility Owners." As such, it is necessary to establish what constitutes an applicable facility owner so that readers understand who is subject to the requirements of the Proposed Amendments. This is a new definition, as the current regulation does not have specific requirements for applicable facility owners.

Applicable Facility Owner/Operator

Purpose

This amendment adds the definition of "Applicable Facility Owner/Operator" to mean a requirement applies to the owner and/or operator of an applicable facility, as determined by agreement or contract between the parties if the two are separate business entities.

Rationale

This amendment is necessary because the Proposed Amendments place specific requirements on "Applicable Facility Owner/Operators." As such, it is necessary to establish what constitutes an applicable facility owner/operator, so that readers understand who is subject to the requirements of the Proposed Amendments. This is a new definition, as the current regulation does not have specific requirements for applicable facility owner/operators.

California

Purpose

This amendment adds the definition of "California" to mean the State of California.

Rationale

This amendment is necessary to specify that for the purposes of this regulation, California means the State of California and does not include Indian Countries in California under Indian or federal jurisdiction.

California-Based Shipper

Purpose

This amendment deletes the definition of "California-Based Shipper."

Rationale

This amendment is necessary because staff are proposing to extend applicability of the regulation to any shipper that arranges, tenders contracts for, or dispatches the transport of perishable goods that requires the operation of TRU-equipped or TRU gen set-equipped trucks, trailers, shipping containers, or railcars in the State of California, regardless of whether the shipper is based in California. This will help to ensure all TRUs operating in California are compliant to achieve the emission reduction and health benefit goals of the Proposed Amendments. As such, staff are proposing to replace the definition of "California-Based Shipper" with "Shipper," thereby removing the term "California-Based Shipper" from the regulatory text.

California-Based Receiver

Purpose

This amendment deletes the definition of "California-Based Receiver."

Rationale

This amendment is necessary because staff are proposing to extend applicability of the regulation to any receiver that arranges, tenders contracts for, or dispatches the transport of perishable goods that requires the operation of TRU-equipped or TRU gen set-equipped trucks, trailers, shipping containers, or railcars in the State of California, regardless of whether the receiver is based in California. This will help to ensure all TRUs operating in California are compliant to achieve the emission reduction and health benefit goals of the Proposed Amendments. As such, staff are proposing to replace the definition of "California-Based Receiver" with "Receiver," thereby removing the term "California-Based Receiver" from the regulatory text.

CARB

Purpose

This amendment adds the definition of "CARB" as the acronym for the California Air Resources Board.

Rationale

This amendment is necessary to better reflect the current identification of the State Board within CalEPA that is responsible for implementing the regulation and to be consistent with how the Agency is referring to itself generally.

CARB Online System

Purpose

This amendment adds the definition of "CARB Online System" as a CARB online system that TRU and applicable facility owners or owner/operators shall report information to for the purposes of the regulation and may be found at: https://arber.arb.ca.gov.

Rationale

This amendment is necessary because the current regulation requires ARBER registration and CARB is in the process of developing a replacement system for ARBER, which is based on an outdated technology platform. The use of the general term "CARB Online System" will allow CARB to continue to collect reported TRU data, as required by the regulation, without future amendments to the regulation to update the specific name of the online system being used.

Class I Railroad

Purpose

This amendment adds the definition of "Class I Railroad" as a railroad that is defined as Class I by the Surface Transportation Board.

Rationale

This amendment is necessary because the term "Class I Railroad" is used to define an "Intermodal Railyard," which is one type of "Applicable Facility" subject to the Proposed Amendments. As such, it is necessary to establish what constitutes a Class I railroad, so readers understand who is subject to the requirements of the Proposed Amendments. This is a new definition, as the current regulation does not have specific requirements for intermodal railyards or Class I Railroads.

Emergency

Purpose

This amendment deletes the reference to section 2477.4; adds language to the definition of "Emergency" to include instances when the Executive Officer has determined that an emergency event arising from sudden and reasonably unforeseen natural disaster such as earthquake, flood, fire, or other unforeseen events that threaten public health and safety has occurred that requires the immediate temporary operation TRUs or TRU gen sets; and makes other non-substantive changes for grammar.

Rationale

This amendment is necessary to delete unneeded wording and limit redundancy. It is inherent that the definitions are in section 2477.4 and not necessary to reference as such every time a defined word is used in the regulatory text.

This amendment is also necessary to provide the Executive Officer the authority to declare an emergency event that requires the immediate temporary operation TRUs or TRU gen sets. This authority is necessary in circumstances where the emergency event is outside the purview of the President of the United States or the Governor of the State of California, or other emergency events that require the use of TRUs or TRU gen sets unrelated to providing foodservice to incident responders.

Facility

Purpose

This amendment deletes the definition of "Facility."

Rationale

This amendment is necessary because staff are proposing to delete the facility reporting requirements, thereby removing the term "Facility" from the regulatory text. The current regulation requires large facilities with 20 or more doors serving refrigerated storage areas to submit a Facility Report in January 2006 for TRU activity that occurred in 2005. The compliance date for these requirements has passed. The Proposed Amendments include new requirements for owners and operators of an "Applicable Facility."

Facility Control (of TRUs and TRU Gen Sets)

Purpose

This amendment deletes the definition of "Facility Control (of TRUs or TRU Gen Sets)."

Rationale

This amendment is necessary because staff are proposing to delete the definition of "Facility" and replace it with "Applicable Facility." The definition of facility includes the only reference to "Facility Control (of TRUs or TRU Gen Sets)," thereby removing the term from the regulatory text. The definition of facility control (of TRUs or TRU gen sets) is no longer needed in the regulation.

Flexibility engine

Purpose

This amendment deletes the definition of "Flexibility engine."

Rationale

This amendment is necessary because staff are proposing to delete the provisions related to the use of flexibility engines, thereby removing the term "Flexibility engine" from the regulatory text. A flexibility engine is an engine installed in new equipment by an OEM under the Transitional Program for Equipment Manufacturers in accordance with title 40, Code of Federal Regulations, sections 89.102 and 1039.625, and title 13, CCR, section 2423(d). The flexibility rules allow pre-approved OEMs to use previous-Tier engines in lieu of Tier 4i or Tier 4 final engines for up to a seven-year phase-in period. The Tier 4i and Tier 4 final engine standards went into effect in 2008 and 2013, respectively. Therefore, the phase-in period ended, and these provisions no longer apply. The definition of flexibility engine is no longer needed in the regulation.

Fleet

Purpose

This amendment adds the definition of "Fleet" as one or more TRUs or TRU gen sets, owned by a person, business, military installation, or government agency operating in the State of California, and does not include TRUs that do not operate in California.

Rationale

This amendment is necessary because the Proposed Amendments establish specific ZE truck TRU requirements for TRU owners based on the size of their truck TRU fleet. As such, it is necessary to establish what constitutes a fleet. This is a new definition, as the current regulation does not include requirements based on the number of TRUs or TRU gen sets in a TRU owner's fleet.

Global Warming Potential Value or GWP Value

Purpose

This amendment adds the definition of "Global Warming Potential value or GWP value."

Rationale

This amendment is necessary because the Proposed Amendments set specific requirements for newly-manufactured truck TRUs, trailer TRUs, and DSC TRUs to use refrigerant with a GWP value less than or equal to 2,200, or use no refrigerant at all. This definition is necessary to establish what a Global Warming Potential Value or GWP Value is under the Proposed Amendments. This is a new definition, as the current regulation does not have specific requirements for refrigerant and did not need to define GWP or GWP value.

Grocery Store

Purpose

This amendment adds the definition of "Grocery Store" as a retail facility that sells food products, which includes, but is not limited to establishments commonly known as supermarkets, food stores, grocery stores, food warehouses, and any other food merchandising stores.

Rationale

This amendment is necessary because grocery stores are one type of "Applicable Facility" subject to the Proposed Amendments. As such, it is necessary to establish what constitutes a grocery store, so that readers understand who is subject to the requirements of the Proposed Amendments. This is a new definition, as the current regulation does not have specific requirements for grocery stores.

Hybrid Cryogenic Temperature Control System

Purpose

This amendment moves the definition of "Hybrid Cryogenic Temperature Control System" to follow the definition of "Highway."

Rationale

This amendment is necessary because "Hybrid Cryogenic Temperature Control System" was not listed in correct alphabetical order.

Independently Owned and Operated

Purpose

This amendment deletes the definition of "Independently Owned and Operated."

Rationale

This amendment is necessary because staff are proposing to delete the definition of "Facility" and replace it with "Applicable Facility." The definition of facility includes the only reference to "Independently Owned and Operated," thereby removing the term from the regulatory text. Please see the rationale of the deletion of "Facility."

Intermodal Railyard

Purpose

This amendment adds the definition of "Intermodal Railyard" as an intermodal facility owned or operated by a Class I Railroad.

Rationale

This amendment is necessary because an intermodal railyard is one type of "Applicable Facility" subject to the Proposed Amendments. As such, it is necessary to establish what constitutes an intermodal railyard, so that readers understand who is subject to the requirements of the Proposed Amendments. This is a new definition, as the current regulation does not have specific requirements for intermodal railyards.

Low Emission TRU (LETRU or L)

Purpose

This amendment deletes the definition of "Low Emission TRU (LETRU or L)."

Rationale

This amendment is necessary because all compliance dates for LETRU have passed. Under the current regulation, there are two levels of in-use standard stringency: the LETRU in-use standard, which reduces diesel PM by at least 50 percent, and the more stringent ULETRU in-use standard, which reduces diesel PM by at least 85 percent. LETRU applies to MY 2002 and older TRU engines. Seven years after complying with LETRU, these MY 2002 and older engines are required to meet the ULETRU in-use standard. For example, a MY 2002 engine is required to meet the LETRU in-use standard by December 31, 2009, and then meet the ULETRU in-use standard by December 31, 2016. Therefore, the definition of LETRU is no longer needed in the regulation.

Military Installation

Purpose

This amendment adds the definition of "Military Installation" and defines it as having the same meaning as defined in title 10, United States Code, section 2801(c)(4).

Rationale

This amendment is necessary because the term "Military Installation" is used to define a "Fleet" and the Proposed Amendments establish specific ZE truck TRU requirements for TRU owners based on the size of their truck TRU fleet. This definition is a new definition because the current regulation does not include requirements based on fleet size and did not need to define fleet or military installation.

Military Tactical Support Equipment (TSE)

Purpose

This amendment adds "vehicles" and "or operated," and makes other non-substantive changes for grammar.

Rationale

This amendment is necessary to specify that military tactical support equipment includes equipment or vehicles owned or operated by the U.S. Department of Defense and/or the U.S. military services, and are used in combat, combat support, combat service support, tactical or relief operations, or training for such operations. This is needed to include TRU-equipped trucks, as well as equipment or vehicles operated but not owned by the U.S. Department of Defense and/or the U.S. military services.

New TRU, TRU Gen Set, or Engine

Purpose

This amendment deletes the reference to section 2477.4.

Rationale

This amendment is necessary to delete unneeded wording and limit redundancy. It is inherent that the definitions are in section 2477.4 and not necessary to reference as such every time a defined word is used in the regulatory text.

Non-operational

Purpose

This amendment adds the definition of "Non-operational" as any TRU that is deleted or separated from the truck, trailer, shipping container, or railcar on which it was originally mounted. This does not include TRU Gen Sets that are not attached to a shipping container or trailer chassis.

Rationale

This amendment is necessary to make the regulatory text consistent by moving language in section 2477.4(b) that defines a non-operational TRU or TRU gen set to be with the other defined terms in section 2477.4.

Operator

Purpose

This amendment deletes the words "as defined."

Rationale

This amendment is necessary to delete unneeded wording and limit redundancy. It is not necessary to specify every time a defined word is used in the regulatory text.

Owner

Purpose

This amendment adds language to specify who the owner of lease or rental units is; deletes the words "see definition;" replaces "register" with "report;" and deletes references to ARBER.

Rationale

The addition of language to specify the owner of a lease or rental unit is necessary to establish who is responsible for the owner/operator requirements in section 2477.5.

The deletion of the words "see definition" is necessary to delete unneeded wording and limit redundancy. It is not necessary to specify every time a defined word is used in the regulatory text.

The replacement of "register" with "report" is necessary because staff are proposing to delete the ARB IDN requirements in section 2477.5(e) that require ARBER

registration and add TRU reporting requirements in section 2477.5(g). Please see the rationale of section 2477.5(g) on the addition of TRU reporting requirements.

The deletion of the reference to "ARBER" is necessary because staff are proposing to replace "ARBER" with "CARB online system."

Parent Company

Purpose

This amendment deletes the definition of "Parent Company."

Rationale

This amendment is necessary because staff are proposing to delete the definition of "Facility Control (of TRUs or TRU Gen Sets)." The definition of facility control (of TRUs or TRU gen sets) includes the only reference to "Parent Company," thereby removing the term from the regulatory text.

Railcar TRU

Purpose

This amendment adds the definition of "Railcar TRU" as a TRU designed to control the environment of temperature-sensitive products in a railcar when that railcar is located on an active rail line.

Rationale

This amendment is necessary because the Proposed Amendments include specific requirements for railcar TRUs; as such, it is necessary to expand on the different types of TRUs subject to the Proposed Amendments. This is a new definition, as the current regulation does not have specific requirements for railcar TRUs.

Real Emissions Reductions

Purpose

This amendment deletes the definition of "Real Emissions Reductions."

Rationale

This amendment is necessary because staff are proposing to delete provisions related to the "Early Compliance with LETRU In-Use Performance Standards," which includes the only reference to "Real Emissions Reductions," thereby removing the term from

the regulatory text. Under the current regulation, if a TRU owner brings a TRU into compliance with LETRU earlier than required, they can apply for a ULETRU compliance date extension. This only applies to TRUs that are required to first meet LETRU and then ULETRU. For each year that LETRU compliance was early, a year of delay in meeting ULETRU is granted. These provisions no longer apply because all compliance dates for LETRU have passed.

Refrigerated Warehouse or Distribution Center (WHDC)

Purpose

This amendment adds the definition of "Refrigerated Warehouse or Distribution Center" as a facility with cold storage used for the reception and storage of products. This includes but is not limited to cold storage warehouses, packing houses, cross-dock facilities, and third-party logistics centers.

Rationale

This amendment is necessary because refrigerated WHDCs are one type of "Applicable Facility" subject to the Proposed Amendments. As such, it is necessary to establish what constitutes a refrigerated WHDC, so that readers understand who is subject to the requirements of the Proposed Amendments. This is a new definition, as the current regulation does not have specific requirements for refrigerated WHDCs.

Repower

Purpose

This amendment deletes the definition of "Repower."

Rationale

This amendment is necessary because staff are proposing to delete provisions related to "ULETRU Extension for Compliance by Original Compliance Date" and "ULETRU Extension for Compliance with LETRU," which include the only references to "Repower," thereby removing the term from the regulatory text. These provisions no longer apply because the ULETRU extension for compliance by original compliance date was available to owners that complied with the original December 31, 2008 compliance date, and all compliance dates for LETRU have passed.

Rotating Outage

Purpose

This amendment deletes the reference to section 2477.4.

Rationale

This amendment is necessary to delete unneeded wording and limit redundancy. It is inherent that the definitions are in section 2477.4 and not necessary to reference as such every time a defined word is used in the regulatory text.

Seaport Facility

Purpose

This amendment adds the definition of "Seaport Facility" as any non-military operational seaport where the seaport functions as a terminal operator or independent marine terminal.

Rationale

This amendment is necessary because seaport facilities are a type of "Applicable Facility" that are subject to the Proposed Amendments. As such, is necessary to establish what constitutes a "Seaport facility." This is a new definition, as the current regulation does not have specific requirements for seaport facilities.

Square Footage

Purpose

This amendment adds the definition of "Square Footage" as the square footage of all buildings on properties owned and operated by one business entity, as calculated from the building floor plan(s) or blueprint(s) archived by the local permitting agency or records office. For businesses leasing all or part of a building, the square footage is the usable area, as specified in the lease agreement.

Rationale

This amendment is necessary because applicability of the Proposed Amendments is based on facility type and building square footage. As such, it is necessary to define what "Square Footage" is so that readers understand which facilities are subject to the Proposed Amendments. This is a new definition, as the current regulation does not apply to facilities based on their building size or square footage.

Statement of Accuracy

Purpose

This amendment adds the definition of "Statement of Accuracy" to mean the person responsible for submitting information under the TRU Regulation submits and signs

the following statement along with the information provided: "I certify under penalty of perjury under the laws of the State of California that the information provided is true, accurate, and complete."

Rationale

This amendment is necessary because staff proposing to require all information submitted to CARB for the purposes of the regulation to include a statement of accuracy. The statement of accuracy is needed to ensure that submitted information is true, accurate, and complete.

Terminal Operator

Purpose

This amendment deletes the definition of "Terminal Operator."

Rationale

This amendment is necessary because staff are proposing to delete the terminal operator requirements, thereby removing the term "Terminal Operator" from the regulatory text. Staff are proposing to replace the terminal operator and facility reporting requirements with applicable facility owner and operator requirements. Please see the rationale of section 2477.2(m) on the addition of applicability to applicable facility owners and operators.

Third Party Agreement Confirmation Information

Purpose

This amendment moves the definition of "Third Party Agreement Confirmation Information" to follow the definition of "Terminal" and replaces "register in ARBER" with "report to CARB."

Rationale of section 2477.14(a)(3)

This amendment is necessary because "Third Party Agreement Confirmation Information" was not listed in correct alphabetical order.

This amendment is also necessary because staff are proposing to delete the ARB IDN requirements in section 2477.5(e) that require ARBER registration and add TRU reporting requirements in section 2477.5(g). Please see the rationale of section 2477.5(g) on the addition of TRU reporting requirements.

Trailer

Purpose

This amendment moves the definition of "Trailer" to follow the definition of "Tier 4 Nonroad/Off-road Emission Standards."

Rationale

This amendment is necessary because "Trailer" was not listed in correct alphabetical order.

Trailer TRU

Purpose

This amendment adds the definition of "Trailer TRU" as a TRU that is mounted on or in a trailer or domestic shipping container that can be attached and detached to a tractor, commonly referenced together as a "tractor-trailer."

Rationale

This amendment is necessary because the Proposed Amendments include specific requirements for trailer TRUs; as such, it is necessary to expand on the different types of TRUs subject to the Proposed Amendments. This is a new definition, as the current regulation does not have specific requirements for trailer TRUs.

Truck TRU

Purpose

This amendment adds the definition of "Truck TRU" as a TRU that is mounted on or in a truck cargo box permanently attached to a truck, in contrast to a detachable trailer.

Rationale

This amendment is necessary because the Proposed Amendments include specific requirements for truck TRUs; as such, it is necessary to expand on the different types of TRUs subject to the Proposed Amendments. This is a new definition, as the current regulation does not have specific requirements for truck TRUs.

Ultra-Low-Aromatic Synthetic Diesel Fuel

Purpose

This amendment adds the letter "n" to the word "cotent" in Table 2.

Rationale

This amendment is necessary because the word "content" was spelled incorrectly.

Ultra-Low Emission TRU (ULETRU or U)

Purpose

This amendment updates the references to subparagraphs 2477.5 "(a)(1)," "(a)(2)," and (a)(3)" to "(c)(1)," "(c)(2)," and (c)(3)."

Rationale

This amendment is necessary because the performance standard requirements were moved from section 2477.5(a) to 2477.5(c) as part of changes to section 2477.5.

Vehicle Owner

Purpose

This amendment adds the definition of "Vehicle Owner" as the Person as defined in this section registered as the owner or lessee of a vehicle by the California Department of Motor Vehicles or its equivalent in another state, province, or as evidenced on the vehicle registration document carried in the vehicle to which the TRU is attached.

Rationale

This amendment is necessary because vehicle owners are subject to the requirements of the Proposed Amendments. As such, it is necessary to establish what constitutes a "Vehicle Owner," so that readers understand who is subject to the requirements of the Proposed Amendments. This is a new definition, as the current regulation does not have specific requirements for vehicle owners.

Zero-Emission Fueling Infrastructure

Purpose

This amendment adds the definition of "Zero-Emission Fueling Infrastructure" as a fueling system that provides the appropriate fuel type to power a ZE truck TRU (e.g., electric charging infrastructure or cryogenic fueling tank and dispenser).

Rationale

This amendment is necessary because the Proposed Amendments include provisions that would allow TRU owners to apply for a compliance extension to the ZE truck TRU requirements in section 2477.5(b) due to unforeseen, temporary, or extenuating circumstances outside the TRU owner's control that prevents the installation of ZE fueling infrastructure. This is a new definition, as the current regulation does not have a specific compliance extension based on delays to ZE fueling infrastructure.

Zero-Emission Truck TRU (ZE truck TRU)

Purpose

This amendment adds the definition of "Zero-Emission Truck TRU (ZE truck TRU)" as a truck refrigeration system whose operation results in zero exhaust emissions of any criteria pollutant (or precursor pollutant) or GHG under any possible operational modes or conditions. The ZE truck TRU may draw power from the truck or stored energy source that is recharged by the truck only if the truck produces zero exhaust emissions while operating. The stored energy source may not be recharged by a CI engine coupled to a generator as a source of electricity. Weight of the stored energy source does not alone qualify as "a decrease in fuel efficiency."

Rationale

This amendment is necessary because the Proposed Amendments establish specific requirements for ZE truck TRUs in section 2477.5(b). As such, it is necessary to establish what constitutes a "ZE truck TRU." This is a new definition, as the current regulation does not have specific requirements for ZE truck TRUs.

Purpose of section 2477.4(b)

This amendment adds language moved from section 2477.2(o).

Rationale of section 2477.4(b)

This amendment is necessary to make the regulatory text consistent. Staff are proposing to move section 2477.2(o) in its entirety to new section 2477.4(b) to be with the other defined terms in section 2477.4.

E. Section 2477.5 – Requirements for Owners or Owner/Operators

2477.5(a) Refrigerant Requirements

Purpose of section 2477.5(a)

This amendment adds new language to establish refrigerant requirements for GWP and labeling that apply to newly-manufactured TRUs. Beginning December 31, 2022, newly-manufactured truck TRUs, trailer TRUs, and DSC TRUs would be required to use refrigerant with a GWP less than or equal to 2,200, or use no refrigerant at all. TRU owners would also be required to ensure that TRU OEM supplied refrigerant labels are maintained so that they are readily visible and legible.

Rationale of section 2477.5(a)

This amendment is necessary because TRUs produce direct GHG emissions when refrigerant leaks from the unit due to normal wear and fatigue of refrigerant fittings. Requiring the use of lower-GWP refrigerant will reduce GHG emissions from TRUs, which is needed to help meet the State's GHG emission reduction targets and climate goals.

TRUs using R-452A refrigerant, which has a GWP of 2,141, are commercially available from both of the two major TRU manufacturers. Staff are proposing a GWP limit of 2,200 to ensure a quick transition to a lower-GWP alternative that is commercially available for the three equipment types (truck TRU, trailer TRU, and DSC TRU). The refrigerant requirement for truck TRUs, trailer TRUs, and DSC TRUs aligns with the U.S. EPA's approval of the use of R-452A for transport applications, which does not include railcar TRUs or TRU gen sets.

Labeling requirements are necessary to ensure proper refrigerant maintenance of TRUs and to aid CARB enforcement personnel during inspections and fleet audits.

2477.5(b) Zero-Emission Truck TRUs

Purpose of section 2477.5(b) and (b)(1)

This amendment establishes ZE truck TRU requirements, including the required ZE truck TRU fleet percentages and phase-in compliance schedule in Table 3, and proposes the methodology for the calculation of the minimum number of ZE truck TRUs required each year. The required minimum number of ZE truck TRUs is based on the truck TRU fleet size reported to CARB on December 31, 2023 or December 31 of each year, whichever is greater.

Rationale of section 2477.5(b) and (b)(1)

The ZE truck TRU requirements are necessary to achieve PM, NOx, and GHG emission reductions needed to help meet the State's multiple risk reduction, air quality, and climate goals, as well as to meet the directive of State policies and plans directing CARB to achieve additional diesel emission reductions. This includes EO N-79-20, which set a goal for 100 percent ZE off-road vehicles and equipment by 2035. Truck TRUs are generally used for local and regional delivery, and return to a home base each night. Based on their daily operational characteristics and the operating range of current technologies, TRUs installed on trucks are well suited for ZE, because they would not require additional refueling or recharging infrastructure outside their home terminals or distribution centers before dispatch.

It is necessary to include the equation, annual ZE truck TRU fleet percentages, and phase-in compliance schedule so truck TRU owners can determine the number of ZE truck TRUs per year needed to comply with the ZE truck TRU requirement.

The Proposed Amendments would require TRU owners to transition 15 percent of their truck TRU fleet to ZE technology each year beginning December 31, 2023. The annual 15 percent ZE truck TRU requirement (over seven years) aligns with the seven-year compliance schedule already established by the current regulation, in which TRU owners are required to meet more stringent performance standards at seven-year intervals until the TRU meets ULETRU.

Purpose of section 2477.5(b)(2)

This amendment adds language to establish the requirements for downsizing a truck TRU fleet. A TRU owner may downsize their truck TRU fleet size, so long as the TRU owner has not purchased additional direct-drive refrigeration units to replace the original diesel-powered units being sold or retired.

Rationale of section 2477.5(b)(2)

This amendment is necessary to prevent owners from replacing diesel-powered truck TRUs with direct-drive refrigeration units, which are exempt from the regulatory requirements. Direct-drive units are not zero-emission and therefore would not achieve the emission and health risk reductions expected under the Proposed Amendments.

Purpose of section 2477.5(b)(3)

This amendment adds language on the rounding methodology for the calculation of ZE truck TRUs required by the Proposed Amendments.

Rationale of section 2477.5(b)(3)

This amendment is necessary because the number of ZE truck TRUs required by the Proposed Amendments may not always result in a whole number and TRU owners cannot purchase a partial ZE truck TRU to comply with the ZE truck TRU requirement.

2477.5(c) In-Use Performance Standards

Purpose of section 2477.5(c)

This amendment adds language to specify in-use performance standard requirements for MY 2022 and older trailer TRU, DSC TRU, railcar TRU, and TRU gen set engines; updates the reference to paragraph "(b)" to "(c)(4);" adds language to specify that the in-use performance standards also apply to owners or owner/operators that cause a TRU or TRU gen set to be operated in California; deletes references to LETRU or L; updates footnote 4; and makes other non-substantive changes for grammar.

Rationale of section 2477.5(c)

The addition of language to specify in-use performance standard requirements for MY 2022 and older trailer TRU, DSC TRU, railcar TRU, and TRU gen set engines amendment is necessary because staff are proposing different requirements for MY 2022 and older versus MY 2023 and newer engines. The Proposed Amendments would require newly-manufactured engines to meet a PM emission standard that aligns with the U.S. EPA Tier 4 final PM emission standard for engines greater than 25 horsepower, regardless of horsepower. This is needed to address the increase in PM emissions from TRU engines less than 25 horsepower. The federal and California PM emission standard for TRU engines less than 25 horsepower is 15 times higher than that for TRU engines greater than 25 horsepower. Based on the updated TRU inventory, the population of TRUs equipped with engines less than 25 horsepower is increasing and will become responsible for the majority of PM emissions from TRUs in the near future, if current trends continue. MY 2022 and older engines would continue

to operate under the current requirements, in which they shall meet ULETRU by December 31 of the seventh year after the engine MY. This is necessary to allow for the full useful life of units purchased to comply with the current regulation.

The update of paragraph "(b)" to "(c)(4)" is necessary because items were added to and deleted from section 2477.5 and the lettering of the subsection that contains the alternative technology provisions has been updated.

The addition of language to specify that the in-use performance standards also apply to owners or owner/operators that cause a TRU or TRU gen set to be operated in California is needed to specify that the requirements apply to TRU owners that may not operate the TRU.

The deletion of references to LETRU or L is necessary because all compliance dates for LETRU have passed.

The update to the numbering of section 2477.5(c)(1)(A)2. to 2477.5(c)(1)(A)1. is necessary because section 2477.5(c)(1)(A)2. was deleted and the numbering of this section has been updated.

The amendment to footnote 4 is necessary to update the status of the Tier 4 "final" Nonroad/Off-road Emission Standards that went into effect in 2013.

Purpose of section 2477.5(c)(3)

This amendment updates the reference to section 2477.5 "(a)(1) and (2)" to "(c)(1) or (2)," and adds language to specify that the alternative to meeting the ULETRU in-use performance standards apply to MY 2022 and older units.

Rationale of section 2477.5(c)(3)

This amendment is necessary because items were added to and deleted from section 2477.5 and the lettering of the subsection that contains the in-use performance standard requirements for MY 2022 and older TRU and TRU gen set engines has been updated.

This amendment is also necessary to specify that the alternative technology provisions apply to MY 2022 and older units to allow for the full useful life of alternative technology units purchased to comply with the current regulation.

Purpose of section 2477.5(c)(3)(A)

This amendment adds the words "all of."

Rationale of section 2477.5(c)(3)(A)

This amendment is necessary to specify that a hybrid electric TRU or electric-standby TRU shall qualify as an Alternative Technology only if all the conditions in sections 2477.5(c)(3)(A) are met.

Purpose of section 2477.5(c)(3)(A)1., 3., and 4.

This amendment deletes the words "as defined."

Rationale of section 2477.5(c)(3)(A)1., 3., and 4.

This amendment is necessary to delete unneeded wording and limit redundancy. It is not necessary to specify every time a defined word is used in the regulatory text.

Purpose of section 2477.5(c)(3)(A)6.

This amendment deletes language from section 2477.5(c)(3)(A)6. specifying that 50 percent of an owner's hybrid electric or electric-standby equipped TRUs shall be equipped with an electronic tracking system by December 31, 2012.

Rationale of section 2477.5(c)(3)(A)6.

This amendment is necessary because the compliance date has passed. As of December 31, 2013, 100 percent of an owner's hybrid electric or electric-standby equipped TRUs shall be equipped with an electronic tracking system.

Purpose of section 2477.5(c)(3)(A)7.

This amendment replaces "registered in ARBER" with "reported to CARB" and updates the reference to section 2477.5 "(e)" to "(g)."

Rationale of section 2477.5(c)(3)(A)7.

These amendments are necessary because staff are proposing to delete the ARB IDN requirements in section 2477.5(e) that require ARBER registration and add TRU reporting requirements in section 2477.5(g). Please see the rationale of section 2477.5(g) on the addition of TRU reporting requirements.

Purpose of section 2477.5(c)(3)(B)

This amendment adds the words "all of."

Rationale of section 2477.5(c)(3)(B)

Please see the earlier rationale of section 2477.5(c)(3)(A) as the changes are the same and thus necessary for the same reasons.

Purpose of section 2477.5(c)(3)(B)2.

This amendment deletes the words "as defined."

Rationale of section 2477.5(c)(3)(B)2.

This amendment is necessary to delete unneeded wording and limit redundancy. It is not necessary to specify every time a defined word is used in the regulatory text.

Purpose of section 2477.5(c)(3)(B)5.

This amendment replaces "registered in ARBER" with "reported to CARB" and updates the reference to section 2477.5 "(e)" to "(g)."

Rationale of section 2477.5(c)(3)(B)5.

These amendments are necessary because staff are proposing to delete the ARB IDN requirements in section 2477.5(e) that require ARBER registration and add TRU reporting requirements in section 2477.5(g). Please see the rationale of section 2477.5(g) on the addition of TRU reporting requirements.

Purpose of section 2477.5(c)(3)(C)

This amendment deletes the reference to section 2477.4.

Rationale of section 2477.5(c)(3)(C)

This amendment is necessary to delete unneeded wording and limit redundancy. It is inherent that the definitions are in section 2477.4 and not necessary to reference as such every time a defined word is used in the regulatory text.

Purpose of section 2477.5(c)(3)(D)

This amendment deletes the reference to section 2477.4 and updates the reference to section 2477.5 "(h)(1)" to "(j)(1)."

Rationale of section 2477.5(c)(3)(D)

This amendment is necessary to delete unneeded wording and limit redundancy. It is inherent that the definitions are in section 2477.4 and not necessary to reference as such every time a defined word is used in the regulatory text.

This amendment is also necessary because items were added to and deleted from section 2477.5 and the lettering of the subsection that contains the requirements for the use of alternative diesel fuels has been updated.

Purpose of section 2477.5(c)(4)

This amendment updates the lettering of section 2477.5(b) to 2477.5(c)(4); adds language to specify the in-use performance standard compliance dates for MY 2022 and older trailer TRU, DSC TRU, railcar TRU, and TRU gen set engines; and updates the reference to sections 2477.5 "(f), (g), (k), (l), or (m)" to "(m) or (n)."

Rationale of section 2477.5(c)(4)

The update to the lettering of section 2477.5(b) to 2477.5(c)(4) is necessary because items were added to section 2477.5 and in-use compliance dates were moved from section 2477.5(b) to 2477.5(c)(4) as part of changes to section 2477.5.

This amendment is also necessary to establish the in-use performance standard compliance dates for MY 2022 and older engines. The language in section 2477.5(c)(4) was moved from section 2477.5(b), except for subsections and tables with outdated information or compliance dates that have passed. MY 2022 and older engines would continue to operate under the current requirements, in which they shall meet ULETRU by December 31 of the seventh year after the engine MY. This is necessary to allow for the full useful life of units purchased to comply with the current regulation.

The update of the reference to sections 2477.5 "(f), (g), (k), (l), or (m)" to "(m) or (n)" is necessary because staff are proposing to delete provisions related to "Early Compliance with LETRU In-Use Performance Standards" in section 2477.5(f), "ULETRU Extension for Compliance by Original Compliance Date" in section 2477.5(g), and "ULETRU Extension for Compliance with LETRU" in section 2477.5(m). These provisions no longer apply because the ULETRU extension for compliance by original compliance date was available to owners that complied with the original December 31, 2008 compliance date, and all compliance dates for LETRU have passed. The update to the lettering of section 2477.5(k) to 2477.5(m) and section 2477.5(l) to 2477.5(m) is necessary because items were added to section 2477.5 and provisions related to the "Compliance Extension Based on Unavailability of Compliance Technology" and "Compliance Extension Based on Delays due to Private Financing, Equipment Manufacture Delays or Installer Delays" were moved as part of changes to section 2477.5.

Purpose of section 2477.5(c)(4)(B)

This amendment updates the reference to sections 2477.5 "(b)(1), (2), (3), and (4)" to "(c)(4)(a)."

Rationale of section 2477.5(c)(4)(B)

This amendment is necessary because items were added to and deleted from section 2477.5 and the lettering of the subsection that contains the in-use compliance dates for MY 2022 and older TRU and TRU gen set engines has been updated.

Purpose of section 2477.5(c)(4)(B)2.

This amendment replaces "apply for an ARB IDN" with "report the TRU to CARB."

Rationale of section 2477.5(c)(4)(B)2.

This amendment is necessary because staff are proposing to delete the ARB IDN requirements in section 2477.5(e) that require ARBER registration and add TRU reporting requirements in section 2477.5(g). Please see the rationale of section 2477.5(g) on the addition of TRU reporting requirements.

2477.5(d) PM Emission Standard for MY 2023 and Newer TRU and TRU Gen Set Engines

Purpose of section 2477.5(d)

This amendment adds language to specify the PM emission standard requirements for MY 2023 and newer trailer TRU, DSC TRU, railcar TRU, and TRU gen set engines.

Rationale of section 2477.5(d)

This amendment is necessary because staff are proposing different requirements for MY 2022 and older versus MY 2023 and newer engines. Please see the earlier rationale of section 2477.5(c) as the changes are necessary for the same reasons.

2477.5(e) VDECS Requirements

Purpose of section 2477.5(e)

This amendment updates the lettering of section 2477.5(c) to 2477.5(e) and adds additional VDECS requirements.

Rationale of section 2477.5(e)

This amendment is necessary because items were added to section 2477.5 and the lettering of this subsection has been updated. The new language is needed to establish requirements for VDECS installation and maintenance in addition to the requirements already established for failure or damage to a VDECS. The additional VDECS requirements are necessary to ensure the VDECS is compatible with the TRU

or TRU gen set and maintained in a specific manner to ensure that TRU engine exhaust emission reductions are reduced by the required levels.

Purpose of section 2477.5(e)(3)(B)

This amendment updates the reference to paragraph "2477.5(a)(1) and 2477.5(a)(2)" to "2477.5(c)."

Rationale of section 2477.5(e)(3)(B)

This amendment is necessary because items were added to and deleted from section 2477.5 and the lettering of the subsection that contains the in-use performance standards for MY 2022 and older TRU and TRU gen set engines has been updated.

2477.5(f) In-Use Recordkeeping and Reporting

Purpose of section 2477.5(f)

This amendment deletes the provisions related to the "Early Compliance with LETRU In-Use Performance Standards" from section 2477.5(f) and updates the lettering of section 2477.5(d) to 2477.5(f).

Rationale of section 2477.5(f)

This amendment is necessary because all compliance dates for LETRU have passed. Under the current regulation, if a TRU owner brings a TRU into compliance with LETRU earlier than required, they can apply for a ULETRU compliance date extension. This only applies to TRUs that are required to first meet LETRU and then ULETRU. For each year that LETRU compliance was early, a year of delay in meeting ULETRU is granted. These provisions no longer apply.

This amendment is also necessary because items were added section to 2477.5 and the lettering of the subsection that contains the requirements for in-use recordkeeping and reporting has been updated.

Purpose of section 2477.5(f)(1)

This amendment deletes section 2477.5(f)(1) regarding operator reports, updates the numbering of section 2477.5(f)(2) to 2477.5(f)(1), adds a reference to section 2477.5(c)(3)(D), and updates the reference to section 2477.5 "(h)(1)" to "(j)(1)."

Rationale of section 2477.5(f)(1)

This amendment is necessary because staff are proposing to delete the terminal operator requirements. Please see the rationale of section 2477.2(b) on the deletion of applicability to terminal operators.

The update to the numbering of section 2477.5(f)(2) to 2477.5(f)(1) is necessary because items were deleted from section to 2477.5(f) and the lettering of this subsection has been updated.

The addition of the reference to section 2477.5(c)(3)(D) is necessary to specify that the in-use recordkeeping and reporting requirements in section 2477.5(f)(1) apply to owners that elect to comply by using a verified alternative diesel fuel in accordance with that section.

The update to the lettering of section 2477.5 "(h)(1)" to "(j)(1)" is necessary because items were added to and deleted from section 2477.5 and the lettering of the subsection that contains the requirements for the use of alternative diesel fuels has been updated.

Purpose of section 2477.5(f)(2)

This amendment updates the numbering of section 2477.5(f)(3) to 2477.5(f)(2); adds references to section 2477.5(c)(3)(A) and section (c)(3)(B); and specifies that hybrid electric TRU, electric standby-equipped TRU, or hybrid cryogenic temperature control systems used to comply with the regulation shall use an electronic tracking system that meets the requirements of section 2477.20(d).

Rationale of section 2477.5(f)(2)

The update to the numbering of section 2477.5(f)(3) to 2477.5(f)(2) is necessary because items were deleted from section to 2477.5(f) and the lettering of this subsection has been updated.

The addition of the reference to section 2477.5(c)(3)(A) and 2477.5(c)(3)(B) is necessary to specify that the electronic tracking system requirements in section 2477.20(d) apply to owners that elect to comply by using a hybrid electric TRU, electric standby-equipped TRU, or hybrid cryogenic temperature control system in accordance with that section.

The addition of the reference to section 2477.20(d) is necessary because staff are proposing to move all reporting requirements to section 2477.20. This is necessary to make the regulatory text consistent by establishing one section that contains all reporting requirements and ensuring that all information reported to CARB to comply

with the regulation is subject to the same requirements for submittal and recordkeeping and include a statement of accuracy.

Purpose of sections 2477.5(f)(2)(A) and (B)

These amendments delete sections 2477.5(f)(2)(A) and (B) in their entirety.

Rationale of section 2477.5(f)(2)(A) and (B)

These amendments are necessary because staff are proposing to move sections 2477.5(f)(2)(A) and (B) in their entirety to new section 2477.20(d) to be with the other reporting requirements in section 2477.20.

Purpose of sections 2477.5(f)(4)

This amendment deletes section 2477.5(f)(3) in its entirety.

Rationale of section 2477.5(f)(3)

This amendment is necessary because staff are proposing to move section 2477.5(f)(3) in its entirety to new section 2477.20(d) to be with the other reporting requirements in section 2477.20.

2477.5(g) TRU Reporting Requirements

Purpose of section 2477.5(g)

This amendment deletes the provisions related to the "ULETRU Extension for Compliance by Original Compliance Date" from section 2477.5(g) in its entirety and adds language to establish TRU reporting requirements. The TRU reporting requirements in section 2477.5(g) were retained from the current regulation ("ARB Identification Numbering Requirements" in section 2477.5(e)), except TRU reporting requirements apply to all TRUs that operate in California, not just those that are based in California and include additional information on the date the TRU was purchased, rented, or leased and certification that TRU owners have appraised the TRU operator of their obligations under the regulation.

Rationale of section 2477.5(g)

This amendment is necessary because the ULETRU extension for compliance by original compliance date was available to owners that complied with the original December 31, 2008 compliance date. These provisions no longer apply.

Reporting of California-based and non-California-based TRUs that operate in California and the additional reporting fields are needed to ensure robust compliance monitoring and enforcement of all TRUs operating in California. The reported data

would be used by staff to better target fleets that are not in compliance. This would help ensure better overall enforcement. Staff expect this to lead to further emission reductions from TRUs, thus leading to more health benefits to individuals living in California. This amendment is also necessary to level the playing field between TRUs based in-state and out-of-state.

Purpose of section 2477.5(g)(1)(A)

This amendment deletes section 2477.5(g)(1)(A) in its entirety.

Rationale of section 2477.5(g)(1)(A)

This amendment is necessary because staff are proposing to move section 2477.5(g)(1)(A) in its entirety to new section 2477.20(f) to be with the other reporting requirements in section 2477.20. This is needed to make the regulatory text consistent by establishing one section that contains all reporting requirements and ensuring that all information reported to CARB to comply with the regulation is subject to the same requirements for submittal and recordkeeping and include a statement of accuracy.

Purpose of section 2477.5(g)(6)

This amendment adds language to specify that the ARB IDN labeling requirements in section 2477.5(g)(6) would be superseded by TRU compliance label requirements in section 2477.5(i) beginning December 31, 2023.

Rationale of section 2477.5(g)(6)

This amendment is necessary to specify that beginning December 31, 2023, the TRU compliance label requirements would supersede the ARB IDN labeling requirements in section 2477.5(g)(6), in which owners would be required to affix a CARB-issued label to both sides of the TRU housing every three years. Compliance labels would assist both CARB enforcement staff and applicable facility staff to determine the compliance status of a TRU without having to look-up up the ARB IDN or other identifying information on CARB's website. Non-compliant TRUs would not be issued a new compliance label. This will help to ensure that non-compliant TRUs are brought into compliance in a timely manner, and achieve the emissions and health risk reductions expected under the Proposed Amendments.

2477.5(h) TRU Operating Fees

Purpose of section 2477.5(h)

This amendment adds language to establish TRU operating fee requirements.

Rationale of section 2477.5(h)

This amendment is necessary to specify who must pay TRU operating fees, when the TRU operating fees shall be paid, the fee amounts, and that TRU operating fees shall be submitted to the Executive Officer. Beginning December 31, 2023, TRU owners would be required to pay a TRU operating fee for each TRU or TRU gen set operated in California. Fees would be collected once every three years. The TRU operating fees would offset the costs to CARB as allowed by SB 854,[59] which authorizes CARB to adopt a schedule of fees to cover all or part of CARB's reasonable costs associated with certification, audit, and compliance of off-road or non-vehicular engines and equipment, aftermarket parts, and emission control components sold in the State. The fee amounts are based on the direct labor cost of staff needed to implement and enforce the amendments; indirect labor cost of management, administrative, legal, and information technology resources; and operational costs to support enforcement efforts (compliance labels, envelopes, and postage). More information on the proposed fees can be found in Appendix G.

2477.5(i) TRU Compliance Labels

Purpose of section 2477.5(i)

This amendment adds language to establish TRU compliance label requirements.

Rationale of section 2477.5(i)

This amendment is necessary to specify when TRU compliance labels will be issued, when TRU compliance label requirements will supersede the ARB IDN labeling requirements in section 2477.5(g)(6), where compliance labels shall be placed on the TRU, and that owners may use alternative unique equipment identification markings.

Beginning December 31, 2023, the TRU compliance label requirements would supersede the ARB IDN labeling requirements in section 2477.5(g)(6), in which owners would be required to affix a CARB-issued label to both sides of the TRU housing every three years. Compliance labels would assist both CARB enforcement staff and applicable facility staff to determine the compliance status of a TRU without having to look-up up the ARB IDN or other identifying information on CARB's website. Non-compliant TRUs would not be issued a new compliance label. This will help to ensure that non-compliant TRUs are brought into compliance in a timely manner and achieve the emissions and health risk reductions expected under the Proposed Amendments.

[59] California Health and Safety Code § 43019.1, Division 26, Senate Bill No. 854, July 27, 2018. (web link: https://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill_id=201720180SB854)

The provision allowing the use of alternative unique equipment identification markings is necessary because some large TRU fleets and TRU gen set fleets use their own equipment numbers to help them track their equipment. In the case of TRU gen sets and refrigerated shipping containers, the numbering system meets the International Organization for Standardization (ISO) standard 6346 and is administered by the Bureau International des Containers (BIC), an international organization. BIC publishes their assigned company codes in their Intermodal Equipment Registry. Railcars use a similar equipment numbering system with company codes, called reporting marks, assigned by the Association of American Railroads (AAR). As part of the original TRU rulemaking, TRU gen set fleets and railroads requested that BIC-Codes and reporting marks be allowed in lieu of the ARB IDNs to avoid confusion, costs, duplication, and space limitations. As such, the current regulation allows the use of BIC-Codes, or reporting marks in place of ARB IDNs, provided specific requirements are met. The Proposed Amendments would retain these provisions.

2477.5(j) Fuel Requirements

Purpose of section 2477.5(j)

This amendment updates the lettering of section 2477.5(h) to 2477.5(j), updates the reference to section 2477.5 "(a)" to "(c)," deletes the reference to "ARBER," updates the reference to section 2477.5 "(e)" to "(g)," and deletes reference to section 2477.5(f) and section 2477.6.

Rationale of section 2477.5(j)

The update to the lettering of section 2477.5(h) to 2477.5(j) is necessary because items were added to and deleted from section 2477.5 and the lettering of this subsection has been updated.

The update of the reference to section 2477.5 "(a)" to "(c)" is necessary because staff are proposing new refrigerant requirements in section 2477.5(a) and in-use performance standard requirements were moved from section 2477.5(a) to 2477.5(c) as part of changes to section 2477.5.

The deletion of the reference to "ARBER" is necessary because staff are proposing to replace "ARBER" with "CARB online system."

The update of the reference to section 2477.5 "(e)" to "(g)" is necessary because items were added to and deleted from section 2477.5 and the lettering of the subsection that contains the requirements for TRU reporting has been updated.

The deletion of references to section 2477.5(f) and section 2477.6 is necessary for the same reasons described in section 2477.5(f) and section 2477.2(b).

2477.5(k) Compliance by Replacing Engines

Purpose of section 2477.5(k)

This amendment updates the lettering of section 2477.5(i) to 2477.5(k); updates the reference to section 2477.5 "(a)" to "(c);" updates the reference to section 2477.5 "(b)" to "(c)(4);" and deletes the words "see definition."

Rationale of section 2477.5(k)

The update to the lettering of section 2477.5(i) to 2477.5(k) is necessary because items were added to and deleted from section 2477.5 and the lettering of this subsection has been updated.

The update of the reference to section 2477.5 "(a)" to "(c)" is necessary because items were added to section 2477.5 and the subsection that contains the requirements for in-use performance standards has been updated.

The update of the reference to section 2477.5 "(b)" to "(c)(4)" is necessary because items were added to and deleted from section 2477.5 and the lettering of the subsection that contains the alternative technology provisions has been updated.

The deletion of the words "see definition" is necessary to delete unneeded wording and limit redundancy. It is not necessary to specify every time a defined word is used in the regulatory text.

2477.5(l) Mobile Catering Company Exemption Requirements

Purpose of section 2477.5(l)

This amendment updates the lettering of section 2477.5(j) to 2477.5(l).

Rationale of section 2477.5(l)

The update to the lettering of section 2477.5(j) to 2477.5(l) is necessary because items were added to and deleted from section 2477.5 and the lettering of this subsection has been updated.

Purpose of section 2477.5(l)(1)

This amendment replaces "in-use performance standards" with "requirements" and adds references to section 2477.5(b), (c), and (d).

Rationale of section 2477.5(l)(1)

This amendment is necessary because staff are proposing new refrigerant requirements in section 2477.5(a), new ZE truck TRU requirements in section 2477.5(b) and the in-use performance standard requirements were moved to section 2477.5(c) and 2477.5(d). The new requirements do not fall in the category of "performance standards." The changes are needed to specify that TRUs operated under the mobile catering exemption would be exempt from all the above requirements. As currently written, the exemption would only apply to the in-use standards.

Purpose of section 2477.5(l)(1)(B)

This amendment deletes the words "California-based," replaces "ARBER registration" with "TRU reporting," replaces "registered in ARBER" to "reported to CARB," and updates the reference to section 2477.5 "(e)" to "(g)."

Rationale of section 2477.5(l)(1)(B)

The deletion of the words "California-based" is necessary to specify that all TRUs operating in California under the mobile catering company exemption would be required to report to CARB under section 2477.5(g). Reporting of all TRUs operating under the mobile catering company exemption, regardless of where they are based, would allow staff to identify all TRUs operating under the exemption. This is needed to help ensure robust compliance monitoring and enforcement of all TRUs operating in California.

For the remaining changes, please see the earlier rationale of section 2477.5(c)(3)(A)(7) as the changes are the same and thus necessary for the same reasons.

Purpose of section 2477.5(l)(1)(C)

This amendment specifies that a mobile catering company shall apply for an exemption with the information required under section 2477.20(g); updates the reference to subparagraph "(j)(1)(D)7" to section "2477.5(g)(7);" and deletes the subsections containing the application requirements.

Rationale of section 2477.5(l)(1)(C)

The addition of the reference to section 2477.20(g) and the update to the reference to subparagraph "(j)(1)(D)7" to section "2477.5(g)(7) are necessary because staff are proposing to move all reporting requirements to section 2477.20. The subsection that contains the requirements for mobile catering service exemption applications has been moved to section 2477.20(g).

The deletion of the subsections containing the application requirements is necessary because staff are proposing to move these sections in their entirety to section 2477.20(i) to be with the other reporting requirements in section 2477.20.

Purpose of sections 2477.5(l)(1)(D), (E), (F), and (G)

These amendments update the lettering of section 2477.5(l)(1)(F) to 2477.5(l)(1)(D), 2477.5(l)(1)(G) to 2477.5(l)(1)(E), 2477.5(l)(1)(H) to 2477.5(l)(1)(F), and 2477.5(l)(1)(I) to 2477.5(l)(1)(G).

Rationale of sections 2477.5(l)(1)(D), (E), (F), and (G)

These amendments are necessary because items were deleted from section 2477.5(l)(1) and the lettering of these subsections has been updated.

2477.5(m) Compliance Extension Based on Unavailability of Compliance Technology

Purpose of section 2477.5(m)

This amendment deletes the provisions related to the "ULETRU Extension for Compliance with LETRU" from section 2477.5(m), updates the lettering of section 2477.5(k) to 2477.5(m), and modifies the title of the section.

Rationale of section 2477.5(m)

The deletion of provisions related to "ULETRU Extension for Compliance with LETRU" is necessary because the extension extended the compliance date for ULETRU by one year and was provided to MY 2001 and older engines that complied with LETRU by December 31, 2009; MY 2002 engines that complied with LETRU by December 31, 2009; and MY 2003 engines that complied with LETRU by December 31, 2010. All dates have passed, and the provisions no longer apply.

The update to the lettering of section 2477.5(k) to 2477.5(m) is necessary because items were added to and deleted from section 2477.5 and the lettering of this subsection has been updated.

The modification to the title of the section is necessary to specify that TRUs that are granted an extension based on unavailability of compliance technology would also be given a one-year extension to refrigerant, ZE truck TRU, and PM emission standard requirements. As currently written, the compliance extension would only apply to the in-use performance standards.

Purpose of section 2477.5(m)(1)

This amendment adds references to section 2477.5(b), (c), and (d); specifies that a TRU owner shall apply for a compliance exemption based on unavailability of compliance technology with the information required under section 2477.20(h); and deletes subsections (1) through (6) in their entirety.

Rationale of section 2477.5(m)(1)

This addition of the references to section 2477.5(b), (c), and (d) is necessary because staff are proposing new refrigerant requirements in section 2477.5(a), new ZE truck TRU requirements in section 2477.5(b), new PM emission standard requirements in section 2477.5(d), and the in-use performance standard requirements were moved to section 2477.5(c). The changes are needed to specify that TRUs that are granted an extension based on unavailability of compliance technology would be given a one-year extension to the compliance deadline for all the above requirements. As currently written, the compliance extension would only apply to the in-use standards.

The addition of the reference to section 2477.20(h) is necessary because staff are proposing to move all reporting requirements to section 2477.20. The subsection that contains the requirements for applications for a compliance exemption based on unavailability of compliance technology has been moved to section 2477.20(h).

The deletion of subsections (1) through (6) is necessary because staff are proposing to move these sections in their entirety to section 2477.20(h) to be with the other reporting requirements in section 2477.20.

2477.5(n) Compliance Extension Based on Delays Due to Private Financing, Equipment Manufacture Delays, or Installer Delays

Purpose of section 2477.5(n)

This amendment updates the lettering of section 2477.5(l) to 2477.5(n) and modifies the title of the section.

Rationale of section 2477.5(n)

The update to the lettering of section 2477.5(l) to 2477.5(n) is necessary because items were added to and deleted from section 2477.5 and the lettering of this subsection has been updated.

The modification to the title of the section is necessary to specify that TRUs that are granted an extension based on delays due to private financing, equipment manufacture delays, or installer delays would also be given a four-month extension to refrigerant, ZE truck TRU, and PM emission standard requirements. As currently

written, the compliance extension would only apply to the in-use performance standards.

Purpose of section 2477.5(n)(1)

This amendment deletes reference to in-use performance standards in section 2477.5(b) and adds references to section 2477.5(a), (b), (c), and (d).

Rationale of section 2477.5(n)(1)

This amendment is necessary because staff are proposing new refrigerant requirements in section 2477.5(a), new ZE truck TRU requirements in section 2477.5(b), new PM emissions standard requirements in 2477.5(d), and the in-use performance standard requirements were moved to section 2477.5(c). The changes are needed to specify that TRUs that are granted an extension based delays due to private financing, equipment manufacture delays, or installer delays would be given a four-month extension to the compliance deadlines for all the above requirements.

For the remaining changes, please see the earlier rationale of section 2477.5(c)(3)(A)(7) as the changes are the same and thus necessary for the same reasons.

Purpose of section 2477.5(n)(1)(B)

This amendment replaces "registered in ARBER" with "reported to CARB as required under section 2477.5(g)."

Rationale of section 2477.5(n(1)(B)

This amendment is necessary because staff are proposing to delete the ARB IDN requirements in section 2477.5(e) that require ARBER registration and add TRU reporting requirements in section 2477.5(g). Please see the rationale of section 2477.5(g) on the addition of TRU reporting requirements.

Purpose of section 2477.5(n)(1)(C)

This amendment specifies that a TRU owner shall apply for a compliance exemption based on delays due to private financing, equipment manufacture delays, or installer delays with the information required under section 2477.20(i); and deletes the subsections containing the application requirements.

Rationale of section 2477.5(n)(1)(C)

The addition of the reference to section 2477.20(i) is necessary because staff are proposing to move all reporting requirements to section 2477.20. The subsection that contains the requirements for applications for a compliance exemption based on

delays due to private financing, equipment manufacture delays, or installer delays has been moved to section 2477.20(i).

The deletion of the subsections containing the application requirements is necessary because staff are proposing to move these sections in their entirety to section 2477.20(i) to be with the other reporting requirements in section 2477.20.

2477.5(o) Compliance Extension Based on Delays Due to Installation of Zero-Emission Fueling Infrastructure

Purpose of section 2477.5(o)

This amendment adds language to provide TRU owners a compliance extension for the ZE truck TRU requirements in section 2477.5(b) due to unforeseen, temporary, or extenuating circumstances outside of the owner's control that prevents the installation of ZE fueling infrastructure. This includes delays in the manufacture and shipment of infrastructure equipment, obtaining construction permit(s), obtaining power from a utility, private financing, installation of infrastructure, or due to a natural disaster or discovery of archeological, historical, or tribal cultural resources under CEQA.

Rationale of section 2477.5(o)

This amendment is necessary to establish the process TRU owners shall follow to apply for the compliance extension, including what situations may qualify for the extension, and the type of documentation is required. The compliance extension is necessary to provide flexibility to TRU owners for compliance deadlines because, for reasons that are beyond their control, the owner is unable to install necessary ZE fueling infrastructure to support required ZE truck TRUs by the compliance date.

2477.5(p) Safe Passage for Noncompliant Equipment Traveling in California

Purpose of section 2477.5(p)

This amendment updates the lettering of section 2477.5(n) to 2477.5(p).

Rationale of section 2477.5(p)

This amendment is necessary because items were added to and deleted from section 2477.5 and the lettering of this subsection has been updated.

Purpose of section 2477.5(p)(1)(B)

This amendment deletes provisions related to units that must comply with both the LETRU and ULETRU in-use standards, and makes other non-substantive changes for grammar.

Rationale of section 2477.5(p)(1)(B)

This amendment is necessary because all compliance dates for LETRU have passed and these provisions no longer apply.

Purpose of section 2477.5(p)(1)(E)

This amendment specifies that a TRU owner shall apply for a safe passage with the information required under section 2477.20(j); and deletes the subsections containing the application requirements.

Rationale of section 2477.5(p)(1)(E)

The addition of the reference to section 2477.20(j) is necessary because staff are proposing to move all reporting requirements to section 2477.20. The subsection that contains the requirements for applications for a safe passage permit has been moved to section 2477.20(j).

The deletion of the subsections containing the application requirements is necessary because staff are proposing to move these sections in their entirety to section 2477.20(j) to be with the other reporting requirements in section 2477.20.

Purpose of sections 2477.5(p)(1)(F), (G), (H), and (I)

These amendments update the lettering of section 2477.5(p)(1)(G) to 2477.5(p)(1)(F), 2477.5(p)(1)(H) to 2477.5(p)(1)(G), 2477.5(p)(1)(I) to 2477.5(p)(1)(H), and 2477.5(p)(1)(J) to 2477.5(p)(1)(I).

Rationale of section 2477.5(p)(1)(F), (G), (H), and (I)

These amendments are necessary because items were deleted from section 2477.5(p)(1) and the lettering of these subsections has been updated.

F. Section 2477.6 – Requirements for Vehicle Owners

Purpose of section 2477.6

This amendment deletes terminal operator requirements from section 2477.6 in its entirety and adds language to establish requirements for vehicle owners.

Rationale of section 2477.6

Please see the earlier rationale of section 2477.2(b) as the changes are necessary for the same reasons.

G. Section 2477.7 – Requirements for Drivers

Purpose of section 2477.7

This amendment adds references to section 2477.5 (b), (c), and (d) and adds language requiring drivers to allow CARB enforcement staff to conduct a visual inspection of TRUs.

Rationale of section 2477.7

The addition to the references to section 2477.5 (b), (c), and (d) is necessary because staff are proposing new refrigerant requirements in section 2477.5(a), new ZE truck TRU requirements in section 2477.5(b), and in-use performance standard requirements were moved from section 2477.5(a) to 2477.5(c) and (d) as part of changes to section 2477.5. Truck drivers would be required to only operate TRU-equipped trucks or tractor-trailers equipped with a TRU or TRU gen set that are compliant with all the above requirements.

The addition of language requiring drivers to allow CARB enforcement staff to conduct a visual inspection of TRUs is necessary to enable staff to inspect TRUs to determine whether emission control components have been tampered with, inadequately maintained, or are defective. Robust compliance monitoring and enforcement is needed to ensure emission reductions are achieved as expected.

H. Section 2477.8 – Requirements for Freight Brokers and Freight Forwarders

Purpose of section 2477.8

This amendment adds references to section 2477.5 (b), (c), and (d).

Rationale of section 2477.8

The addition to the references to section 2477.5 (b), (c), and (d) is necessary because staff are proposing new refrigerant requirements in section 2477.5(a), new ZE truck TRU requirements in section 2477.5(b), and in-use performance standard requirements were moved from section 2477.5(a) to 2477.5(c) and (d) as part of changes to section 2477.5. Freight brokers and freight forwarders would be required to only arrange, hire, contract for, or dispatch TRU-equipped trucks, trailers, shipping containers, and railcars or TRU gen sets that are compliant with all the above requirements.

I. Section 2477.9 – Requirements for Motor Carriers

Purpose of section 2477.9(b)

This amendment deletes subsection 2477.9(b).

Rationale of section 2477.9(b)

This amendment is necessary because staff are proposing to delete the terminal operator requirements. Please see the rationale of section 2477.2(b) on the deletion of applicability to terminal operators.

J. Section 2477.10 – Requirements for Shippers

Purpose of section 2477.10

This amendment deletes the words "California-based," adds references to section 2477.5 "(b), (c), and (d)," and makes other non-substantive changes for grammar.

Rationale of section 2477.10

The deletion of the words "California-based" is necessary to specify that the shipper requirements apply to any shipper that arranges, tenders contracts for, or dispatches the transport of perishable goods that requires the operation of TRU-equipped or TRU gen set-equipped trucks, trailers, shipping containers, or railcars in the State of California, regardless of whether the shipper is based in California. Please see the earlier rationale of section 2477.2(f) and (g).

The addition of the references to section 2477.5 "(b), (c), and (d)" is necessary because staff are proposing new refrigerant requirements in section 2477.5(a), new ZE truck TRU requirements in section 2477.5(b), and in-use performance standard requirements were moved from section 2477.5(a) to 2477.5(c) and (d) as part of changes to section 2477.5. Shippers would be required to only arrange, tender contracts for, or dispatch the transport of perishable goods in TRU-equipped or TRU gen set-equipped trucks, trailers, shipping containers, or railcars compliant with all the above requirements.

K. Section 2477.11 – Requirements for Receivers

Purpose of section 2477.11

This amendment deletes the words "California-based," adds references to section 2477.5 "(b), (c), and (d)," and makes other non-substantive changes for grammar.

Rationale of section 2477.11

The deletion of the words "California-based" is necessary to specify that the receiver requirements apply to any receiver that arranges, tenders contracts for, or dispatches the transport of perishable goods that requires the operation of TRU-equipped or TRU gen set-equipped trucks, trailers, shipping containers, or railcars in the State of California, regardless of whether the receiver is based in California. Please see the earlier rationale of section 2477.2(f) and (g).

The addition of the references to section 2477.5 "(b), (c), and (d)" is necessary because staff are proposing new refrigerant requirements in section 2477.5(a), new ZE truck TRU requirements in section 2477.5(b), and in-use performance standard requirements were moved from section 2477.5(a) to 2477.5(c) and (d) as part of changes to section 2477.5. Receivers would be required to only arrange, tender contracts for, or dispatch the transport of perishable goods in TRU-equipped or TRU gen set-equipped trucks, trailers, shipping containers, or railcars compliant with all the above requirements.

L. Section 2477.12 – Requirements for Lessors and Lessees

Purpose of section 2477.12(a)(1)(A)

This amendment deletes references to ARBER registration, updates the reference to section 2477.5 "(e)" to "(g), (h), and (i)," and adds language to allow lessors to delegate TRU reporting, TRU operating fee, and TRU compliance label requirements to the lessee.

Rationale of section 2477.12(a)(1)(A)

Please see the earlier rationale of section 2477.5(c)(3)(A)7. on the deletion of references to ARBER registration.

The remaining changes are necessary because staff are proposing to replace the ARB IDN requirements in section 2477.5(e) with TRU reporting requirements in section 2477.5(g), add TRU operating fee requirements in section 2477.5(h), and add TRU compliance label requirements in section 2477.5(i). The proposed changes specify that lessors may delegate the above administrative requirements to the lessee if certain requirements are met.

Purpose of section 2477.12(a)(1)(A)2.

This amendment specifies that the lessor shall submit third party agreement information as required under section 2477.20(k); replaces "applying for an IDN" with "reporting the TRU or TRU gen set to CARB;" and deletes the subsections containing the required third-party agreement confirmation information.

Rationale of section 2477.12(a)(1)(A)2.

The addition of the reference to section 2477.20(k) is necessary because staff are proposing to move all reporting requirements to section 2477.20. The subsection that contains the requirements for third-party agreement confirmation information has been moved to section 2477.20(k).

The replacement of "applying for an IDN" with "reporting the TRU or TRU gen set to CARB" is necessary because staff are proposing to delete the ARB IDN requirements in section 2477.5(e) that require ARBER registration and add TRU reporting requirements in section 2477.5(g). Please see the rationale of section 2477.5(g) on the addition of TRU reporting requirements.

The deletion of the subsections containing required third-party agreement confirmation information is necessary because staff are proposing to move these sections in their entirety to section 2477.20(k) to be with the other reporting requirements in section 2477.20.

Purpose of section 2477.12(a)(1)(B)

This amendment deletes reference to in-use standards; updates the reference to section 2477.5 "(a)" to "(a), (b), (c), and (d);" deletes the reference to section 2477.4; and makes other non-substantive changes for grammar.

Rationale of section 2477.12(a)(1)(B)

This amendment is necessary because staff are proposing new refrigerant requirements in section 2477.5(a), new ZE truck TRU requirements in section 2477.5(b) and the in-use performance standard requirements were moved to section 2477.5(c) and 2477.5(d). The new requirements do not fall in the category of "performance standards." The changes are needed to specify that an owner may not delegate responsibility of all the above requirements to the lessee.

This amendment is also necessary to delete unneeded wording and limit redundancy. It is inherent that the definitions are in section 2477.4 and not necessary to reference as such every time a defined word is used in the regulatory text.

Purpose of section 2477.12(a)(2)

This amendment deletes section 2477.12(a)(2).

Rationale of section 2477.12(a)(2)

This amendment is necessary because staff are proposing to delete the terminal operator requirements. Please see the rationale of section 2477.2(b) on the deletion of applicability to terminal operators.

Purpose of section 2477.12(b)(1)

This amendment deletes section 2477.12(b)(1), updates the numbering of section 2477.12(b)(2) to 2477.12(b)(1), deletes references to ARBER registration, updates the reference to section 2477.5 "(e)" to "(g), (h), and (i)," and updates the reference to subparagraph 2477.5 "(e)(1)(F)" to "(g)(6)."

Rationale of section 2477.12(b)(1)

This amendment is necessary because staff are proposing to delete the terminal operator requirements. Please see the rationale of section 2477.2(b) on the deletion of applicability to terminal operators.

The update to the numbering of section 2477.12(b)(2) to 2477.12(b)(1) is necessary because section 2477.12(a)(1) was deleted and the numbering of this subsection has been updated.

Please see the earlier rationale of section 2477.5(c)(3)(A)(7) on the deletion of references to ARBER registration.

Please see the earlier rationale of section 2477.12 on the update of the reference to section 2477.5 "(e)" to "(g), (h), and (i)."

The update to the updates the reference to subparagraph 2477.5 "(e)(1)(F)" to "(g)(6)" is necessary because staff are proposing to replace the ARB IDN requirements in section 2477.5(e) with TRU reporting requirements in section 2477.5(g) and the subsection that contains the CARB IDN labeling requirements has been updated.

M. Section 2477.13 – Requirements for TRU, TRU Gen Set, and ZE Truck TRU Original Equipment Manufacturers

Purpose of section 2477.13

This amendment adds "ZE truck TRU" to the title of the section.

Rationale of section 2477.13

This amendment is necessary to specify that the TRU OEM requirements in section 2477.13 also apply to OEMs that direct ZE truck TRUs sales to the California market. As defined, a TRU is a refrigeration system powered by an integral internal combustion

engine. Thus, the OEM requirements would not apply to ZE truck TRU OEMs because ZE truck TRUs do not have a diesel-powered engine. Staff are proposing to require ZE Truck TRU OEMs to report the same information to CARB that is currently required for TRU and TRU gen set OEMs. This will enable staff to verify information reported by TRU owners on the ZE truck TRUs used to comply with section 2477.5(b).

Purpose of section 2477.13(a)

This amendment deletes section 2477.13(a) in its entirety and establishes refrigerant requirements for OEMs. Beginning December 31, 2022, OEMs would be required to only manufacture truck TRUs, trailer TRUs, and DSC TRUs for sale or use in California that use refrigerant with a GWP value less than or equal to 2,200 or use no refrigerant at all. This amendment also establishes refrigerant label requirements for OEMs.

Rationale of section 2477.13(a)

The deletion of section 2477.13(a) is necessary because staff are proposing to delete provisions related to flexibility engines. A flexibility engine is an engine installed in new equipment by an OEM under the Transitional Program for Equipment Manufacturers in accordance with title 40, Code of Federal Regulations, sections 89.102 and 1039.625, and title 13, CCR, section 2423(d). The flexibility rules allow pre-approved OEMs to use previous-tier engines in lieu of Tier 4i or Tier 4 final engines for up to a seven-year phase-in period. The Tier 4i and Tier 4 final engine standards went into effect in 2008 and 2013, respectively. Therefore, the phase-in period ended, and these provisions no longer apply.

The OEM refrigerant requirements are necessary to ensure that only compliant truck TRUs, trailer TRUs, and DSC TRUs are manufactured for sale or use in California. Please see the earlier rationale of section 2477.5(a) on the addition of refrigerant requirements. The refrigerant labeling requirements are necessary to ensure units are labeled properly to enable TRU owners and CARB enforcement staff to easily identify whether a given unit is compliant for use in California. Proper labeling is also needed to ensure TRU owners recharge their unit with the correct refrigerant type when doing routine maintenance.

Purpose of section 2477.13(b)

This amendment establishes ZE truck TRU requirements for OEMs. Beginning December 31, 2023, OEMs would be required to only manufacture truck TRUs for sale or use in California that meet the definition of a ZE truck TRU.

Rationale of section 2477.13(b)

This amendment is necessary to ensure that only compliant truck TRUs are manufactured for sale or use in California and that there are sufficient ZE truck TRUs available in the market to enable owners to operate compliant fleets. Please see the earlier rationale of section 2477.5(b) on the addition of ZE truck TRU requirements.

Purpose of section 2477.13(c)

This amendment establishes performance standard requirements for OEMs. Beginning May 31, 2023, OEMs would be required to only manufacture trailer TRUs, DSC TRUs, railcar TRUs, and TRU gen sets for sale or use in California that are equipped with an engine that meets the PM emission standard set forth in section 2477.5(d).

Rationale of section 2477.13(c)

This amendment is necessary to ensure that only compliant trailer TRUs, DSC TRUs, railcar TRUs, and TRU gen sets are manufactured for sale or use in California. Please see the earlier rationale of section 2477.5(d) on the PM emission standard requirements. The May 31, 2023 date provides OEMs sufficient time to use leftover stock of MY 2022 TRU engines that are not required to meet the PM emission standard.

Purpose of section 2477.13(d)

This amendment updates the lettering of section 2477.13(b) to 2422.13(d), and deletes provisions related to current and prior production reports.

Rationale of section 2477.13(d)

This amendment is necessary because items were added to section 2477.13 and the lettering of this subsection has been updated.

The deletion of provisions related to current and prior production reports is necessary to lessen the burden on OEMs to comply with reporting requirements. As currently written, OEMs are required to report unit and engine data for the coming production year and prior production years, as well as provide monthly production reports. Staff are proposing to delete the requirements for current and prior production reports, so that OEMs would only be required to submit monthly production reports.

Purpose of section 2477.13(d)(1)

This amendment updates the numbering and lettering of section 2477.13(b)(2)(B) to 2477.13(d)(1); changes the monthly production report due date from the 15th of each calendar month to the end of the second business day of each month, updates the

reference to section "2477.13 (b)(2)(C)" to "2477.20(l)," and deletes the subsections containing the required monthly production report information.

Rationale of section 2477.13(d)(1)

The update to the numbering and lettering of section 2477.13(b)(2)(B)(1) to 2477.13(d)(1)(A) is necessary because items were added to section 2477.13 and the numbering and lettering of this subsection has been updated.

The change to the monthly production report due date was made in response to a request from an OEM since the 15th of each calendar month does not always fall on a business day.

The update of the reference to section "2477.13 (b)(2)(C)" to "2477.20(l)" is necessary because necessary because staff are proposing to move all reporting requirements to section 2477.20. The subsection that contains the monthly production report requirements has been updated.

The deletion of the subsections containing the required monthly production report information is necessary because staff are proposing to move these sections in their entirety to section 2477.20(l) to be with the other reporting requirements in section 2477.20.

Purpose of section 2477.13(d)(2)

This amendment updates the numbering and lettering of section 2477.13(b)(3) to 2477.13(d)(2), deletes the words "current and prior," adds the word "specific," and makes other non-substantive changes for grammar.

Rationale of section 2477.13(d)(2)

The update to the numbering and lettering of section 2477.13(b)(3) to 2477.13(d)(2) is necessary because items were added to section 2477.13 and the numbering and lettering of this subsection has been updated.

The addition of the word "specific" is needed to allow OEMs to designate specific information submitted in the production report as confidential or trade secret. As currently written, OEMs could only designate the entire production report as confidential or trade secret.

Purpose of section 2477.13(e) and (e)(1)

This amendment updates the lettering of section 2477.13(c) to 2477.13(e); adds "ZE truck TRUs;" deletes references to "ARBER;" updates the references to section 2477.5 "(e)" to "(g)," and deletes the references to section 2477.4.

Rationale of section 2477.13(e) and (e)(1)

The update to the lettering of section 2477.13(c) to 2477.13(e) is necessary because items were added to section 2477.13 and the numbering and lettering of this subsection has been updated.

The addition of "ZE truck TRU" is necessary to specify that OEMs would be required to provide a registration document for each new ZE truck TRU, which is already required for new TRUs and TRU gen sets. The registration document provides the owner or owner/operator the necessary unit information to report the ZE truck TRU to CARB as required in section 2477.5(g).

The deletion of references to "ARBER" and the update of the references to section 2477.5 "(e)" to "(g)" are necessary because staff are proposing to delete the ARB IDN requirements in section 2477.5(e) that require ARBER registration and add TRU reporting requirements in section 2477.5(g). Please see the rationale of section 2477.5(g) on the addition of TRU reporting requirements.

The deletion of the reference to section 2477.4 is necessary to delete unneeded wording and limit redundancy. It is inherent that the definitions are in section 2477.4 and not necessary to reference as such every time a defined word is used in the regulatory text.

Purpose of section 2477.13(e)(2)

This amendment adds "ZE truck TRU;" deletes references to "ARBER;" updates the reference to section 2477.5 "(e)" to "(g)," and deletes the reference to section 2477.4.

Rationale of section 2477.13(e)(2)

The addition of "ZE truck TRU" is necessary to specify that OEMs would be required to provide a registration document for each new ZE truck TRU, which is already required for new TRUs and TRU gen sets. The registration document provides the owner or owner/operator the necessary unit information to report the ZE truck TRU to CARB as required in section 2477.5(g).

The update of the reference to section 2477.5 "(e)" to "(g)" is necessary because staff are proposing to delete the ARB IDN requirements in section 2477.5(e) that require ARBER registration and add TRU reporting requirements in section 2477.5(g). Please see the rationale of section 2477.5(g) on the addition of TRU reporting requirements.

The deletion of the reference to section 2477.4 is necessary to delete unneeded wording and limit redundancy. It is inherent that the definitions are in section 2477.4 and not necessary to reference as such every time a defined word is used in the regulatory text.

Purpose of section 2477.13(e)(2)(D)

This amendment updates the references of section 2477.13 "(c)(2)(A), (B), and (C)" to "(e)(2)(A), (B), and (C)."

Rationale of section 2477.13(e)(2)(D)

This amendment is necessary because items were added to section 2477.13 and the lettering of the subsection that contains requirements for the OEM registration information document required for new TRU, TRU gen set, or ZE truck TRUs has been updated.

Purpose of section 2477.13(e)(3)

This amendment replaces "register in ARBER" with "report to CARB;" updates the reference to section 2477.5 "(e)" to "(g);" updates the reference to section "2477.5(e)(1)(A)4." to "2477.20(f)(4);" and updates the references of section 2477.13 "(c)(3)(A), (B), and (C)" to "(e)(3)(A), (B), and (C)."

Rationale of section 2477.13(e)(3)

The replacement of "register in ARBER" with "report to CARB" and the update of the reference to section 2477.5 "(e)" to "(g)" are necessary because staff are proposing to delete the ARB IDN requirements in section 2477.5(e) that require ARBER registration and add TRU reporting requirements in section 2477.5(g).

The update of the reference to section "2477.5(e)(1)(A)4." to "2477.20(f)(4)" is necessary because staff are proposing to move TRU reporting information to new section 2477.20(f) to be with the other reporting requirements in section 2477.20. The subsection that contains the TRU reporting requirements related to unit information has been updated.

The update of the reference to section 2477.13 "(c)(3)(A), (B), and (C)" to "(e)(3)(A), (B), and (C)" is necessary because items were added to section 2477.13 and the lettering of the subsection that contains requirements for the OEM registration information

Purpose of section 2477.13(f)

This amendment updates the lettering of section 2477.13(d) to 2477.13(f).

Rationale of section 2477.13(f)

The update to the lettering of section 2477.13(d) to 2477.13(f) is necessary because items were added to section 2477.13 and the lettering of this subsection has been updated.

N. Section 2477.14 – Requirements for TRU, TRU Gen Set, and TRU-Equipped Truck and Trailer Dealers

Purpose of section 2477.14(a)

This amendment adds "ZE truck TRU."

Rationale of section 2477.14(a)

The addition of "ZE truck TRU" is necessary to specify that dealers would be required to provide the registration document provided by the TRU OEM to the ultimate purchaser of a new ZE truck TRU, which is already required for new TRUs and TRU gen sets. The registration document provides the owner or owner/operator the necessary unit information to report the ZE truck TRU to CARB as required in section 2477.5(g).

Purpose of section 2477.14(a)(1) and (2)

This amendment updates the reference to section "2477.13(c)(2)(D) or 2477.13(c)(3)(D)" to section "2477.13(e)(2)(D) or (e)(3)(D);" adds "ZE truck TRU;" and updates the reference to section 2477.5 "(e)" to "(g)."

Rationale of section 2477.14(a)(1) and (2)

The update of the reference to section "2477.13(c)(2)(D) or 2477.13(c)(3)(D)" to section "2477.13(d)(2)(D) or (d)(3)(D)" is necessary because items were added to section 2477.13 and the lettering of the subsection that contains the OEM reporting requirements has been updated.

The addition of "ZE truck TRU" is necessary to specify that dealers would be required to provide the registration document provided by the TRU OEM to the ultimate purchaser of a new ZE truck TRU, which is already required for new TRUs and TRU gen sets. The registration document provides the owner or owner/operator the necessary unit information to report the ZE truck TRU to CARB as required in section 2477.5(g).

The update of the reference to section 2477.5 "(e)" to "(g)" is necessary because the TRU reporting requirements were moved from section 2477.5(e) to 2477.5(g) as part of changes to section 2477.5.

Purpose of section 2477.14(a)(3)

This amendment replaces "register in ARBER" with "report to CARB," and updates the reference to section "2477.5(e)(1)(A)7" to "2477.20(f)(7)."

Rationale of section 2477.14(a)(3)

This amendment is necessary because staff are proposing to delete the ARB IDN requirements in section 2477.5(e) that require ARBER registration and add TRU reporting requirements in section 2477.5(g). The update of the reference to section "2477.5(e)(1)(A)7" to "2477.20(f)(7)" is necessary because staff are proposing to move TRU reporting information to new section 2477.20(f) to be with the other reporting requirements in section 2477.20. The subsection that contains the TRU reporting requirements related to TRU engine information has been updated.

Purpose of section 2477.14(a)(4)

This amendment deletes section 2477.14(a)(4) which requires dealers to notify ultimate purchasers of TRUs or TRU gen sets equipped with a flexibility engine of the written disclosures provided by the OEM and provide the disclosures to the ultimate purchaser prior to sale.

Rationale of section 2477.14(a)(4)

Please see the earlier rationale of section 2477.13(a) as this amendment is necessary for the same reasons.

Purpose of section 2477.14(b)

This amendment replaces "in-use performance standard" with "requirements," and adds section 2477.5 "(b), (c), (d), and (g)."

Rationale of section 2477.14(b)

This amendment is necessary because staff are proposing new ZE truck TRU requirements in section 2477.5(b) and in-use performance standard requirements were moved from section 2477.5(a) to 2477.5(c) and (d) as part of changes to section 2477.5. In addition, the ARB IDN requirements in section 2477.5(e) were moved to section 2477.5(g) as part of changes to section 2477.5.

O. Section 2477.15 – Requirements for Repair Shops Located in California that Work on TRUs or TRU Gen Sets

Purpose of section 2477.15(a)(1) and (2)

This amendment replaces "register in ARBER" with "report to CARB," and updates the reference to section "2477.5(e)(1)(A)7" to "2477.20(f)(7)."

Rationale of section 2477.15(a)(1) and (2)

Please see the earlier rationale of section 2477.14(a)(3) as the changes are the same and thus necessary for the same reasons.

Purpose of section 2477.15(a)(3)

This amendment replaces "register in ARBER" with "report to CARB," and updates the reference to section "2477.5(e)(1)(A)4" to "2477.20(f)(4)."

Rationale of section 2477.15(a)(3)

This amendment is necessary because staff are proposing to delete the ARB IDN requirements in section 2477.5(e) that require ARBER registration and add TRU reporting requirements in section 2477.5(g). The update of the reference to section "2477.5(e)(1)(A)4" to "2477.20(f)(4)" is necessary because items were added and the numbering and lettering of the subsection that contains the TRU reporting requirements related to unit information has been updated.

P. Section 2477.16 – Requirements for Engine Rebuilders

Purpose of section 2477.16(a)

This amendment updates the reference to section 2477.5 "(a)" to "(c)."

Rationale of section 2477.16(a)

This amendment is necessary because items were added to section 2477.5. The subsection that contains the requirements for in-use performance standards has been updated.

Purpose of section 2477.16(b)(4)(A)

This amendment deletes the reference to section 2477.4.

Rationale of section 2477.16(b)(4)(A)

This amendment is necessary to delete unneeded wording and limit redundancy. It is inherent that the definitions are in section 2477.4 and not necessary to reference as such every time a defined word is used in the regulatory text.

Purpose of section 2477.16(e)(1) and (2)

This amendment replaces "register in ARBER" with "report to CARB;" updates the reference to section "2477.5(e)(1)(A)7." to "2477.20(f)(7);" and updates the reference to section "2477.5(e)(1)(A)4 and 5" to "2477.20(f)(4) and (5)."

Rationale of section 2477.16(e)(1) and (2)

The replacement of "register in ARBER" with "report to CARB" is necessary because staff are proposing to delete the ARB IDN requirements in section 2477.5(e) that require ARBER registration and add TRU reporting requirements in section 2477.5(g). Please see the rationale of section 2477.5(g) on the addition of TRU reporting requirements.

The update of the reference to section "2477.5(e)(1)(A)7" to "2477.20(f)(7)" and the update to the reference to section "2477.5(e)(1)(A)4 and 5" to "2477.20(f)(4) and (5)" are necessary because staff are proposing to move TRU reporting information to new section 2477.20(f) to be with the other reporting requirements in section 2477.20. The subsections that contain the TRU reporting requirements related to unit, other TRU identifying numbers, and TRU engine information have been updated.

Q. Section 2477.17 – Requirements for Applicable Facility Owners or Applicable Facility Owner/Operators

Purpose of section 2477.17

This amendment updates the title of section 2477.17.

Rationale of section 2477.17

This amendment is necessary to specify that the requirements in section 2477.17 apply to owners or owner/operators of an applicable facility. Staff are proposing to delete the facility reporting requirements and add requirements for owners or owner/operators of applicable facilities.

Purpose of section 2477.17(a)

This amendment changes the compliance date for initial registration to December 31, 2023, deletes reporting fields that no longer apply, and adds reporting fields on applicable facility type, building size, rental or lease status, and ZE fuel provided.

Rationale of section 2477.17(a)

This amendment is necessary to inform applicable facility owners or owner/operators of the registration requirements in the Proposed Amendments and give the due date for facilities to register with CARB. The compliance date was changed because the reporting date in the current regulation has passed. Staff anticipate the Proposed Amendments to become effective at the end of 2022. The December 31, 2023 date provides staff sufficient time to conduct outreach prior to implementation. The additional reporting fields are necessary to collect data relevant to applicable facilities.

The facility information will be used by staff to monitor compliance and the ZE fuel information will help CARB to monitor the installation of infrastructure to support ZE TRUs and support the development of the Part 2 regulation to transition trailer TRUs and the remaining TRU categories to ZE technology.

Purpose of section 2477.17(a)(8) and (9)

This amendment updates the numbering of section 2477.17(a)(10) and (11) to 2477.17(a)(8) and (9), changes the reporting year from 2005 to 2022, and deletes the reference to subparagraph "(f)(2)(B)2."

Rationale of section 2477.17(a)(8) and (9)

The update to the numbering of section 2477.17(a)(10) and (11) to 2477.17(a)(8) and (9) is necessary because items were deleted from section 2477.17 and the lettering of these sections has been updated.

The changes to the reporting year from 2005 to 2022 is necessary because the current date has already passed and staff need data that is recent and relevant. The data collected will help to inform the development of the Part 2 regulation to transition trailer TRUs and the remaining TRU categories to ZE technology.

The deletion of the reference to subparagraph "(f)(2)(B)2." is necessary to correct an error because section 2477.17(f)(2)(B)2. does not exist in the current regulation.

Purpose of section 2477.17(b) and (c)

This amendment adds language to require applicable facilities to report any changes to the submitted facility information within 30 days of the changes, and any applicable facility that begins operations after December 31, 2023 to report facility information to CARB within 30 days.

Rationale of section 2477.17(b) and (c)

This amendment is necessary to ensure applicable facility information is accurate and that CARB is informed of any new applicable facilities subject to the Proposed Amendments.

Purpose of section 2477.17(d)

This amendment adds language to establish applicable facility registration fee requirements.

Rationale of section 2477.17(d)

Please see the earlier rationale of section 2477.5(h) as the changes are the same and thus necessary for the same reasons.

Purpose of section 2477.17(e)

This amendment establishes two facility reporting options for an applicable facility. An applicable facility may change their selected option by notifying CARB by September 30 of the preceding calendar year.

Rationale of section 2477.17(e)

This amendment is necessary to inform applicable facilities of the two reporting options and how to change their selected reporting option. The Proposed Amendments provide two reporting options to provide flexibility to applicable facilities and allow them to choose the option that works best for their business operations. TRU emissions are generated at applicable facilities and impact communities surrounding them. Therefore, applicable facility owners and operators should bear some responsibility for ensuring TRUs operating on their properties are compliant with emissions requirements. This amendment would also allow an applicable facility to change their designated reporting option.

Purpose of section 2477.17(e)(1)

This amendment establishes reporting option 1, in which an applicable facility may choose to report all TRUs that operate on applicable facility property to CARB.

Rationale of section 2477.17(e)(1)

This amendment is necessary to specify that applicable facilities that choose reporting option 1 would be required to collect information required under section 2477.20(m) for any TRU that operates inside the facility fence line or property boundary. The collected information will enable staff to identify non-compliant TRUs operating in California and bring them into compliance.

Purpose of section 2477.17(e)(1)(B)

This amendment establishes the date applicable facility owners or applicable facility owner/operators would be required to begin reporting information collected in section 2477.17(e)(1)(A) to CARB and the schedule of when this information is to be reported.

Rationale of section 2477.17(e)(1)(B)

This amendment is necessary for applicable facility owners or applicable facility owner/operators to know when the information collected in section 2477.17(e)(1)(A) needs to be submitted to CARB.

Purpose of section 2477.17(e)(1)(C)

This amendment establishes that applicable facility owners or applicable facility owner/operators are responsible for reporting all TRUs operating inside their fence line or property boundary and any non-reported TRUs found operating by CARB may result in penalties.

Rationale of section 2477.17(e)(1)(C)

This amendment is necessary to ensure applicable facility owners or applicable facility owner/operators know that they are liable for TRU compliance on their property and to inform them of the consequences if non-reported TRUs are found to be operating on their property.

Purpose of section 2477.17(e)(1)(D)

This amendment adds language to specify that an applicable facility owner or applicable facility owner/operator may designate specific report information as confidential or trade secret.

Rationale of section 2477.17(e)(1)(D)

This amendment is necessary to protect reported TRU activity at an applicable facility that is considered confidential or trade secret but necessary for CARB staff to determine facility compliance, identify non-compliant TRUs operating in California, and bring them into compliance.

Purpose of section 2477.17(e)(2)

This amendment establishes reporting option 2, in which an applicable facility may choose to provide a declaration to CARB, under penalty of perjury, that non-compliant TRUs subject to this regulation will not be permitted to operate on their property. This amendment also establishes the penalties and liabilities an applicable facility owner or applicable facility owner/operator is subject to if CARB finds non-compliant TRUs operating within the applicable facility fence line or property boundary.

Rationale of section 2477.17(e)(2)

This amendment is necessary to inform readers of what is required if an applicable facility chooses option 2. Not allowing non-compliant TRUs to operate at an applicable

facility incentivizes TRU owners to comply and achieves immediate emission reductions in impacted communities. This amendment is also necessary to ensure applicable facility owners and applicable facility owner/operators know that they are liable for TRU compliance on their property.

Purpose of section 2477.17(f)

This amendment updates the lettering of section 2477.17(b) to 2477.17(f).

Rationale of section 2477.17(f)

This amendment is necessary because items were added to section 2477.17 and the lettering of this subsection has been updated.

Purpose of section 2477.17(f)(1)

This amendment deletes section 2477.17(f)(1), updates the numbering of section 2477.17(b)(2) to 2477.17(f)(1), and deletes the subsections that contain the recordkeeping and facility report submittal requirements.

Rationale of section 2477.17(f)(1)

The update to the numbering of section 2477.17(b)(2) to 2477.17(f)(1) is necessary because items were added to section 2477.17 and the lettering of this subsection has been updated.

The remaining changes are necessary because staff are proposing to move facility reporting and recordkeeping requirements to new sections 2477.20(a) and 2477.20(b), respectively, to be with the other reporting requirements in section 2477.20. Establishing one section that contains all the reporting requirements will make the regulatory text consistent and ensure that all information reported to CARB to comply with the regulation is subject to the same requirements for submittal and recordkeeping and include a statement of accuracy.

R. Section 2477.18 – Prohibitions

Purpose of section 2477.18(a) and (b)

This amendment deletes the word "performance" and adds references to the requirements in section 2477.5 "(b), (c), and (d)," and replaces "registered in ARBER" with "reported to CARB."

Rationale of section 2477.18(a) and (b)

This amendment is necessary because staff are proposing new refrigerant requirements in section 2477.5(a), new ZE truck TRU requirements in section 2477.5(b)

and the in-use performance standard requirements were moved to section 2477.5(c) and 2477.5(d). The new requirements do not fall in the category of "performance standards." The changes are needed to prohibit the selling, renting, or leasing of TRUs that do not meet all the above requirements. As currently written, the prohibition would only apply to TRUs that do not meet the in-use standards.

This amendment is also necessary because staff are proposing to delete the ARB IDN requirements in section 2477.5(e) that require ARBER registration and add TRU reporting requirements in section 2477.5(g).

Purpose of section 2477.18(b)(2)

This amendment updates the reference to section 2477.5 "(a)(3)" to "(c)(3)."

Rationale of section 2477.18(b)(2)

This amendment is necessary because items were added to section 2477.5 and the section that contains the alternative technology provisions has been updated.

Purpose of section 2477.18(c)

This amendment deletes the word "performance" and adds references to the requirements in section 2477.5 "(b), (c), and (d)."

Rationale of section 2477.18(c)

Please see the earlier rationale of section 2477.18(a) and (b) as the changes are the same and thus necessary for the same reasons.

S. Section 2477.19 – Non-compliance and Penalties

Purpose of section 2477.19

This amendment adds "Non-compliance" to the title of the section.

Rationale of section 2477.19

This amendment is necessary because staff are proposing to add section 2477.19(a)(1), which establishes liability for non-compliance.

Purpose of section 2477.19(a)(1)

This amendment adds language to establish liability for non-compliance.

Rationale of section 2477.19(a)(1)

This section is necessary to establish liability for non-compliance to the owner of a TRU or applicable facility when neither the owner nor the operator can produce evidence of the party responsible for compliance with State laws.

T. Section 2477.20 – Reporting

Purpose of section 2477.20

This amendment establishes one section that contains all the reporting requirements.

Rationale of section 2477.20

This is necessary to make the regulatory text consistent by establishing one section that contains all reporting requirements and ensuring that all information reported to CARB to comply with the regulation is subject to the same requirements for submittal and recordkeeping and include a statement of accuracy.

Purpose of section 2477.20(a)

This amendment specifies that submission of information to CARB shall be done by one of three methods: mail, electronically submit by email, or electronically submit through CARB's online system.

Rationale of section 2477.20(a)

This amendment is necessary to ensure that regulated parties are aware of the approved methods of submittal.

Purpose of section 2477.20(b)

This amendment specifies that all records are required to be kept for a minimum of three years and compiled and made available to CARB upon request.

Rationale of section 2477.20(b)

This amendment is necessary to ensure that regulated parties maintain records for a sufficient amount of time for CARB to enforce the regulation. The three-year retention time is consistent with recordkeeping requirements in other CARB regulations.

This amendment is also necessary as it specifies that records shall be made available to CARB upon request to verify reported information and for the purpose of demonstrating compliance with requirements of the regulation.

Purpose of section 2477.20(c)

This amendment specifies that information submitted to CARB shall be accompanied by a statement of accuracy.

Rationale of section 2477.20(c)

This amendment is necessary to help ensure that information submitted to CARB is true, accurate, and complete.

Purpose of section 2477.20(d)

This amendment specifies the requirements for electronic tracking systems for owners that elect to comply with the in-use performance standards by using a hybrid electric TRU or electric standby-equipped TRU. The electronic tracking system is required to collect time, TRU engine hour meter reading, location data at a rate of at least one reading per minute with no more than 10 minutes data gap, and capable of determining if the TRU or TRU gen set location is within California and determining the TRU engine run time in California for each day.

Rationale of section 2477.20(d)

This amendment is necessary to establish the requirements for electronic tracking systems to monitor compliance with the Alternative Technology option. The required information to be collected by the electronic tracking system is needed to ensure the hybrid electric or electric standby-equipped TRU is operated in accordance with the regulation. The electronic tracking system requirements were retained from the current regulation (in section 2477.5(e)(1)(F), but have been moved to section 2477.20(d) to be with the other reporting requirements in section 2477.20.

Purpose of section 2477.20(e)

This amendment specifies the requirements for placement of the CARB IDN on the TRU chassis.

Rationale of section 2477.20(e)

This amendment is necessary to ensure uniform placement of the CARB IDN on the TRU chassis. This will allow CARB enforcement staff to quickly identify the CARB IDN. The requirements for placement of the CARB IDN were retained from the current regulation (in section 2477.5(d)(3)(B) and section 2477.5(d)(4)), but have been moved to section 2477.20(e) to be with the other reporting requirements in section 2477.20.

Purpose of section 2477.20(f)

This amendment specifies what information TRU owners or owner/operators are required to report to CARB.

Rationale of section 2477.20(f)

This amendment is necessary to identify the information TRU owners or owner/operators are required to report to CARB for each TRU operated in California. The TRU reporting requirements were retained from the current regulation ("ARB Identification Numbering Requirements" in section 2477.5(e)), except TRU reporting requirements apply to all TRUs that operate in California, not just those that are based in California and include additional information on the date the TRU was purchased, rented, or leased and certification that TRU owners have appraised the TRU operator of their obligations under the regulation.

Reporting of California-based and non-California-based TRUs that operate in California and the additional reporting fields are needed to ensure robust compliance monitoring and enforcement of all TRUs operating in California. The reported data would be used by staff to better target fleets that are not in compliance. This would help ensure better overall enforcement. Staff expect this to lead to further emission reductions from TRUs, thus leading to more health benefits to individuals living in California. This amendment is also necessary to level the playing field between TRUs based in-state and out-of-state.

Purpose of section 2477.20(g)

This amendment specifies what information is required to apply for a mobile catering service exemption.

Rationale of section 2477.20(g)

This amendment is necessary to identify the information required in an application for a mobile catering service exemption. The mobile catering exemption application requirements were retained from the current regulation (in section 2477.5(j), but have been moved to section 2477.20(g) to be with the other reporting requirements in section 2477.20.

Purpose of section 2477.20(h)

This amendment specifies what information is required to apply for a compliance extension based on unavailability of compliance technology.

Rationale of section 2477.20(h)

This amendment is necessary to identify the information required in an application for a compliance extension based on unavailability of compliance technology. The requirements for a compliance extension based on unavailability of compliance technology were retained from the current regulation (in section 2477.5(k), but have been moved to section 2477.20(h) to be with the other reporting requirements in section 2477.20.

Purpose of section 2477.20(i)

This amendment specifies what information is required to apply for a compliance extension based on delays.

Rationale of section 2477.20(i)

This amendment is necessary to identify the information required in an application for a compliance extension based on delays. The requirements for a compliance extension based on delays were retained from the current regulation (in section 2477.5(l), but have been moved to section 2477.20(i) to be with the other reporting requirements in section 2477.20 and include a new compliance extension for delays related to the installation of ZE fueling infrastructure. Please see the earlier rationale of section 2477.5(o) as the changes are necessary for the same reasons.

Purpose of section 2477.20(j)

This amendment specifies what information is required to apply for a safe passage permit.

Rationale of section 2477.20(j)

This amendment is necessary to identify the information required in an application for a safe passage permit. The requirements for a safe passage permit were retained from the current regulation (in section 2477.5(n), but have been moved to section 2477.20(j) to be with the other reporting requirements in section 2477.20.

Purpose of section 2477.20(k)

This amendment specifies what information is required to be submitted for third-party agreement confirmation.

Rationale of section 2477.20(k)

This amendment is necessary to identify the information required for third-party agreement confirmation. The requirements for third-party agreement confirmation

were retained from the current regulation (in section 2477.12(b), but have been moved to section 2477.20(k) to be with the other reporting requirements in section 2477.20.

Purpose of section 2477.20(l)

This amendment specifies what information is required in OEM monthly production reports, including the following new reporting fields: OEM VDECS manufacturer and family name, VDECS serial number, whether the unit is ZE, if the unit is electric-standby equipped or is a hybrid-electric, and the refrigerant type.

Rationale of section 2477.20(l)

This amendment is necessary to identify the information required in OEM monthly production reports. The OEM monthly production report requirements were retained from the current regulation (in section 2477.13(b)(2)(C), but have been moved to section 2477.20(l) to be with the other reporting requirements in section 2477.20.

The additional reporting fields are needed to ensure robust compliance monitoring and enforcement of the refrigerant, ZE truck TRU, in-use performance standard, and PM emission standard requirements, as well as to enable staff to verify information reported by TRU owners.

Purpose of section 2477.20(m)

This amendment specifies what information applicable facility owners or owner/operators are required to submit to CARB if they choose to report all TRU activity under section 2444.17(e)(1).

Rationale of section 2477.20(l)

This amendment is necessary to identify the information applicable facility owners or owner/operators are required to submit to CARB if they choose to report all TRU activity. The required information is needed for CARB enforcement purposes and to bring reported non-compliant TRUs into compliance.

U. Section 2477.21 – Fees

Purpose of section 2477.21

This amendment adds language to establish TRU operating and applicable facility registration fee requirements.

Rationale of section 2477.21

Please see the earlier rationale of section 2477.5(h) as the changes are the same and thus necessary for the same reasons.

V. Section 2477.22 – Relationship to Other Law

Purpose of section 2477.22

This amendment adds language to establish a relationship to other law clause and sets forth that nothing in this regulation allows TRUs to operate in violation of other applicable laws.

Rationale of section 2477.22

This amendment is necessary to establish that the Proposed Amendments shall not conflict with or supersede any other sections of the California Vehicle Code, Health & Saf. Code, or any applicable ordinance, rule, or requirement that is as stringent as, or more stringent than the requirements of this regulation. The addition of this section is necessary for rule harmonization and to ensure current emission reduction levels continue.

W. Section 2477.23 – Authority to Request Additional Information

Purpose of section 2477.23

This amendment updates the numbering of section 2477.20 to 2477.23.

Rationale of section 2477.23

This amendment is necessary because staff are proposing new section 2477.23 and the numbering of this section has been updated.

X. Section 2477.24 – Severability

Purpose of section 2477.24

This amendment updates the numbering of section 2477.21 to 2477.24.

Rationale of section 2477.24

This amendment is necessary because staff are proposing new section 2477.24 and the numbering of this section has been updated.

V. Benefits Anticipated from the Regulatory Action, Including the Benefits or Goals Provided in the Authorizing Statute

A. Health Benefits

Exposure to pollution from the diesel engines that power TRUs has both potential cancer and non-cancer health impacts. For this Staff Report, staff conducted a health risk assessment (HRA) to evaluate the potential cancer risk resulting from direct exposure to diesel PM from TRUs, as well as the non-cancer health impacts associated with exposure to ambient levels of directly emitted PM2.5 and secondary PM2.5 formed in the atmosphere from TRU NOx emissions. The HRA compared the current and future impacts of the TRU ATCM (Baseline) to the current and future impacts of the Proposed Amendments. Chapter VI provides a detailed summary of the health benefits of the Proposed Amendments.

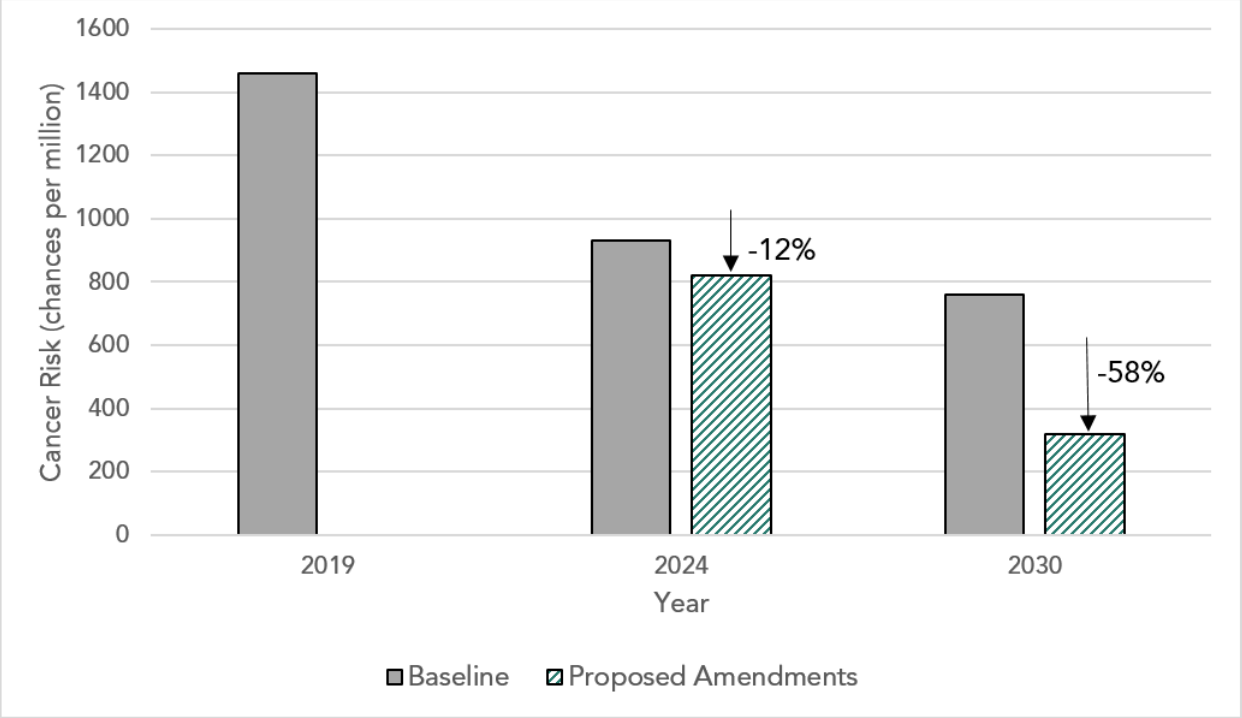
1. Reduction in Potential Cancer Risk

Based on staff's analysis, the facility types with the highest estimated contribution of statewide diesel PM emissions from TRUs are refrigerated WHDCs (which include CSWs) and grocery stores. Therefore, staff conducted an HRA to evaluate the cancer risk associated with emissions from TRUs operating at a CSW and grocery store. Potential cancer risk is expressed as the chance an individual has of developing cancer if a million people were exposed to a toxic air contaminant continuously for a specified duration of exposure. Staff calculated potential cancer risk values for two exposure scenarios: individual residential exposure and off-site worker exposure.

a. Individual Residential Cancer Risk

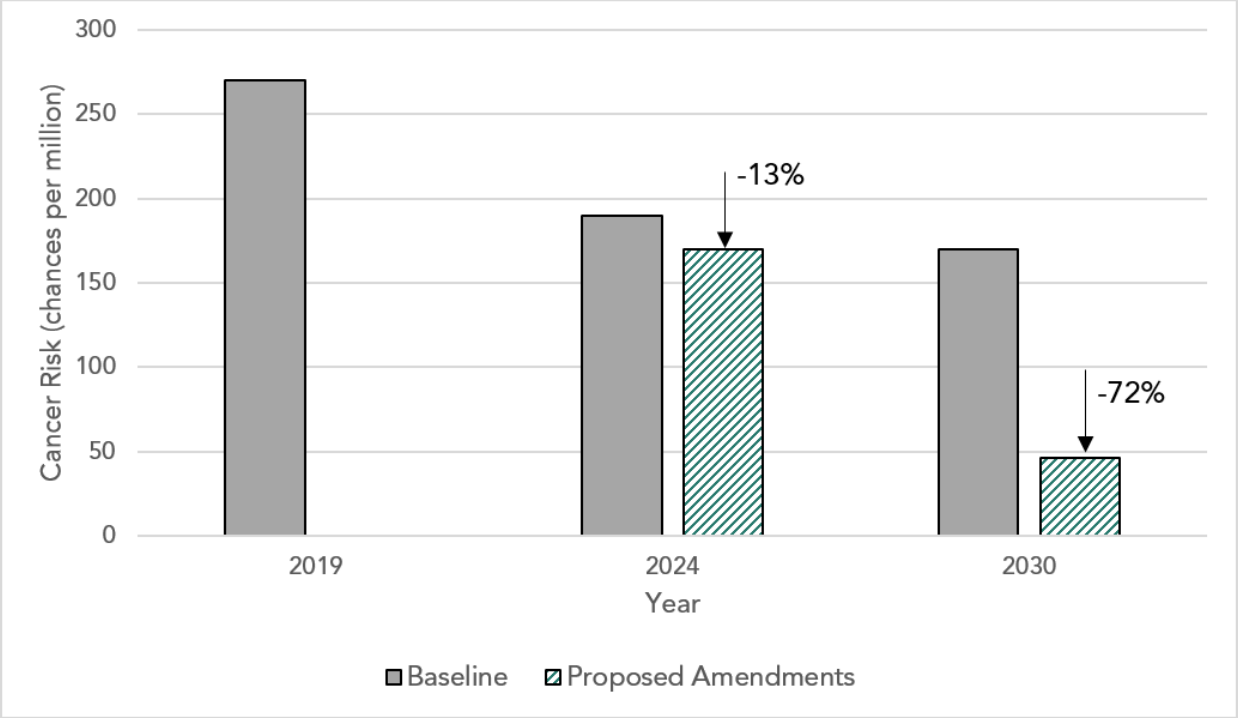
The cancer risk to an individual resident is based on an assumed 30-year exposure duration. Staff evaluated the potential cancer risk to individual residents under the Proposed Amendments and the Baseline. After full implementation, the Proposed Amendments are expected to reduce potential individual residential cancer risk from TRU operations at a CSW by approximately 58 percent compared to the Baseline. Similarly, after full implementation, the Proposed Amendments are expected to reduce potential individual residential cancer risk from TRU operations at a grocery store by up to 72 percent compared to the Baseline, depending on the operational scenario. Figure V-1 and Figure V-2 show the potential individual residential cancer risk from TRU operations at a CSW and grocery store under the Baseline and Proposed Amendments.

Figure V-1. Potential Individual Resident Cancer Risk and Risk Reduction for Cold Storage Warehouses[60]



[60] Individual resident cancer risk estimates are based on a 30-year exposure duration using the Risk Management Policy method (95th percentile/80th percentile daily breathing rates. Fraction of time at home equals 1 for age bins <16 years and 0.73 for age bin 16-70 years.

Figure V-2. Potential Individual Resident Cancer Risk and Risk Reduction for Grocery Stores (7 Trucks, 2 Trailers, 1 Seasonal Trailer Scenario)[61]



b. Off-site Worker Cancer Risk

For the evaluation of off-site worker cancer risk, staff assumed that a worker outside a CSW or grocery store is exposed to the emission sources for 25 years, 8 hours per day, and 250 days per year. After full implementation, the Proposed Amendments are expected to reduce potential off-site worker cancer risk from TRU operations at a CSW by approximately 58 percent compared to the Baseline. Similarly, after full implementation, the Proposed Amendments are expected to reduce potential off-site worker cancer risk from TRU operations at a grocery store by up to 71 percent compared to the Baseline, depending on the operational scenario. Although the HRA only evaluated exposure to individual residents and off-site workers, the Proposed Amendments are also expected to reduce occupational exposure of on-site workers, including, but not limited to TRU operators, truck drivers, and other individuals who work at facilities where TRUs operate.

[61] Individual resident cancer risk estimates are based on a 30-year exposure duration using the Risk Management Policy method (95th percentile/80th percentile daily breathing rates. Fraction of time at home equals 1 for age bins <16 years and 0.73 for age bin 16-70 years.

2. Non-Cancer Health Impacts and Valuations

Staff evaluated a limited number of statewide non-cancer health benefits associated with reductions in exposure to PM2.5 and NOx emissions resulting from the Proposed Amendments. NOx includes nitrogen dioxide, a potent lung irritant, which can aggravate lung diseases such as asthma when inhaled. However, the most serious quantifiable impacts of NOx emissions occur through the conversion of NOx to fine particles of ammonium nitrate aerosol through chemical processes in the atmosphere. PM2.5 formed in this manner is termed secondary PM2.5. Both directly emitted (primary) PM2.5 and secondary PM2.5 is associated with adverse health outcomes, such as cardiopulmonary mortality, hospitalizations for cardiovascular and respiratory illnesses, and emergency room visits for asthma. As a result, reductions in PM2.5 and NOx emissions are associated with reductions in these adverse health outcomes. Staff estimates that the total reduction in the number of cases statewide due to the implementation of the Proposed Amendments from 2022 to 2034 would be as follows:

- 177 fewer premature deaths (138 to 217, 95 percent confidence interval (CI))
- 57 fewer hospital admissions for cardiovascular and respiratory illnesses (7 to 106, 95 percent CI)
- 87 fewer emergency room visits for asthma (55 to 119, 95 percent CI)

3. Monetization of Health Impacts

In accordance with U.S. EPA practice, staff monetized health outcomes by multiplying the projected number of cases by a standard value derived from economic studies.[62] The total statewide valuation due to avoided health outcomes as a result of the Proposed Amendments from 2022 to 2034 are summarized in Table V-1. The spatial distribution of these benefits follows the distribution of emission reductions and avoided adverse health outcomes. Therefore, most benefits to individuals would occur in the South Coast, San Joaquin Valley, and San Francisco air basins, with fewer benefits in the Sacramento Valley and San Diego County air basins. The total statewide health benefits for the Proposed Amendments are estimated to be $1.75 billion (compared to approximately $1.04 billion in total net costs).

[62] National Center for Environmental Economics et al., Appendix B: Mortality Risk Valuation Estimates, Guidelines for Preparing Economic Analyses (EPA 240-R-10-001, December 2010). (web link: https://www.epa.gov/sites/production/files/2017-09/documents/ee-0568-22.pdf)

Table V-1. Statewide Valuation from Avoided Adverse Health Outcomes as a Result of the Proposed Amendments from 2022-2034 (2019$)

Outcome	Valuation
Avoided Premature Deaths	$1,749,747,000
Avoided Hospitalizations	$3,092,000
Avoided Emergency Room Visits	$73,000
Total	$1,752,912,000

Note: Values have been rounded to the nearest thousand.

While CARB's PM2.5 mortality and illness analysis has been, and continues to be, a useful method for valuing the health benefits of regulations, it only represents a portion of those benefits. The full health benefits of the Proposed Amendments are underestimated because not all the adverse health outcomes associated with PM2.5 and additional pollutants such as air toxics are evaluated and monetized. Also, CARB's current evaluation methodology does not take into account all PM2.5 precursor emissions. Expansion of the emissions inputs and health outcomes, including, but not limited to, additional cardiovascular and respiratory illnesses, nonfatal/fatal cancers, nervous system diseases, and work loss days would provide a more comprehensive picture of the benefits from reduced exposure to air pollution.

B. Air Quality and Climate Benefits

1. PM2.5 and NOx

The Proposed Amendments require the use of ZE technology and implement a PM standard for newly-manufactured units, which will achieve PM2.5 and NOx emission reductions. This will help to reduce ambient levels of PM2.5 and ozone, contribute toward meeting commitments outlined in the 2016 State SIP Strategy, and support attainment of federal ambient air quality standards, which are established to protect even the most sensitive individuals. Cumulatively, from 2022 to 2034, the Proposed Amendments are expected to reduce statewide TRU emissions by approximately 1,258 tons of PM2.5 and 3,515 tons of NOx, relative to the Baseline. Chapter VI provides a detailed summary of the air quality benefits of the Proposed Amendments.

2. Greenhouse Gases

The benefit of GHG reductions achieved by the Proposed Amendments can be estimated using the social cost of carbon (SC-CO2), which provides a dollar valuation of the damages caused by one ton of carbon pollution and represents the monetary benefit today of reducing carbon emissions in the future.

The Council of Economic Advisors and the Office of Management and Budget convened an Interagency Working Group on the Social Cost of Greenhouse Gases (IWG) to develop a methodology for estimating the SC-CO2. The methodology relies

on a standardized range of assumptions and can be used consistently when estimating the benefits of regulations across agencies and around the world.[63] Staff utilized the current IWG supported SC-CO2 values to consider the social costs of actions taken to reduce GHG emissions. This is consistent with the approach presented in the Revised 2017 Climate Change Scoping Plan, in line with the Office of Management and Budget Circular A-4 of September 17, 2003, and reflects the best available science in the estimation of the socio-economic impacts of carbon.[64,65]

The IWG describes the social cost of carbon as follows:

> "The social cost of carbon (SC-CO2) for a given year is an estimate, in dollars, of the present discounted value of the future damage caused by a 1-metric ton increase in carbon dioxide (CO2) emissions into the atmosphere in that year, or equivalently, the benefits of reducing CO2 emissions by the same amount in that year. The SC-CO2 is intended to provide a comprehensive measure of the net damages – that is, the monetized value of the net impacts – from global climate change that result from an additional ton of CO2.
>
> These damages include, but are not limited to, changes in net agricultural productivity, energy use, human health, property damage from increased flood risk, as well as nonmarket damages, such as the services that natural ecosystems provide to society. Many of these damages from CO2 emissions today will affect economic outcomes throughout the next several centuries."[66]

The SC-CO2 is year-specific and is highly sensitive to the discount rate used to discount the value of the damages in the future due to CO2. The SC-CO2 increases over time as systems become more stressed from the aggregate impacts of climate change and future emissions cause incrementally larger damages. A higher discount rate decreases the value today of future environmental damages. This analysis uses the IWG standardized range of discount rates from 2.5 to 5 percent to represent varying

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[63] Interagency Working Group on the Social Cost of Carbon, Technical Update of the Social Cost of Carbon for Regulatory Impact Analysis under Executive Order 12866, August 2016. (web link: https://obamawhitehouse.archives.gov/sites/default/files/omb/inforeg/scc_tsd_final_clean_8_26_16.pdf)
[64] California Air Resources Board, California's 2017 Climate Change Scoping Plan, November 2017. (web link: https://www.arb.ca.gov/cc/scopingplan/scoping_plan_2017.pdf)
[65] Office of Management and Budgets, Circular A-4, September 17, 2003. (web link: https://www.transportation.gov/sites/dot.gov/files/docs/OMB%20Circular%20No.%20A-4.pdf)
[66] National Academies of Sciences, Engineering, Medicine, Valuing Climate Damages: Updating Estimation of Carbon Dioxide, 2017. (web link: http://www.nap.edu/24651)

valuation of future damages. Table V-2 shows the range of IWG SC-CO2 values used in California's regulatory assessments.[67,68]

Table V-2. Social Cost of Carbon (2019$/Metric Ton)

Year	5 Percent Discount Rate	3 Percent Discount Rate	2.5 Percent Discount Rate
2020	$15	$54	$80
2025	$18	$59	$88
2030	$21	$65	$94
2035	$23	$71	$101
2040	$27	$77	$108
2045	$30	$83	$115
2050	$34	$89	$123

If all of the expected emission reductions projected under the Proposed Amendments are achieved and assumed to be equivalent to CO2 reductions, the avoided SC-CO2 in a given year is the total emission reductions (in MTCO2e multiplied by the SC-CO2 (in $/MTCO2e) for that year. The annual emission reductions from the Proposed Amendments and the estimated benefits are shown in Table V-3. The total benefits range between $29 million to $134 million from 2022 to 2034, depending on the discount rate.

[67] Interagency Working Group on the Social Cost of Carbon, Technical Update of the Social Cost of Carbon for Regulatory Impact Analysis under Executive Order 12866, August 2016. (web link: https://obamawhitehouse.archives.gov/sites/default/files/omb/inforeg/scc_tsd_final_clean_8_26_16.pdf)
[68] The IWG SC-CO2 values are provided in 2007 dollars. Staff adjusted from 2007 to 2019 dollars by using the California Department of Finance Consumer Price Index (CPI-U), adjusting from 2007 dollars to 2019 dollars. (web link: https://www.dof.ca.gov/Forecasting/Economics/Indicators/Inflation/documents/CPI_All_Item_CY.xlsx)

Table V-3. Avoided Social Cost of CO2 from 2022 to 2034 (Million 2019$)

Year	GHG Emission Reductions (MMTCO2e)	5 Percent Discount Rate	3 Percent Discount Rate	2.5 Percent Discount Rate
2022	0.00	$0	$0	$0
2023	0.01	$0	$1	$1
2024	0.03	$1	$2	$3
2025	0.05	$1	$3	$4
2026	0.07	$1	$4	$6
2027	0.09	$2	$6	$8
2028	0.12	$2	$7	$11
2029	0.14	$3	$9	$13
2030	0.16	$3	$10	$15
2031	0.17	$4	$11	$16
2032	0.18	$4	$12	$18
2033	0.19	$4	$13	$19
2034	0.20	$5	$14	$20
Total	1.42	$29	$92	$134

SC-CO2, while intended to be a comprehensive estimate of the damages caused by carbon globally, does not represent the cumulative cost of climate change and air pollution to society. There are additional costs to society outside of the SC-CO2, including costs associated with changes in co-pollutants, the social cost of other GHGs including methane and nitrous oxide, and costs that cannot be included due to modeling and data limitations. The Intergovernmental Panel on Climate Change has stated that the IWG SC-CO2 estimates likely are underestimated due to the omission of impacts that cannot be accurately monetized, including important physical, ecological, and economic impacts.[69]

C. Other Benefits

1. Establishing ZE Technology in the Off-Road Sector

Transitioning diesel-powered truck TRUs to ZE under the Proposed Amendments will provide an opportunity to increase ZE technology in the off-road sector. As more truck TRU fleets use ZE technologies as a result of the Proposed Amendments, industry acceptance of advanced technologies will improve. The state of ZE TRU technology

[69] Intergovernmental Panel on Climate Change, Contribution of Working Group III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, 2007. (web link: https://www.ipcc.ch/site/assets/uploads/2018/03/ar4_wg3_full_report-1.pdf)

will progress and expand into extended range applications, as well as other off-road sectors.

2. Infrastructure

The Proposed Amendments will increase the installation of electric charging and fueling infrastructure needed to support the use of ZE truck TRUs. Advanced TRU technologies are underutilized due in part to limited access to supporting infrastructure at the facilities where TRUs operate. Additional installations of electric charging and fueling infrastructure will support the use of these technologies, as well as other advanced technology equipment and vehicles onsite.

The increased use of electric charging infrastructure will also increase the amount of electricity supplied by utility providers and help the State's investor-owned utilities meet the goals of SB 350.[70] SB 350 requires the State's investor-owned utilities to develop programs to accelerate widespread transportation electrification with goals to reduce dependence on petroleum, increase the uptake of ZE vehicles, help meet air quality standards, and reduce GHGs. The three large investor-owned utilities in the State, Pacific Gas & Electric, San Diego Gas & Electric, and Southern California Edison, all have programs to install make-ready charging infrastructure for TRUs. In addition, all three large investor-owned utilities have either proposed or have been approved to establish new commercial electricity rate options that make charging more affordable during certain times of the day. Although not required by SB 350, several publicly-owned utilities have taken similar action. For example, Los Angeles Department of Water and Power and Sacramento Municipal Utility District have make-ready charging infrastructure programs and new commercial rates for charging. The Proposed Amendments support the utilities' programs and the goals of SB 350 by increasing the number of ZE TRUs in the State to make use of these utility investments and rates.

3. Benefits in Disadvantaged Communities

The Proposed Amendments reduce PM2.5 and NOx emissions, resulting in health benefits for Californians, including those in disadvantaged communities. Many of the communities near facilities where TRUs operate bear a disproportionate health burden due to their close proximity to emissions from the diesel engines that power TRUs. There are several occurrences across the State where communities contain "groups" or "clusters" of facilities where TRUs operate. In many cases, these facilities are located in or near communities that are classified as disadvantaged by CalEPA. CalEPA uses CalEnviroScreen to score California communities based on environmental

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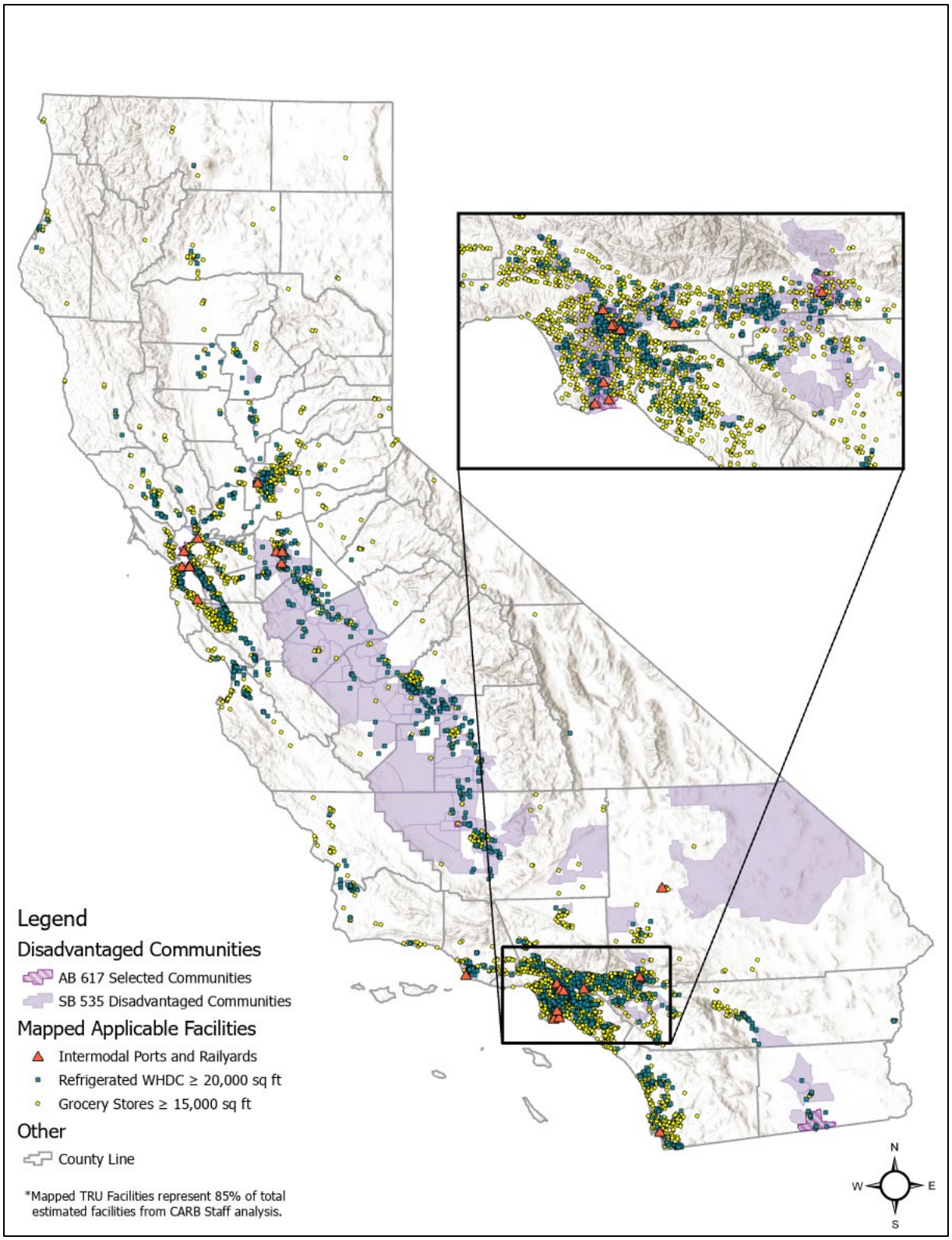
[70] California Legislature, Senate Bill No. 350, signed October 7, 2015. (web link: https://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill_id=201520160SB350)

pollution burden and socio-economic indicators.[71] Based on staff's analysis, approximately 40 percent of the proposed applicable facilities identified are located in disadvantaged communities as designated by CalEnviroScreen.

The Proposed Amendments require applicable facilities to ensure that only compliant TRUs operate on their properties. To meet this requirement, the Proposed Amendments require applicable facilities to gather information on all TRUs that operate at their facilities and report that information to CARB quarterly. Alternatively, facilities may provide a declaration, under penalty of perjury, that they do not allow non-compliant TRUs to operate on their properties. Applicable facility reporting will help staff better identify non-compliant TRUs operating in California and bring them into compliance. Alternatively, not allowing non-compliant TRUs to operate at an applicable facility incentivizes TRU owners to comply and achieves immediate emission reductions in impacted communities. Figure V-3 shows the statewide distribution of the proposed applicable facilities, including those in disadvantaged communities.

[71] Office of Environmental Health Hazard Assessment. CalEnviroScreen 3.0, June 25, 2018. (web link: https://oehha.ca.gov/calenviroscreen/report/calenviroscreen-30)

Figure V-3. Applicable Facilities (as of January 2021)



4. Job Opportunities

The Proposed Amendments provide opportunities for design, engineering, construction, and project management firms to design new and expanded infrastructure at an estimated 1,000 truck TRU home base facilities statewide. The increase in electric charging and fueling infrastructure will also benefit suppliers, equipment installers, and electricians. All of the installations will be in California and some of the infrastructure equipment may be manufactured in California. One manufacturer, ESL Power Systems, has primary operations based in California.[72]

Increased purchases of ZE TRUs under the Proposed Amendments will also benefit ZE TRU manufacturers, as well as various businesses in the ZE TRU supply chain, including those involved in battery, fuel cell, cold plate, and solar photovoltaic technology throughout the State.

5. Noise Reduction

An additional benefit of the Proposed Amendments is reduced noise from diesel-powered TRUs. Diesel-powered TRUs can produce a substantial amount of noise, which also results in adverse health impacts. This is of concern when TRUs operate in and near places where people live, work, and play. Staff have received several noise complaints regarding TRU activity near schools, hospitals, elder care facilities, and residential neighborhoods. The Proposed Amendments will transition diesel-powered truck TRUs to ZE technology, which produces little to no noise. This will eventually eliminate the use of diesel-powered truck TRUs and reduce noise levels.

[72] ESL Power Systems, Inc. (web link: https://eslpwr.com/, last accessed May 11, 2021)

VI. Air Quality and Health Impacts

This chapter describes the air quality and health impacts that will result from the Proposed Amendments. Section A of this chapter includes an overview of the emission inventory methods, Section B describes the baseline used to estimate emission benefits of the Proposed Amendments, Section C provides the resulting PM2.5, NOx, and GHG emission reductions, and Section D summarizes the expected health benefits.

A. Emission Inventory Methods

This section outlines the 2021 update to the statewide emission inventory for TRUs. The data sources and methodology used in the 2021 update are described in Appendix H. Staff last updated the inventory in 2011.[73] The updated inventory reflects improvements to a number of parameters, including, but not limited to:

- Population and age distribution.
- Annual TRU engine activity and the portion of activity that occurs within the State.
- Turnover (replacement of old units) and purchasing trends (addition of new units).

A significant update to the inventory reflects the emergence of trailer TRUs with less than 25 horsepower engines. The emergence of trailer TRUs with engines less than 25 horsepower is notable because the U.S. EPA Tier 4 final PM emission standard for these smaller horsepower engines is 15 times higher (i.e., less stringent) than those for engines greater than 25 horsepower. Similar trends are expected for DSC TRUs, railcar TRUs, and TRU gen sets. The number of TRUs equipped with engines less than 25 horsepower will become responsible for the majority of PM emissions from TRUs in the near future, if current trends continue.

The emission inventory for any given year is calculated by combining the TRU population, hours of TRU engine activity, TRU engine horsepower, load factors, emission factors, and fuel correction factors, in the following equation:

Emissions = Population × Activity × Hp × LF × EF × FCF

Where:

Population = Count of equipment population (unit-less)

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[73] California Air Resources Board, Public Hearing to Consider Proposed Amendments to the Airborne Toxic Control Measure for In-Use Diesel-Fueled TRUs and TRU Generator Sets, and Facilities where TRUs Operate. Staff Report: Initial Statement of Reasons, August 31, 2011. (web link: https://ww3.arb.ca.gov/regact/2011/tru2011/truisor.pdf)

Activity = Time the engine is running (hours)

Hp = Horsepower of the engine (maximum brake horsepower)

LF = Load factor (unit-less)

EF = Emission factor (grams per kilowatt-hour) specific to horsepower and MY and pollutant, and includes deterioration

FCF = Fuel correction factor based on calendar year (unit-less)

B. Baseline Information

Per Department of Finance (DOF) regulations (title 1, CCR, sections 2000 through 2004), the Proposed Amendments are a major regulation requiring a (SRIA) because the economic impact of the regulation is projected to exceed $50 million in a 12-month period. The SRIA requires an analysis of the economic and emission impacts of the regulatory proposal relative to a baseline that reflects full compliance with existing regulations. All impacts of the Proposed Amendments that are discussed in this Staff Report are based on the SRIA baseline.

The analysis relative to the emission inventory baseline, which reflects actual conditions and expected compliance with the TRU ATCM based on observed compliance choices in the California Air Resources Board Equipment Registration (ARBER) program and data from CARB's enforcement program can be found in Appendix H.

C. Emissions Results

1. PM2.5

Figure VI-1 shows the PM2.5 emissions from TRUs in the baseline scenario and under the Proposed Amendments, excluding truck TRUs. Under the Proposed Amendments, emissions are expected to decrease beginning in 2023, when the PM standard goes into effect for MY 2023 and newer trailer TRU, DSC TRU, railcar TRU, and TRU gen set engines. Figure VI-2 shows the PM2.5 emissions from truck TRUs in the baseline scenario and under the Proposed Amendments.

Figure VI-1. Statewide PM2.5 Emissions from TRUs (excluding Truck TRUs) in the Baseline and under the Proposed Amendments from 2022 to 2034

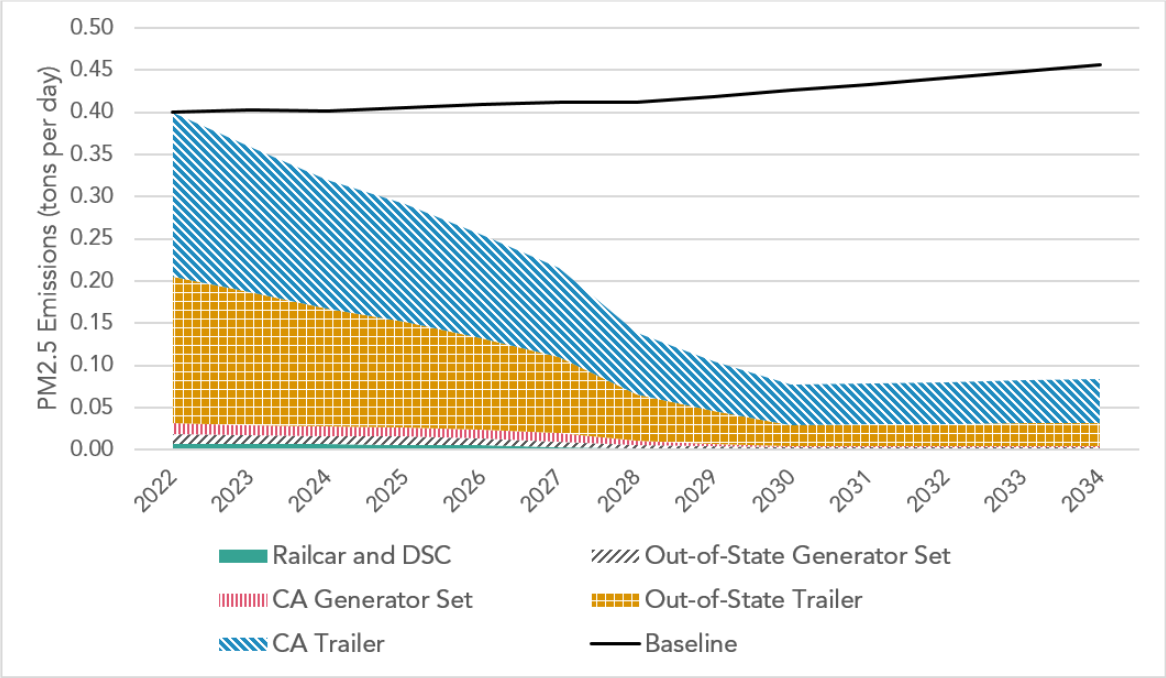
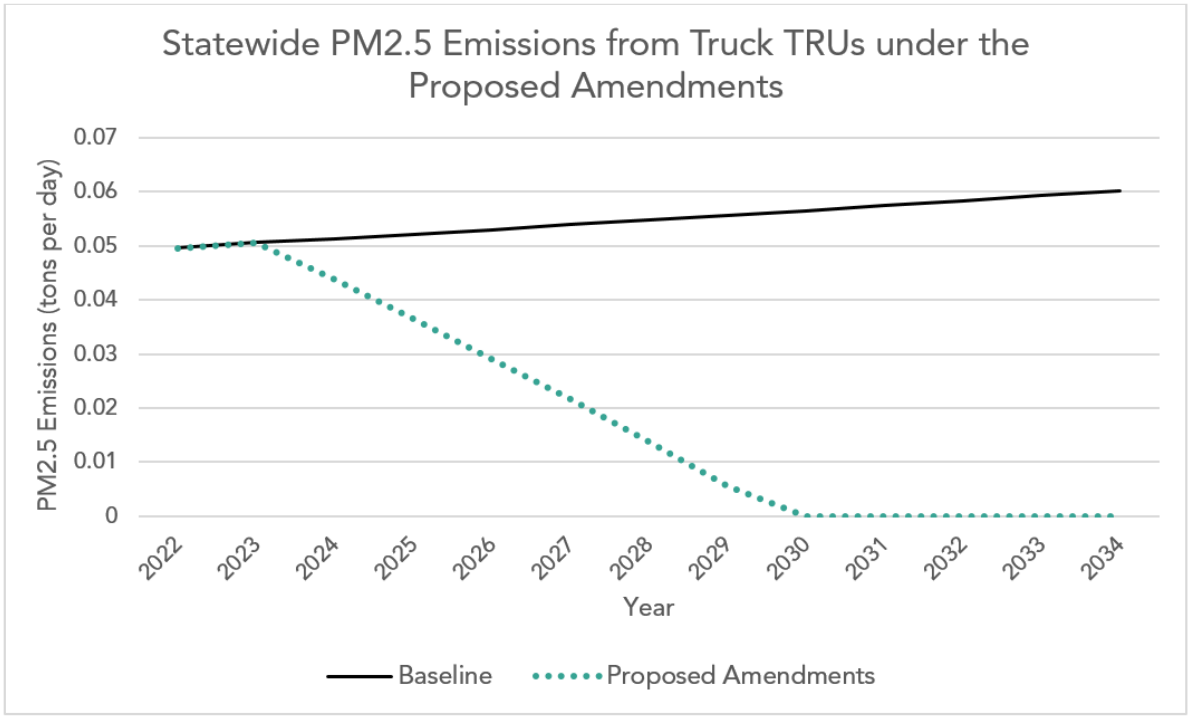


Figure VI-2. Statewide PM2.5 Emissions from Truck TRUs in the Baseline and under the Proposed Amendments from 2022 to 2034



2. NOx

Figure VI-3 shows the NOx emissions from TRUs in the baseline scenario, excluding truck TRUs. Under the Proposed Amendments, NOx emissions are only reduced by the requirement for truck TRUs to transition to ZE technology, with no change in emissions from the remaining TRU categories. Figure VI-4 shows the NOx emissions from truck TRUs in the baseline scenario and under the Proposed Amendments.

Figure VI-3. Statewide NOx Emissions from TRUs (excluding Truck TRUs) in the Baseline from 2022 to 2034

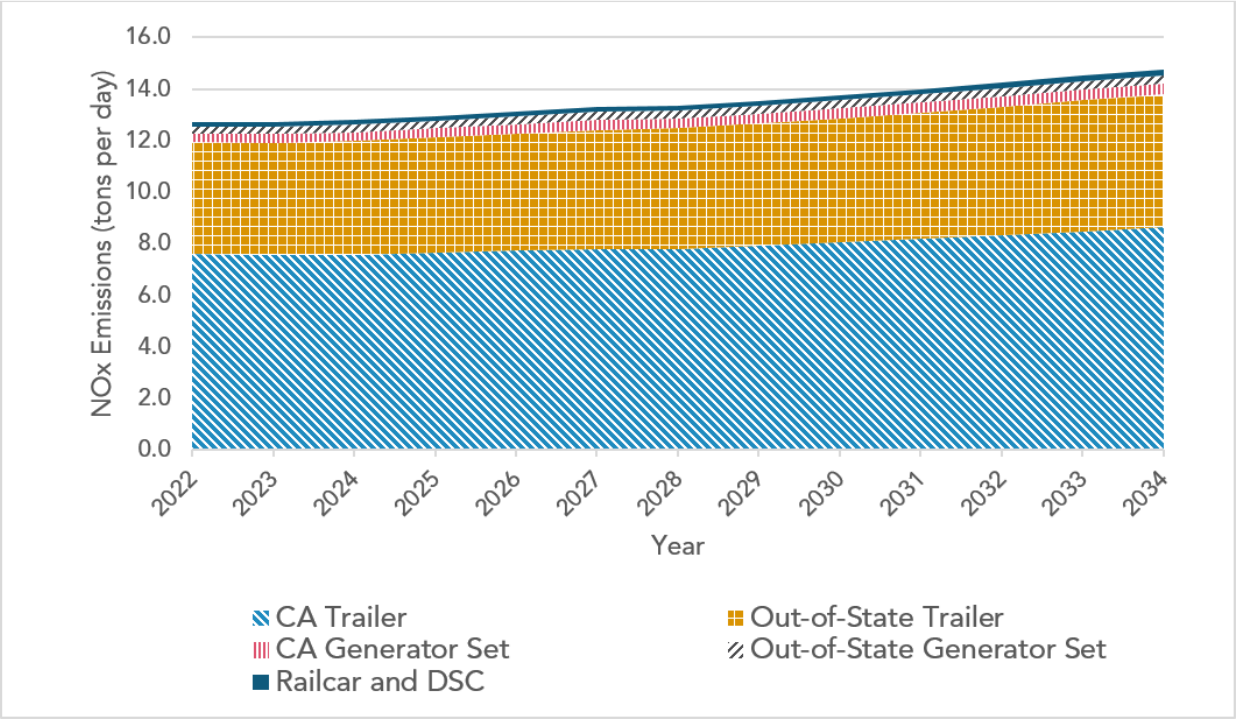
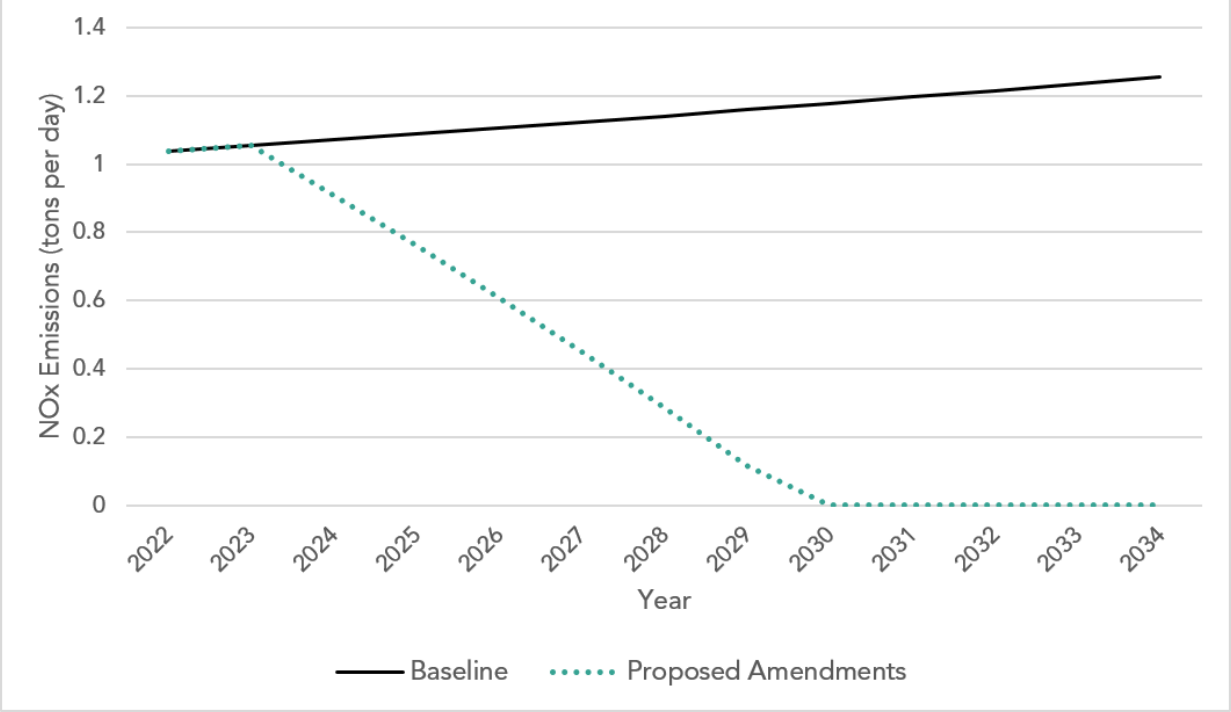


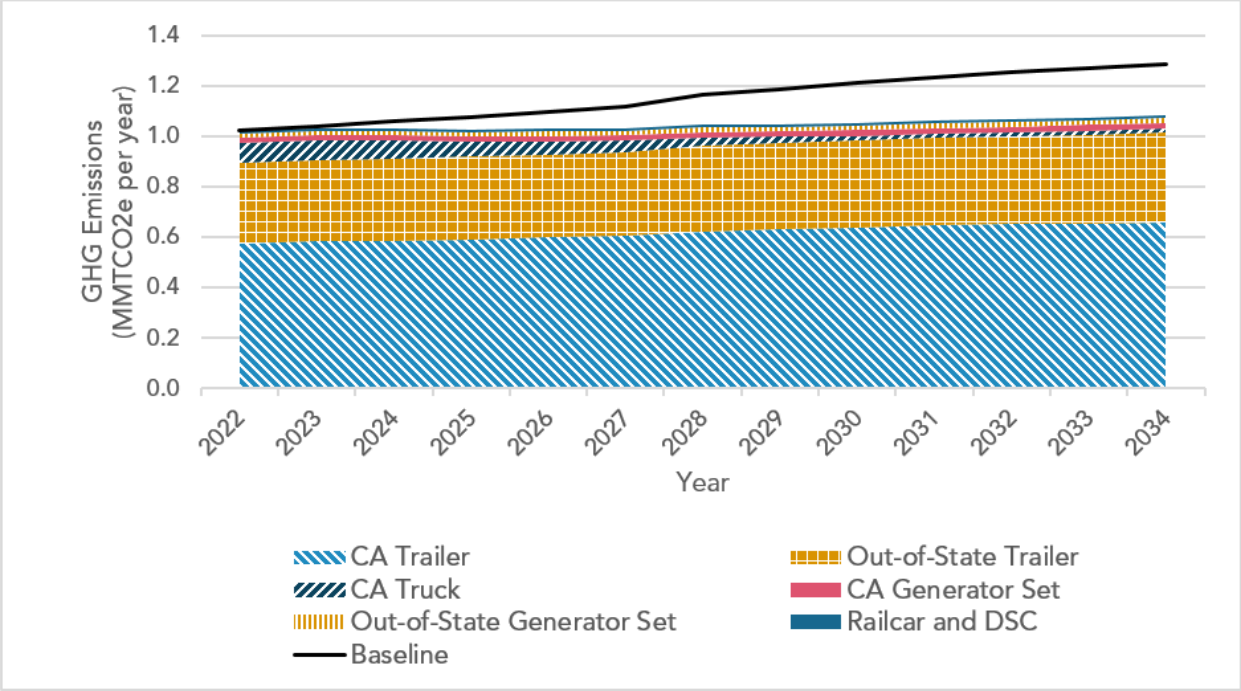
Figure VI-4. Statewide NOx Emissions from Truck TRUs in the Baseline and under the Proposed Amendments from 2022 to 2034



3. GHG

Figure VI-4 shows the GHG emissions from TRUs in the baseline scenario and under the Proposed Amendments from 2022 to 2034. GHG emission reductions will start in 2023 when the lower-GWP refrigerant requirement begins. Additional GHG emission reductions will begin in 2024 when truck TRUs are required to transition to ZE technology.

Figure VI-5. Statewide GHG Emissions from TRUs in the Baseline and under the Proposed Amendments from 2022 to 2034



D. Health Impacts

This section summarizes the results of an evaluation of the health impacts from TRU emissions using two different methods: an HRA and a mortality and illness analysis. The HRA considers the localized health impacts to communities around facilities where TRUs operate, in which air dispersion modeling is used to estimate the air concentration of diesel PM, estimates diesel PM exposure to residents in those communities, and quantifies the health effects (potential cancer risk, and acute and chronic non-cancer impact) that would be expected to result from that exposure. The HRA further projects how those impacts change with implementation of the Proposed Amendments.

The mortality and illness analysis uses emissions inventory data and county-specific statistics on health outcomes (premature death due to cardiac or respiratory effects, hospitalizations and emergency room visits attributed to those causes). The analysis focuses on the impacts of regional PM2.5 pollution, either directly emitted from TRUs or formed in the atmosphere from NOx emissions from these sources. The following is a summary of the results from these analyses. The complete health analyses can be found in Appendix I.

1. Potential Exposures and Health Risks from TRU Engine Diesel PM Emissions

Staff conducted an HRA to estimate the potential cancer risk from diesel PM emitted from diesel-powered TRUs operating at refrigerated facilities. TRUs typically operate at refrigerated WHDCs, grocery stores, seaport facilities, intermodal railyards, and other locations that are often near sensitive receptors, such as schools, hospitals, elder care facilities, and residential neighborhoods. Staff estimated the number and types of facilities where TRUs operate as well as their contribution to statewide diesel PM emissions with the purpose of determining the applicability of the Proposed Amendments. More information on the applicable facilities included in the Proposed Amendments is provided in Appendix F.

Based on staff's analysis, the facility types with the highest estimated contribution of statewide diesel PM emissions from the diesel engines that power TRUs are refrigerated WHDCs (which include CSWs) and grocery stores. Therefore, staff modeled a generic CSW and a generic grocery store to characterize existing health risk and the effectiveness of the Proposed Amendments.

Staff used air dispersion modeling to estimate the diesel PM concentrations for communities nearby a generic CSW and generic grocery store and estimated the potential health impacts from the modeled exposures. The HRA compared the current and future impacts of the TRU ATCM (Baseline) to the current and future impacts of the Proposed Amendments. The Proposed Amendments provide reductions in

potential cancer risk to individual residents and off-site workers when compared to the Baseline.

a. CSW Modeling Results

CSWs range in size depending on the location and type of operation. The primary emission sources of diesel PM at these facilities are the diesel engines powering TRUs mounted either on straight trucks or on semi-trailers. Because of the variability in size and operation, staff modeled a generic CSW that could accommodate TRU engine activity, ranging from 500 hours per week, representing a small warehouse, to 8,000 hours per week, representing a large warehouse.

Figure VI-6 compares the potential cancer risk for individual residents under the Baseline and the Proposed Amendments in 2030. The scenarios show reductions in risk across all activity levels. After full implementation of the Proposed Amendments, residential and off-site worker cancer risk is anticipated to be reduced by approximately 58 percent compared to the Baseline.

Figure VI-6. Cold Storage Warehouse Individual Resident Cancer Risk – Year 2030 (chances per million)

Baseline

Total Hours of TRU Engine Operation		Downwind Distance (m) from Facility																	
Per Week	Per year	25	50	75	100	200	300	400	500	600	700	800	900	1000	1100	1200	1300	1400	1500
8,000	416,000	760	650	560	490	310	220	168	130	110	94	81	72	65	59	54	50	47	43
5,000	260,000	470	410	350	300	190	140	105	84	69	58	51	45	40	37	34	31	29	27
3,000	156,000	280	250	210	180	120	83	63	50	41	35	30	27	24	22	20	19	17	16
2,000	104,000	190	160	140	120	77	55	42	33	28	23	20	18	16	15	13	13	12	11
1,000	52,000	95	82	70	61	39	28	21	17	14	12	10	9	8	7	7	6	6	5
500	26,000	47	41	35	30	19	14	10	8	7	6	5	4	4	4	3	3	3	3

Proposed Am.

Total Hours of TRU Engine Operation		Downwind Distance (m) from Facility																	
Per Week	Per year	25	50	75	100	200	300	400	500	600	700	800	900	1000	1100	1200	1300	1400	1500
8,000	416,000	320	270	230	200	130	92	70	56	46	39	34	30	27	25	22	21	19	18
5,000	260,000	200	170	150	130	81	58	44	35	29	24	21	19	17	15	14	13	12	11
3,000	156,000	120	100	87	76	48	35	26	21	17	15	13	11	10	9	8	8	7	7
2,000	104,000	79	68	58	51	32	23	18	14	12	10	8	8	7	6	6	5	5	4
1,000	52,000	40	34	29	25	16	12	9	7	6	5	4	4	3	3	3	3	2	2
500	26,000	20	17	15	13	8	6	4	3	3	2	2	2	2	2	1	1	1	1

Note: Individual resident cancer risk estimates are based on a 30-year exposure duration using the Risk Management Policy method (95th/80th percentile daily breathing rates. Fraction of time at home equals 1 for age bins <16 years and 0.73 for age bin 16-70 years. All numbers are rounded.

b. Grocery Store Modeling Results

Grocery stores range in size from small local markets to supercenter grocery stores. The primary emission sources of diesel PM at these facilities are TRUs mounted on straight trucks or semi-trailers. Additionally, during the holiday seasons, some grocery stores have one or more semi-trailers parked for an extended period of time behind the store to provide additional storage for refrigerated or frozen products. These are referred to as seasonal trailers. Because of the variability of size and operation, staff modeled a generic grocery store using three operational scenarios, which are described as follows:

- One daily truck TRU, one daily trailer TRU, one seasonal trailer TRU.
- Seven daily truck TRUs, two daily trailer TRUs, one seasonal trailer TRU.
- Ten daily truck TRUs, six daily trailer TRUs, one seasonal trailer TRU.

TRU activity at a grocery store is dependent on the number of truck and trailer trips generated by the facility. Staff developed these operating scenarios using data from environmental planning documents and CARB surveys regarding the total number of deliveries grocery stores receive each day.

Figure VI-7 shows the potential cancer risk for individual residents under the Baseline and the Proposed Amendments in 2030. The three grocery store scenarios under the Baseline show potential cancer risk ranging from approximately 79 to 300 chances per million at the facility fence line. After implementation of the Proposed Amendments, the potential cancer risk is reduced to a range of approximately 34 to 94 chances per million in 2030. After full implementation of the Proposed Amendments, residential cancer risk is anticipated to be reduced by approximately 57 to 72 percent compared to the Baseline, depending on the operational scenario. Off-site worker cancer risk is anticipated to be reduced by approximately 58 to 71 percent compared to the Baseline, depending on the operational scenario.

Figure VI-7. Grocery Store Individual Resident Cancer Risk – Year 2030 (chances per million)

Control Measure	Downwind Distance (m) from Grocery Store Fence Line															
	0	10	25	50	75	100	150	200	250	300	350	400	500	600	700	800
1 Daily Truck, 1 Daily Trailer, 1 Seasonal Trailer (Baseline TRU Engine Hours: 202 per week; 3,940 per year)																
Baseline	79	56	38	23	16	12	7	5	4	3	2	2	2	1	<1	<1
Prop. Am.	34	24	16	10	7	5	3	2	2	1	<1	<1	<1	<1	<1	<1
7 Daily Trucks, 2 Daily Trailers, 1 Seasonal Trailer (Baseline TRU Engine Hours: 274 per week; 7,717 per year)																
Baseline	170	120	82	51	35	26	16	11	9	7	6	5	4	3	3	2
Prop. Am.	46	33	22	14	9	7	4	3	2	2	1	1	<1	<1	<1	<1
10 Daily Trucks, 6 Daily Trailers, 1 Seasonal Trailer (Baseline TRU Engine Hours: 402 per week; 14,334 per year)																
Baseline	300	210	150	90	61	45	28	20	15	12	10	8	6	5	4	4
Prop. Am.	94	68	46	28	19	14	9	6	4	3	3	2	2	1	1	<1

Note: Individual resident cancer risk estimates are based on a 30-year exposure duration using the Risk Management Policy method (95th percentile/80th percentile daily breathing rates. Fraction of time at home equals 1 for age bins <16 years and 0.73 for age bin 16-70 years. All numbers are rounded.

2. Regional PM2.5 Mortality and Illness Analysis for California Air Basins

Staff conducted a PM2.5 mortality and illness analysis based on the statewide emission reductions of PM2.5 and NOx that will be achieved by the Proposed Amendments (see Appendix I). This section provides a summary of the mortality and illness impacts, which include premature death from cardiopulmonary disease, hospitalizations for cardiovascular and respiratory illnesses, and emergency room visits for asthma.

a. PM2.5 Mortality and Illness

CARB staff evaluated a limited number of statewide non-cancer health benefits associated with reductions in exposure to PM2.5 and NOx emissions resulting from the Proposed Amendments. NOx includes nitrogen dioxide, a potent lung irritant, which can aggravate lung diseases such as asthma when inhaled. However, the most serious quantifiable impacts of NOx emissions occur through the conversion of NOx to fine particles of ammonium nitrate aerosol through chemical processes in the atmosphere. PM2.5 formed in this manner is termed secondary PM2.5. Both directly emitted (primary) PM2.5 and secondary PM2.5 is associated with adverse health outcomes, such as cardiopulmonary mortality, hospitalizations for cardiovascular and respiratory illnesses, and emergency room visits for asthma. As a result, reductions in PM2.5 and NOx emissions are associated with reductions in these adverse health outcomes.

b. Reduction in Health Outcomes

CARB uses the incidence-per-ton (IPT) methodology to quantify the health benefits of emission reductions in cases where air quality modeling results are not available. A description of this method is included on CARB's Methodology for Estimating the Health Effects of Air Pollution webpage.[74] CARB's IPT methodology is based on the methodology developed by U.S. EPA.[75,76,77]

The IPT methodology assumes that changes in emissions are approximately proportional to changes in health outcomes. IPT factors are derived by calculating the

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[74] California Air Resources Board, CARB's Methodology for Estimating the Health Effects of Air Pollution. (web link: https://ww2.arb.ca.gov/resources/documents/carbs-methodology-estimating-health-effects-air-pollution, last accessed May 11, 2021)
[75] Fann N, Fulcher CM, Hubbell BJ., The influence of location, source, and emission type in estimates of the human health benefits of reducing a ton of air pollution, Air Quality, Atmosphere & Health, 2:169-176, 2009. (web link: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2770129/)
[76] Fann N, Baker KR, Fulcher CM., Characterizing the PM2.5-related health benefits of emission reductions for 17 industrial, area and mobile emission sectors across the U.S. Environ Int.; 49:141-51, 2012. (web link: https://www.sciencedirect.com/science/article/pii/S0160412012001985)
[77] Fann N, Baker K, Chan E, Eyth A, Macpherson A, Miller E, Snyder J., Assessing Human Health PM2.5 and Ozone Impacts from U.S. Oil and Natural Gas Sector Emissions in 2025, Environ. Sci. Technol. 52 (15), pp 8095–8103, 2018. (web link: https://pubs.acs.org/doi/abs/10.1021/acs.est.8b02050)

number of health outcomes associated with exposure to PM2.5 concentrations for a baseline scenario and dividing by the emissions of PM2.5 or a precursor. The calculation is performed separately for each air basin using the following equation:

IPT = (number of health outcomes in air basin)/(annual emissions in air basin)

Multiplying the emission reductions from the Proposed Amendments in an air basin by the IPT factor then yields an estimate of the reduction in health outcomes achieved by the Proposed Amendments. For future years, the number of outcomes is adjusted to account for population growth. CARB's current IPT factors are based on a 2014-2016 baseline scenario, which represents the most recent data available at the time the current IPT factors were computed. IPT factors are computed for the two types of PM2.5: primary PM2.5 and secondary PM2.5 of ammonium nitrate aerosol formed from precursors.

Staff estimated the reduction in adverse health outcomes associated with reduced emissions of PM2.5 and NOx due to the Proposed Amendments. These health outcomes include cardiopulmonary mortality, hospital admissions for cardiovascular and respiratory illnesses, and emergency room visits for asthma. Staff estimates that the total reduction in the number of cases statewide due to the implementation of the Proposed Amendments from 2022 to 2034 would be as follows:

- 177 fewer premature deaths (138 to 217, 95 percent confidence interval (CI))
- 57 fewer hospital admissions for cardiovascular and respiratory illnesses (7 to 106, 95 percent CI)
- 87 fewer emergency room visits for asthma (55 to 119, 95 percent CI)

Table VI-1 shows the estimated reductions in health outcomes as a result of the Proposed Amendments by air basin from 2022 to 2034.

Table VI-1. Total Reductions in Health Outcomes as a Result of the Proposed Amendments from 2022 to 2034

Air Basin	Cardiopulmonary Mortality	Cardiovascular and Respiratory Hospital Admissions	Asthma Emergency Room Visits
Great Basin Valleys	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)
Lake County	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)
Lake Tahoe	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)
Mojave Desert	2 (2 -3)	1 (0 - 1)	1 (1 - 1)
Mountain Counties	1 (1 - 1)	0 (0 - 0)	0 (0 - 0)
North Central Coast	1 (1 - 2)	0 (0 - 1)	1 (0 - 1)
North Coast	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)
Northeast Plateau	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)
Sacramento Valley	7 (5 - 8)	2 (0 - 3)	2 (2 - 3)
Salton Sea	1 (1 - 2)	0 (0 - 1)	1 (0 - 1)
San Diego County	6 (5 - 7)	2 (0 - 3)	2 (2 - 3)
San Francisco Bay Area	20 (16 - 25)	7 (1 - 12)	11 (7 - 15)
San Joaquin Valley	22 (17 - 27)	5 (1 - 9)	8 (5 - 11)
South Central Coast	2 (1 - 2)	0 (0 - 1)	1 (0 - 1)
South Coast	115 (89 - 140)	40 (5 - 74)	59 (37 - 81)
Total	177 (138 - 217)	57 (7 -106)	87 (55 - 119)

Note: The values in parentheses represent the 95 percent confidence intervals of the central estimate. Totals may not add due to rounding.

c. Statewide Valuation

In accordance with U.S. EPA practice, staff monetized health outcomes by multiplying the projected number of cases by a standard value derived from economic studies.[78] Table VI-2 shows the valuations assigned to different health outcomes in 2019 U.S. Dollars (2019$).

[78] National Center for Environmental Economics et al., Appendix B: Mortality Risk Valuation Estimates, Guidelines for Preparing Economic Analyses (EPA 240-R-10-001), December 2010. (web link: https://www.epa.gov/sites/production/files/2017-09/documents/ee-0568-22.pdf)

Table VI-2. Valuation per Incident Avoided Health Outcomes (2019$)

Outcome	Valuation per Incident
Avoided Premature Deaths	$9,864,695
Avoided Acute Respiratory Hospitalizations	$58,288
Avoided Cardiovascular Hospitalizations	$50,842
Avoided Emergency Room Visits	$834

The valuation for avoided premature mortality is based on willingness to pay.[79] This value is a statistical construct based on the aggregated dollar amount that a large group of people would be willing to pay to avoid a single annual death in the population. This value is not an estimate of how much someone would be willing to pay to prevent the death of any particular person,[80] nor does it consider specific mortality-related costs such as hospital expenses.

Unlike premature mortality valuation, the valuation for avoided hospitalizations and emergency room visits is based on a combination of typical costs and the willingness of surveyed individuals to pay to avoid adverse outcomes that occur when hospitalized. These include hospital charges, post-hospitalization medical care, out-of-pocket expenses, and lost earnings for both individuals and family members. It also includes lost recreation value and lost household protection (e.g., valuation of time-losses from inability to maintain a household or provide childcare). These costs are most closely associated with specific cost savings to individuals and costs to the health care system.

Table VI-3 shows the total statewide valuation of avoided adverse health outcomes as a result of the Proposed Amendments from 2022 to 2034. The spatial distribution of these benefits follows the distribution of emission reductions and avoided adverse health outcomes. Therefore, most benefits to individuals would occur in the South Coast, San Joaquin Valley, and San Francisco air basins, with fewer benefits in the Sacramento Valley and San Diego County air basins.

[79] United States Environmental Protection Agency Science Advisory Board (U.S. EPA-SAB), An SAB Report on EPA's White Paper Valuing the Benefits of Fatal Cancer Risk Reduction (EPA-SAB-EEAC-00-013), July 2000. (web link: http://yosemite.epa.gov/sab%5CSABPRODUCT.NSF/41334524148BCCD6852571A700516498/$File/eeacf013.pdf)

[80] United States Environmental Protection Agency, Mortality Risk Valuation – What does it mean the place a value on a life? (web link: https://www.epa.gov/environmental-economics/mortality-risk-valuation#means, last accessed March 2, 2021)

Table VI-3. Statewide Valuation from Avoided Adverse Health Outcomes as a Result of the Proposed Amendments from 2022 to 2034 (2019$)

Outcome	Valuation
Avoided Premature Deaths	$1,749,747,000
Avoided Hospitalizations	$3,092,000
Avoided Emergency Room Visits	$73,000
Total	$1,752,912,000

Note: Values have been rounded to the nearest thousand.

In addition to the health impacts for which valuations were provided, the Proposed Amendments would provide other health benefits that are not currently quantified. These include decreases in vulnerability and impacts in disadvantaged communities, work loss days, school loss days, nervous system and lung impacts, and cancer risk.

VII. Environmental Analysis

CARB is the lead agency for the Proposed Amendments and has prepared an environmental analysis pursuant to its certified regulatory program (title 17, CCR, sections 60000 through 60008) to comply with the requirements of CEQA. CARB's regulatory program, which involves the adoption, approval, amendment, or repeal of standards, rules, regulations, or plans for the protection and enhancement of the State's ambient air quality has been certified by the California Secretary for Natural Resources under Public Resources Code section 21080.5 of CEQA (title 14, CCR, section 15251(d)). Public Resources Code section 21080.5 allows public agencies with certified regulatory programs to prepare a "functionally equivalent" or substitute document in lieu of an environmental impact report or negative declaration, once the program has been certified by the Secretary for the Resources Agency as meeting the requirements of CEQA. CARB, as a lead agency, prepares a substitute environmental document (referred to as an "Environmental Analysis" or "EA") as part of the Staff Report to comply with CEQA (title 17, CCR, section 60005).

The Draft Supplemental Environmental Analysis (Draft Supplemental EA) for the Proposed Amendments is included in Appendix D. The Draft Supplemental EA provides a programmatic environmental analysis of an illustrative, reasonably foreseeable compliance scenario that could result from implementation of the Proposed Amendments. The Draft Supplemental EA states that implementation of the Proposed Amendments could result in beneficial impacts to PM, NOx, and GHGs through reductions in emissions from diesel-powered TRUs in California, long-term beneficial impacts to air quality through reductions in criteria pollutants, and beneficial impacts to energy demand.

For the purpose of determining whether the Proposed Amendments will have a potential adverse effect on the environment, CARB evaluated the potential physical changes to the environment resulting from a reasonable, foreseeable compliance scenario.

Implementation of the Proposed Amendments could result in the construction and operation of new or expanded manufacturing facilities for ZE TRU technologies (e.g., lithium-ion batteries, cryogenic fuels, cold plates, solar photovoltaics); the construction of supporting infrastructure, such as electric chargers and fueling stations; increased demand for electricity, requiring more electricity generation; the displacement of fossil fuel extraction, refinement, manufacture, distribution, and combustion; new or modified recycling or refurbishment facilities to accommodate battery disposal; and increased demand for the extraction of raw minerals used in the production of batteries, such as lithium from source countries and states.

In some cases, potentially significant effects to environmental resources may occur due to implementation of compliance responses associated with the Proposed Amendments. It is expected that many of these potentially significant impacts can be

feasibly avoided or mitigated to a less-than-significant level, due to project-specific environmental review processes associated with compliance responses and compliance with local and State laws and regulations. However, the Draft Supplemental EA takes the conservative approach in its post-mitigation significance conclusions (i.e., tending to overstate the risk that feasible mitigation may not be sufficient to mitigate an impact to less than significant or may not be implemented by other parties) and discloses, for CEQA compliance purposes, that potentially significant environmental impacts may be unavoidable. Table VII-1 summarizes the potential environmental impacts of the Proposed Amendments.

Table VII-1. Summary of Potential Environmental Impacts

	Resource Area Impact	Significance
1-1	Short-Term Construction-Related and Long-Term Operation-Related Effects to Aesthetics	Potentially Significant and Unavoidable
2-1	Short-Term Construction-Related and Long-Term Operation-Related Effects to Agriculture and Forest Resources	Potentially Significant and Unavoidable
3-1	Short-Term Construction-Related Effects to Air Quality	Potentially Significant and Unavoidable
3-2	Long-Term Operation-Related Effects to Air Quality	Beneficial
4-1	Short-Term Construction-Related Effects to Biological Resources	Potentially Significant and Unavoidable
4-2	Long-Term Operation-Related Effects to Biological Resources	Potentially Significant and Unavoidable
5-1	Short-Term Construction-Related and Long-Term Operation-Related Effects to Cultural Resources	Potentially Significant and Unavoidable
6-1	Short-Term Construction-Related Effects on Energy Demand	Less than Significant
6-2	Long-Term Operation-Related Effects on Energy Demand	Beneficial
7-1	Short-Term Construction-Related and Long-Term Operation-Related Effects to Geology, Seismicity, and Soils	Potentially Significant and Unavoidable
8-1	Short-Term Construction-Related and Long-Term Operation-Related Effects to Greenhouse Gas Emissions and Climate Change	Beneficial
9-1	Short-Term Construction-Related Effects to Hazards and Hazardous Materials	Potentially Significant and Unavoidable
9-2	Long-Term Operation-Related Effects to Hazards and Hazardous Materials	Less than Significant
10-1	Short-Term Construction-Related Effects on Hydrology and Water Quality	Potentially Significant and Unavoidable

	Resource Area Impact	Significance
10-2	Long-Term Operation-Related Effects to Hydrology and Water Quality	Potentially Significant and Unavoidable
11-1	Short-Term Construction-Related and Long-Term Operation-Related Impacts on Land Use and Planning	Less than Significant
12-1	Short-Term Construction-Related Effects to Mineral Resources	Less than Significant
12-2	Long-Term Operation-Related Effects to Mineral Resources	Potentially Significant and Unavoidable
13-1	Short-Term Construction-Related Noise Effects	Potentially Significant and Unavoidable
13-2	Long-Term Operation-Related Noise Effects	Potentially Significant and Unavoidable
14-1	Short-Term Construction-Related and Long-Term Operation-Related Effects to Population and Housing	Less than Significant
15-1	Short-Term Construction-Related and Long-Term Operation-Related Effects to Public Services	Less than Significant
16-1	Short-Term Construction-Related and Long-Term Operation-Related Effects to Recreation	Less than Significant
17-1	Short-Term Construction-Related Effects to Transportation	Potentially Significant and Unavoidable
17-2	Long-Term Operation-Related Effects to Transportation	Potentially Significant and Unavoidable
18-1	Short-Term Construction-Related and Long-Term Operational Impacts on Utilities and Service Systems	Potentially Significant and Unavoidable
19-1	Short-Term Construction-Related and Long-Term Operation-Related Effects on Wildfire	Less than Significant

Staff prepared a Notice of Preparation and made it available for review and comment for 30 days, per the CEQA Guidelines (title 14, CCR, section 15082(b)). The comment period for the Notice of Preparation began on July 30, 2019 and ended on August 29, 2019. CARB held public workshops that also served as CEQA scoping meetings to solicit input on the scope and content of the Draft EA on August 28, 2019, September 3, 2019, and September 11, 2019. Written comments on the Draft EA will be accepted starting July 30, 2021, through 5:00 p.m. on September 13, 2021. The Board will consider the Final EA and responses to comments received on the Draft EA before taking action to adopt the Proposed Amendments.

VIII. Environmental Justice

State law defines environmental justice as the fair treatment and meaningful involvement of people of all races, cultures, incomes, and national origins, with respect to the development, adoption, implementation, and enforcement of environmental laws, regulations, and policies (Government Code section 65040.12, subd. (e)(1)). Environmental justice includes, but is not limited to, all of the following: (A) The availability of a healthy environment for all people. (B) The deterrence, reduction, and elimination of pollution burdens for populations and communities experiencing the adverse effects of that pollution, so that the effects of the pollution are not disproportionately borne by those populations and communities. (C) Governmental entities engaging and providing technical assistance to populations and communities most impacted by pollution to promote their meaningful participation in all phases of the environmental and land use decision making process. (D) At a minimum, the meaningful consideration of recommendations from populations and communities most impacted by pollution into environmental and land use decisions (Government Code section 65040.12, subd. (e)(2)). The Board approved its Environmental Justice Policies and Actions (Policies) on December 13, 2001, to establish a framework for incorporating environmental justice into CARB's programs consistent with the directives of State law (CARB 2001). These policies apply to all communities in California, but are intended to address the disproportionate environmental exposure burden borne by low-income communities and communities of color. Environmental justice is one of CARB's core values and fundamental to achieving its mission.

Diesel-powered TRUs emit harmful pollutants while in transit and during stationary operation at refrigerated WHDCs, grocery stores, seaports, intermodal railyards, and other locations that are often in close proximity to sensitive receptors, such as schools, hospitals, elder care facilities, and residential neighborhoods. In addition, some facilities, such as refrigerated WHDCs and grocery stores, use TRUs for extended cold storage when facilities run out of space inside their buildings. These facilities store overflow products in TRU-equipped trucks and trailers outside, contributing to higher localized health risk in nearby communities.

Although CARB's existing regulations and incentive programs have reduced freight related emissions, additional reductions are needed to better protect the communities around California freight facilities still exposed to higher risk from diesel-powered sources such as TRUs. These communities bear a disproportionate health burden due to their close proximity to diesel emissions. The impacts of the elevated air pollution burden in these communities can be measured. For example, while exposure to cancer-causing diesel particles has decreased statewide, exposure to diesel particles in disadvantaged communities is on average twice that experienced in

non-disadvantaged communities.[81] In recognition that air pollution heavily impacts disadvantaged communities in California, AB 617 places additional emphasis on protecting such communities by requiring new community-focused and community-driven action to reduce air pollution and improve public health in communities that experience disproportionate burdens from exposure to air pollutants.[82]

The Proposed Amendments are consistent with CARB's environmental justice goal of reducing exposure to air pollutants and reducing adverse health impacts from toxic air contaminants in all communities, including low-income communities and communities of color. As discussed in Chapter III of this Staff Report, the Proposed Amendments will achieve additional emission reductions from TRUs by transitioning diesel-powered truck TRUs to ZE technology, as well as requiring a PM emission standard for newly-manufactured TRUs in the remaining categories and the use of lower-GWP refrigerant. The Proposed Amendments also require applicable facilities to either report all TRU activity to CARB or ensure that only compliant TRUs to operate on their properties. Applicable facility reporting will help CARB staff better identify non-compliant TRUs operating in California and bring them into compliance. Alternatively, only allowing compliant TRUs to operate at an applicable facility incentivizes TRU owners to comply and achieves immediate emission reductions in nearby communities. Based on staff's analysis, approximately 40 percent of the proposed applicable facilities identified are located in disadvantaged communities as designated by CalEnviroScreen (see Figure V-3 in Chapter V for the statewide distribution of the proposed applicable facilities, including those in disadvantaged communities).

The Proposed Amendments are designed to reduce criteria pollutants, toxic air contaminants, GHG emissions, and risk from regional air pollution that can be associated with adverse health impacts. The additional reductions and associated improvements to air quality are designed to help protect all Californians and will be of particular benefit in disadvantaged communities.

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[81] California Air Resources Board, Community Air Protection Blueprint, August 2018. (web link: https://ww2.arb.ca.gov/sites/default/files/2018-08/final_draft_community_air_protection_blueprint_august_2018_1.pdf)

[82] California Health and Safety Code § 40920.6, 42400, 42402, 39607.1, 40920.8, 42411, 42705.5, and 44391.2, Division 26, Assembly Bill No. 617, Nonvehicular Air Pollution: Criteria Air Pollutants and Toxic Air Contaminants, July 26, 2017. (web link: https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=201720180AB617)

IX. Technical Feasibility of the Proposed Amendments

The purpose of this chapter is to describe the various TRU technologies, including their performance considerations, availability, deployment, and cost, that may be used to meet the requirements of the Proposed Amendments. The Proposed Amendments do not prescribe a single set of technologies, but instead allow any technology to be used to meet the requirements. The Proposed Amendments can be met through the application of existing technologies and solutions that are available today. In addition, staff anticipate that certain technologies, described herein, will become available within the timeframe of the Proposed Amendments. This chapter evaluates the current and projected technologies that may be used to comply with the following requirements of the Proposed Amendments:

- Truck TRU fleets shall transition to full ZE technology by replacing 15 percent of the diesel-fueled fleet per year. The current regulation does not have a ZE requirement for truck TRUs.
- MY 2023 and newer trailer TRU, DSC TRU, railcar TRU, and TRU gen set engines shall meet a PM emission standard of 0.02 g/hp-hr or lower. The current regulation requires that these engines meet ULETRU by December 31 of the seventh year after the engine MY.
- Newly-manufactured truck TRUs, trailer TRUs, and DSC TRUs shall use refrigerant with a GWP less than or equal to 2,200, or use no refrigerant at all. The current regulation does not have a refrigerant requirement.

Expanded descriptions and technical details of the technologies discussed in this chapter can be found in the CARB's 2015 Draft Technology Assessment: Transport Refrigerators.[83]

A. Proposed Requirement: ZE Truck TRUs

The Proposed Amendments require truck TRU fleets to transition to ZE technology by replacing 15 percent of the diesel-fueled truck TRU fleet per year. Truck TRUs are used to refrigerate cargo in straight trucks where the trailer is permanently attached to the truck cab. Truck TRUs often travel shorter distances, return to a home base each night, and can be charged at the depot or the location where they are dispatched. These operational characteristics make truck TRUs ideal candidates for the currently available ZE TRU technologies discussed below.

[83] California Air Resources Board, Technology Assessment: Transport Refrigerators, August 2015. (web link: https://ww2.arb.ca.gov/sites/default/files/2020-06/TRU%20Tech%20Assessment%20Report%20ada.pdf)

1. Description of Available ZE Truck TRU Technology

a. Battery-Electric Truck TRU

In battery-electric truck TRUs, the diesel engine powering the compressor and fans is removed and replaced with electric motors to drive those components. Battery packs provide electrical power to the TRU while on the road and away from grid-connected electric power plugs. Straight truck box lengths vary between 12 and 28 feet. The required size of the battery pack is dependent on the size of the truck, as well as other factors specific to each operation, including the length of the route, product being transported, temperature of the load, number of door openings on the route, and outdoor temperature.

Currently available battery-electric truck TRUs utilize lead-acid or lithium-ion battery technology. Deep cycle lead-acid absorbed glass mat batteries are designed to discharge between 45 percent and 75 percent of their capacity, but they are heavy. Depending on the number needed, lead-acid batteries can create a payload impact and cause additional wear and tear on the truck. However, they are less expensive than advanced batteries, such as lithium-ion. Lithium-ion batteries are lighter, take up less space, and are lower maintenance. They are capable of high charge/discharge rates and have no memory effect if they are repeatedly only partially discharged before being recharged. Lithium-ion batteries also have a long life if managed properly. Lithium-ion batteries currently cost more than other battery chemistries, but can vary widely, depending on cell capacity, performance needed, and the number being produced.

Existing deployments of battery-electric truck TRUs use solar panels to extend the operating range of the TRU, in which the energy collected by the solar assist system is used to directly run the refrigeration system or refuel the batteries. In existing battery-electric truck TRU deployments, high-efficiency monocrystalline silicone solar photovoltaic (PV) cells are mounted on a flexible support foundation in modules so they can withstand road vibration and shock. These PV modules are mounted on top of the refrigerated truck van's roof to capture solar irradiation and collect the energy as direct current (DC) electricity using the photovoltaic effect. A solar charge controller is used to optimize the power coming from the PV cells and manage the electric power delivery to the on-board battery pack. A DC-to-alternate current (AC) inverter is part of the battery management system to convert DC power from the solar array and batteries to AC power for the refrigeration compressor, electronic controls, and condenser and evaporator fans. High-efficiency scroll compressors can be driven by DC inverter systems that vary the frequency to control compressor speed, which provides a more energy efficient, precise temperature control. Existing battery-electric truck TRUs need about 7kW of electric power input, which is the amount of power that the inverter needs to deliver from the battery (and solar panels if installed) with no optimization of the refrigeration system or insulated truck van. Figure IX-1 shows battery-electric truck TRUs with solar assist.

Figure IX-1. Battery-Electric Truck TRUs with Solar Assist

Most of the cooling capacity and power demand of a TRU is needed for a quick chill-down of the truck van prior to loading. Loads on the refrigeration system can also be heavier after each door opening on a multi-stop delivery route. The load on the refrigeration system to maintain the temperature set point after chill-down is much less and depends on the temperature set point, the amount and condition of the truck van insulation, ambient temperature, product being hauled, and other factors.

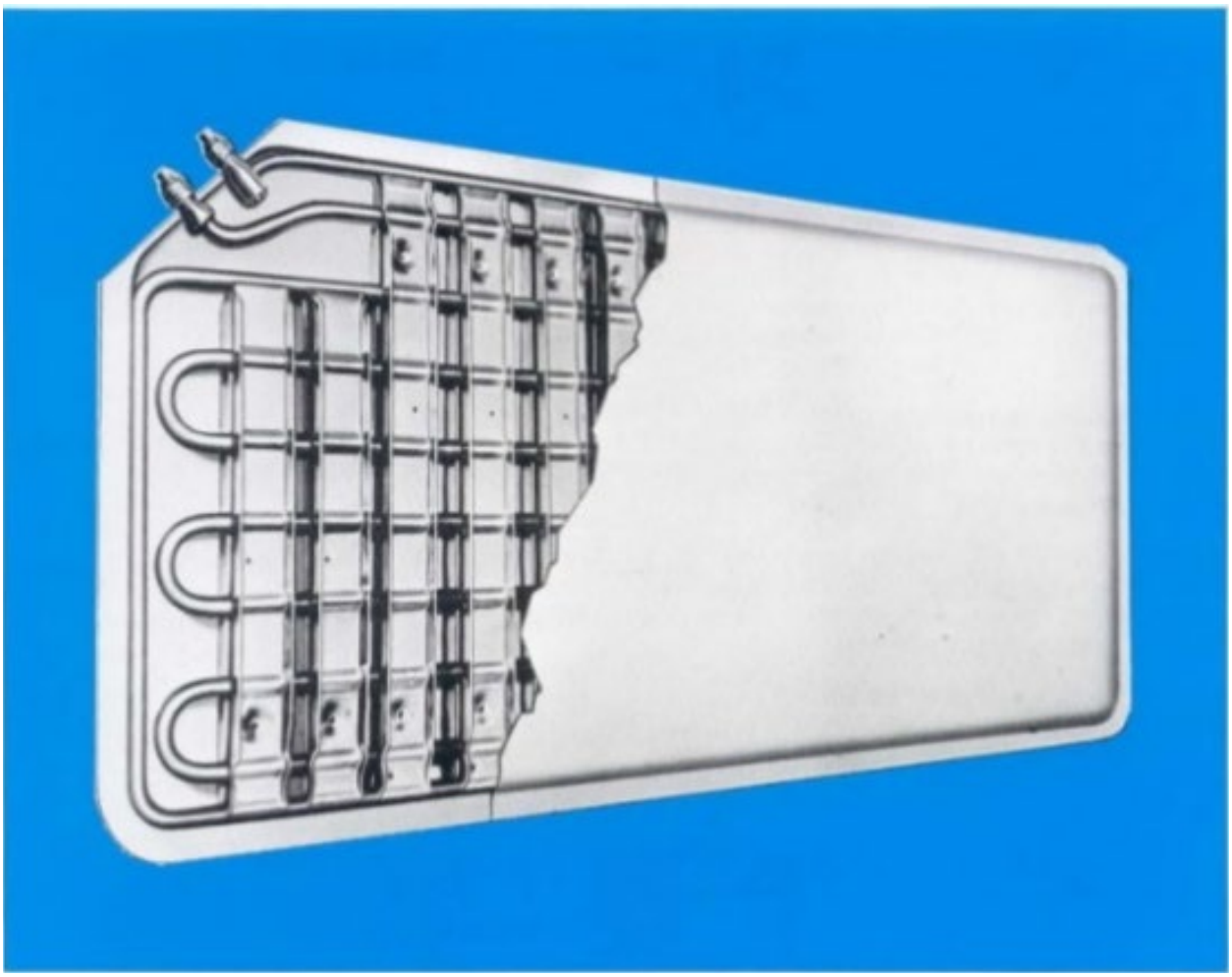
Battery-electric truck TRUs require supporting electrical infrastructure to recharge the batteries and run the TRU while stationary (e.g., to facilitate the initial pre-chill of the

truck van prior to loading and after loading, and to power the refrigerator while parked and waiting for dispatch). The most common infrastructure for a battery-electric truck TRU is a Level 2 electrical vehicle supply equipment (EVSE) that requires a 208- or 240-volt wall outlet and a J1772 connector.

b. Cold Plate Truck TRU

Cold plate truck TRU systems consist of a sheet metal shell, with cooling coils built inside to hold the eutectic fluid. The fluid used in cold plates is a mixture of water and salts (e.g., sodium and potassium salts) that form a eutectic solution that has the lowest possible melting/freezing point. Cold plates are similar to the gel packs used in lunch boxes and ice chests, but larger. Figure IX-2 shows a eutectic cold plate, in which the refrigeration unit's evaporator coils are built into a sheet metal shell. The refrigeration unit is plugged into electric power until the eutectic plates are frozen.

Figure IX-2. Cold Plate



Cold plate truck TRU systems provide refrigeration in the cargo area of the truck by absorbing the heat load coming through the walls, ceiling, floor, and doors and any heat generated by the load itself (e.g., from produce respiration). All of the eutectic salt mixture's constituents go through a phase change, from solid state to liquid state, simultaneously within the plates as they absorb the heat load. The plates are mounted on the ceiling and/or interior walls or as partitions of the cargo area. Some systems include fans and evaporator-blowers. The cold plate TRU system can offer single- or multi-temp applications. Once the cold plates are frozen and the product is loaded, the TRU is unplugged, and the truck begins the refrigerated deliveries. Figure IX-3 shows a cold plate system with blowers.

Figure IX-3. Cold Plates and Blowers

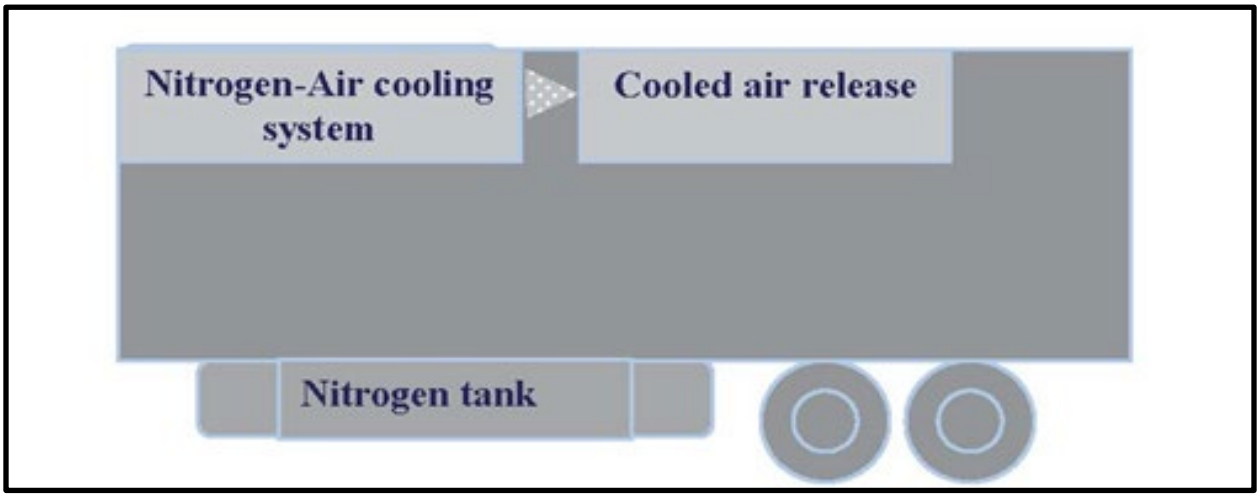
Once the cold plates are used, they must be refrozen by plugging into a single-phase or 3-phase electric power source. Cold plates are refrozen in-place in the cargo area, which requires 6 to 8 hours of stationary plug-in time. Similar to what was described in the previous section for battery-electric TRUs, Level 2 EVSE are the most common charging infrastructure for cold plate TRU systems. In addition to recharging (refreezing) the cold plates, the batteries can also be recharged while plugged into shore power.

c. Cryogenic Truck TRU

In cryogenic truck TRUs, a cryogenic fluid (liquid CO2 or liquid nitrogen) is the cooling agent, which replaces the diesel engine-driven refrigeration system utilized in a conventional TRU. Stored at temperatures below -150°F (-100°C), the cryogenic fluid is contained in a refillable storage tank on the truck near the cargo space. When cooling is needed by the microprocessor controller, valves open to allow the liquid to flow from the tank into the evaporator coils, also called a heat exchanger, inside the cargo space. Electric fans circulate air through the coils. As the liquid evaporates, it cools the coil and the air passing over it. As a result, cool air is circulated through the cargo

maintaining the temperature set-point. Having cooled the coil and the air, the gas is directed outside the vehicle body into the atmosphere. This is considered indirect cooling. Currently available cryogenic truck TRU applications utilize indirect cooling. In indirect cooling, the gas never enters the cargo space, and the load temperature and humidity are controlled by airflow. Figure IX-4 shows a depiction of indirect cryogenic cooling.

Figure IX-4. Indirect Cryogenic Cooling



The primary components of currently available cryogenic truck TRUs include the cryogenic storage tank, a heat exchanger to dispense the cryogenic fuel and transfer cooling, and fans to circulate air. In addition, controllers and flow regulators are needed to meter the dispensing of the cryogenic fluid to properly control the desired temperature. Often, electronic sensors and controllers are used to ensure desired temperatures are maintained and safety systems are robust. The cryogenic truck TRU has fewer moving parts than a conventional diesel-powered truck TRU, as it does not require an engine or compressor. Some of the equipment is exposed to cryogenic liquids, so the materials must be compatible with very cold temperatures.

Existing cryogenic truck TRUs use either liquid CO2 or liquid nitrogen. Liquid CO2 is collected as a byproduct from petroleum refining. The refueling infrastructure consists of a bulk storage tank and a dispenser with a liquid nitrogen fill pipe. Dispensers can be gravity or pump fill. The gravity dispensers can be very slow to fill dependent on the temperature and pressure differentials between the dispensing tank and the receiving tank. Dispensers can be configured to fill a single tank or multiple tanks, as needed.

2. ZE Truck TRU Technology Performance

Staff determined that each of the currently available ZE truck TRU technologies are capable of meeting the following performance parameters.

Ability to Perform the Duty Cycle

TRUs must be capable of maintaining the optimum "set point" temperature to ensure product integrity and providing fast "pull-down" (pre-cool) to prepare the cargo space for loading (typically in under 30 minutes), and to recover quickly from door openings that occur during deliveries. Straight truck TRUs are rated at 5,000 to 33,000 British Thermal Units per hour cooling capacity depending on the thermostat set point. Most transport refrigeration applications demand high-performance cooling capacity and airflow. Delivery routes using truck TRUs often require doors to be opened frequently. Rapid cool-down after each delivery stop is required and the additional fan load and evaporator load for multiple cooling zones in a truck also adds to the power demand on the engine.

Operating Range

For TRUs, operating range is the number of hours of operation between refueling. Truck TRUs are generally used for local and regional delivery in grocery and foodservice distribution. Typically, drivers of TRU-equipped trucks deliver to a number of customers along a route, such as to convenience stores, restaurants, and cafeterias. Truck TRUs generally require a minimum of 8 to 10 hours of daily operation between refueling, depending on factors specific to each operation, including the length of the route, product being transported, temperature of the load, number of door openings on the route, and outdoor temperature.

Payload Impacts

Maximizing the payload carrying capacity for a refrigerated truck generally improves the economics of transport operations. Space and weight payload capacity can be reduced by heavy temperature control technologies. Reducing payload capacity has a negative impact on potential revenue and the rate of return for the equipment. In addition, reducing cargo space may result in more loads/trips and increased environmental impacts.

Infrastructure Availability

According to the statewide TRU emission inventory, truck TRUs operating in the State are almost entirely California-based. Truck TRUs are generally used for local and regional delivery, and return to a home base each night. Based on their daily operational characteristics and operating range of current technologies, TRUs installed on trucks are well suited for ZE, because they would not require additional refueling or recharging infrastructure outside their home terminals or distribution centers before dispatch.

a. Battery-Electric Truck TRU

Battery-electric truck TRUs achieve the key performance parameters required for transport refrigeration with the ability to perform their duty cycles by maintaining optimum set point temperature and providing fast pre-cool of the cargo area.

Current battery-electric truck TRUs achieve the necessary operating range of 8 to 10 hours per day with batteries ranging in size from 10 to 60 kilowatt hours (kWh). A 40 kWh battery can handle a medium to frozen temperature load for an 8-to-12-hour route, depending on depending on factors specific to each operation. With solar assist, operating range is increased by 1 to 2 hours per day.

These systems have minimal impact on the payload capacity because the addition of batteries and solar panels is offset by the removal of the diesel engine.

It is expected that truck TRU owners would install infrastructure at their home terminals or distribution centers, enabling battery-electric truck TRUs to recharge their batteries at night or before dispatch. In addition, battery-electric truck TRUs may utilize Level 2 EVSE already installed and operational throughout California to support light-duty and medium-duty vehicles. As of May 2021, approximately 27,000 Level 2 charging outlets are located at over 13,000 stations statewide.[84]

b. Cold Plate Truck TRU

Cold plate truck TRU systems achieve the key performance parameters required for transport refrigeration and have the ability to perform their duty cycles by maintaining optimum set point temperature and providing fast pre-cool of the cargo area.

Current cold plate truck TRU systems are capable of providing cooling for daily runs of 10 to 12 hours.

Cold plate truck TRU systems have minimal impact on the payload capacity because the weight of the cold plates and batteries is offset by the removal of the diesel engine.

Similar to battery-electric truck TRU owners, it is expected that cold plate truck TRU owners would install infrastructure at their home terminals or distribution centers to recharge at night or prior to dispatch. Cold plate TRUs may also utilize the Level 2 EVSE operational at charging stations across the State.

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[84] U.S. Department of Energy, Energy Efficiency and Renewable Energy Alternative Fuels Data Center, Alternative Fueling Station Counts by State. (web link: https://afdc.energy.gov/stations/states, last accessed May 12, 2021).

c. Cryogenic Truck TRU

Cryogenic truck TRU systems achieve the key performance parameters required for transport refrigeration by maintaining optimum set point temperature, providing fast pre-cool of the cargo area, and faster set point temperature recovery after door openings. Ventilation fans can be used to begin the pre-cool process without the need of any fuel usage.

Current cryogenic truck TRU systems for truck applications achieve the necessary operating range of 8 to 10 hours per day required for foodservice and grocery distribution. With solar assist, operating range can be increased 1 to 2 hours a day.

Cryogenic truck TRU systems have minimal impact on the payload capacity of the TRU because the weight of the cooling system and nitrogen tanks is offset by the removal of the diesel engine.

The infrastructure required for cryogenic truck TRU systems includes the installation of a liquid CO2 or liquid nitrogen fueling station. Public access to liquid CO2 and liquid nitrogen fueling is limited. Liquid nitrogen is produced in air separation units and there are approximately 40 air separation units in California concentrated around densely populated regions such as Southern and Northern California.[85] It is expected that cryogenic truck TRU owners would install infrastructure at their home terminals or distribution centers to refuel at night or prior to dispatch. For larger fleets, complete detailed construction site plans for installation of fueling stations are available from cryogenic suppliers. Liquid nitrogen tank leasing options are available for smaller fleets.

3. ZE Truck TRU Technology Availability

a. Battery-Electric Truck TRU

As of January 2021, both of the two major TRU manufacturers do not have a commercially available ZE truck TRU. However, both manufacturers have indicated to staff that they are currently developing and intend to have a battery-electric truck TRU available in time to meet the ZE truck TRU implementation dates in the Proposed Amendments. Demonstration products are anticipated for 2021 with limited sales beginning in 2022.[86] In addition, there are two small-scale manufacturers with battery-electric truck TRUs available in the United States: Volta Air and eNOW.

[85] Presentation by Cold Clean Power to CARB, "Overview for CARB," March 2021.
[86] Claimed confidential data obtained from an industry source that requested non-attribution.

b. Cold Plate Truck TRU

Cold plate truck TRUs are fully commercialized, having been in use for over 50 years, and their designs have improved over the years along with the refrigeration system. Both Dole Refrigerating Company and Great Dane Johnson (formerly Johnson Truck Bodies) offer cold plate systems in the United States. The current market share for truck refrigeration is about 20 percent cold plates and 80 percent mechanical or diesel-powered.[87]

c. Cryogenic Truck TRU

Cryogenic truck TRU technologies are commercially available in Europe. Thermo King produces the CryoTech indirect liquid CO2 (using R-744 refrigerant) system as the CT-10 Spectrum multi-temp truck unit and the CT-10 single temp truck unit.[88] In the United States, Cold Clean Power (formerly Dearman Engine Company) plans to begin marketing their cryogenic truck TRU in late 2021.

4. ZE Truck TRU Technology Deployment

a. Battery-Electric Truck TRU

As of January 2021, there are two small-scale manufacturers with battery-electric truck TRUs in operation in California. D&D Wholesale operates three ZE Volta Air truck TRUs. Volta Air has a total of 20 fully battery-electric truck TRUs in operation in the United States and another 30–35 in operation in Canada. eNOW also has one ZE truck TRU in operation in California.

b. Cold Plate Truck TRU

In the United States, the majority of cold plates are produced by Dole Refrigerating Company. They have over 100 standard cold plate sizes plus numerous made-to-order custom-sized cold plates. About 500 new refrigerated trucks per year are produced with cold plate refrigeration systems.[89]

c. Cryogenic Truck TRU

As of January 2021, there are no cryogenic truck TRUs operating in the United States. However, there is one Cold Clean Power cryogenic truck TRU and over 500 Thermo King CryoTech truck units in operation in Europe.[90] Cold Clean Power anticipates

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[87] Phone conversation between Great Dane Johnson staff and Renee Coad (CARB) dated January 2020.
[88] Thermo King, CryoTech Brochure, 2020. (web link: https://europe.thermoking.com/wp-content/uploads/2019/07/TK80.22_CryoTech-08-2020-EN_V1.0.pdf)
[89] Phone conversation between Great Dane Johnson staff and Renee Coad (CARB) dated January 2020.
[90] Phone conversation between Thermo King staff and Lea Yamashita (CARB) dated May 14, 2021.

being able to produce approximately 1,500 cryogenic truck TRUs in the United States beginning in 2022 and ramp up each year to meet market demands.[91]

5. ZE Truck TRU Technology Cost

Staff determined the total cost of ownership for a ZE truck TRU compared to a conventional diesel-powered truck TRU. ZE truck TRUs have higher upfront costs than diesel-powered truck TRUs, but their maintenance costs provide cost savings over the useful lifetime. In addition to the operational savings attributable to ZE TRUs, owners may generate Low Carbon Fuel Standard (LCFS) credit revenue. Credits are generated by the purchase and/or usage of electricity, hydrogen, or other low carbon fuels to displace internal combustion fuel, such as diesel fuel. The credits have a monetary value when sold to regulated parties who must offset deficits created by their supply of fuels with carbon intensities that exceed the LCFS standards. Table IX-1 shows the cost of ownership for a ZE truck TRU compared to a diesel-powered truck TRU.

Table IX-1. Cost of Ownership for ZE and Diesel-Powered Truck TRUs

	Diesel-Powered Truck TRU	Battery-Electric Truck TRU	Cold Plate Truck TRU	Indirect Cryogenic Truck TRU
Capital Equipment Cost	$19,300	$44,600	$23,000	$45,000
Capital Infrastructure Cost (includes installation)	n/a	$4,887	$4,887	$0[92]
Annual Fuel Cost	$1,780[93]	$2,550[94]	$2,550	$6,120
Annual Equipment Maintenance Cost	$1,290	$680	$680	$900
Annual Infrastructure Maintenance Cost	n/a	$93	$93	$200
Annual LCFS Credit	n/a	(-$2,000)[95]	(-$2,000)	n/a
Total Cost of Ownership[96]	$52,550	$69,260	$44,800	$123,150

[91] Email from Brett Gipe (Cold Clean Power) to Lea Yamashita (CARB) dated January 15, 2021.
[92] Assumes liquid nitrogen fuel available onsite. Capital cost of $120,000 - $180,000 for tank with 20 unit capacity. Lease options available for approximately $3,000 per month.
[93] Assumes 1,360 annual operating hours, fuel consumption rate of $0.55 gallons per hour, and 2023 diesel price of $2.38 per gallon. See Appendix B for more information.
[94] Assumes 40 kWh battery size, 312 operating days, and 2023 electricity price of $0.19 per kWh. See Appendix B for more information.
[95] Assumes 2023 LCFS credit price of $0.16 per kWh. See Appendix B for more information.
[96] Assumes 10 year useful life. Capital costs amortized over a five year period at 5 percent interest.

6. ZE Truck TRU Technology in Development

a. Fuel Cell Truck TRU

Hydrogen (H2) proton-exchange membrane (PEM) fuel cells are devices that convert H2 and oxygen to water, creating electricity and some heat in the process. Compressed H2 molecules enter the cell on the anode side of the fuel cell, get distributed across the membrane surface and catalytically dissociated, releasing the electrons, which are conducted out through the anode to the load, shown here as a light bulb. The hydrogen ions (protons) diffuse through the proton exchange membrane to the cathode side of the fuel cell. Air enters the cathode side of the fuel cell as oxygen molecules are dispersed across the membrane surface.

The electrons return from load through the cathode to a catalytic surface, where they recombine with hydrogen ions and oxygen to form water. The water serves as the electrolyte hydrating the membrane to keep it functional and stable. Some heat is created in the process, but all of this typically occurs at 60 to 80 °C (140 to 180 °F).

A number of fuel cells are stacked together to form the fuel cell stack, which is the primary energy system. As more fuel cells are stacked together, the power capacity of the stack increases. The power needed for the initial chill-down of the truck van typically determines the peak power capacity for the TRU.

Fuel cell components include energy storage (batteries may be used to provide power in excess of nominal power during peak loads), filters, flow meters, an air compressor, air humidifier, a DC-to-AC inverter, a DC-to-DC converter, cooling system for the stack, batteries, and DC-to-DC converter (e.g., coolant pump, intercooler, radiators, and fans), protective devices, sensors, an electronic control unit, system controller, cables, and connectors. An on-board H2 storage tank rated for high pressure and sized to provide adequate range is also necessary,

Fuel cell TRU systems achieve the key performance parameters required for transport refrigeration with the ability to perform their duty cycles by maintaining optimum set point temperature and providing fast pre-cool of the cargo area. These systems have lowered payload impacts without the use of a diesel engine, but this technology has payload impacts due to on-board fuel storage. The addition of batteries and solar panels to increase range may also have payload impacts.

The H2 infrastructure required for this technology has limited public availability. There are approximately 30 H2 fueling stations located throughout California with concentrations in Southern California, the Bay Area, and some stations in the Sacramento region.

Fuel cell TRUs have been demonstrated. However, the high cost of the technology and limited availability of H2 infrastructure need to be addressed prior to market acceptance.

B. Proposed Requirement: PM Emission Standard

The Proposed Amendments require newly-manufactured (MY 2023 and newer) trailer TRU, DSC TRU, railcar TRU, and TRU gen set engines to meet a PM emission standard of 0.02 g/hp-hr or lower. In-use (MY 2022 and older) engines would continue to operate under the current regulatory requirements, in which they are required to meet ULETRU by December 31 of the seventh year after the engine MY.

1. Description of PM Emission Standard Technology

MY 2013 and newer TRU engines in the 25 to less than 50 horsepower category are certified to the U.S. EPA Tier 4 final off-road engine standards and meet the 0.02 g/hp-hr standard.

2. PM Emission Standard Technology Availability

Both Carrier and Thermo King have commercially-available TRUs with engines certified to meet the PM standard.

3. PM Emission Standard Technology Deployment

As of November 2020, over 44,000 trailer TRUs, DSC TRUs, railcar TRUs, and TRU gen sets are registered in ARBER that are equipped with a certified engine that meets the PM standard. Table IX-2 shows the number of TRUs equipped with a certified engine that meets the PM standard by manufacturer.

Table IX-2. Number of TRUs Equipped with a Certified Engine that Meets PM Standard (as of November 2020)

TRU OEM	Number of Registered TRUs Equipped with a Certified Engine that Meets PM Standard
Carrier	270
Thermo King	43,880
Other	10
Total	44,160

4. PM Emission Standard Technology Cost

The estimated cost of a TRU equipped with an engine certified to meet the PM standard is based on the average cost of commercially available single-temperature and multi-temperature units with greater than 25 horsepower engines, as shown in Table IX-3.

Table IX-3. Capital Cost of TRU Equipped with a Certified Engine that Meets PM Standard

Equipment Type	Cost (per Unit)
Diesel Trailer TRU/DSC TRU/Railcar TRU	$28,390
TRU Generator Set	$19,900

C. Proposed Requirement: Lower-GWP Refrigerant

The Proposed Amendments require newly-manufactured truck TRUs, trailer TRUs, and DSC TRUs that operate in California to use a refrigerant with a GWP value less than or equal to 2,200, or use no refrigerant at all.

1. Description of Available Refrigerant Technology

In the United States, the predominant refrigerant used in TRUs is R-404A. Despite being non-ozone-depleting, R-404A has a high-GWP value of 3,922, which is above the proposed threshold of 2,200. R-452A is a hydrofluoroolefin-based replacement for R-404A. Like R-404A, R-452A is non-ozone depleting, but has a lower-GWP of 2,140 and meets the proposed threshold. It can be used in new transport refrigeration equipment and for the retrofit of existing systems. R-452A is a "design-compatible" replacement for R-404A because it offers similar levels of refrigeration performance, fuel efficiency, reliability, and refrigerant charge.[97] U.S. EPA approved R-452A for use in transport refrigeration applications in 2017.[98]

2. Refrigerant Technology Availability

TRUs in Europe have been using R-452A since 2015, as a result of the European Union F Gas Regulation requiring the phase down in the use of HFCs.[99] In the United States, both of the two major TRU manufacturers offer R-452A as an option for truck TRUs, trailer TRUs, and DSC TRUs.

3. Refrigerant Technology Deployment

TRUs using R-452A refrigerant are commercially available from both of the two major TRU manufacturers. However, very few units in the United States use R-452A, because it is higher in cost compared to R-404A and its use is unregulated. As of

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[97] Refrigerated Transporter, "Carrier Transicold will offer R-452A for reefer transport," July 28, 2017. (web link: https://www.refrigeratedtransporter.com/going-green/article/21721031/carrier-transicold-will-offer-r452a-for-reefer-transport)
[98] United States Environmental Protection Agency, Federal Register, Vol. 82, No. 139, Page 33823, July 21, 2017. (web link: https://www.govinfo.gov/content/pkg/FR-2017-07-21/pdf/2017-15379.pdf)
[99] European Commission, "EU legislation to control F-gases." (web link: https://ec.europa.eu/clima/policies/f-gas/legislation_en, last accessed March 1, 2021)

November 2020, there are approximately 100 units in the United States that use R-452A. In Europe, nearly all of the TRUs use R-452A and all of the units coming from Europe that operate in the United States (approximately 3,000 units) use R-452A.[100]

4. Refrigerant Technology Cost

R-452A is a "design-compatible" replacement for R-404A and offers similar levels of refrigeration performance, fuel efficiency, and refrigerant charge. Therefore, the only cost consideration is the higher cost of R-452A refrigerant compared to R-404A refrigerant. The refrigerant capital cost is the amount of refrigerant used (charge size) multiplied by the per-pound cost of the refrigerant. Based on manufacturer specifications for commercially-available truck TRUs, trailer TRUs, and DSC TRUs from the two major TRU manufacturers, staff used a refrigerant capacity of 6.5 pounds[101,102] for truck TRUs and 16 pounds[103,104] for trailer TRUs and DSC TRUs. Staff estimated the average initial charge with R-452A would cost $38 more for a truck TRU and $100 more for a trailer TRU or DSC TRU, as compared with an initial charge with R-404A. Table IX-4 shows the capital cost comparison between R-45A and R-404A.

Table IX-4. Refrigerant Capital Costs (2019$)

Equipment Type	Baseline Cost (R-404A)	Proposed Cost (R-452A)	Incremental Cost (Proposed Cost – Baseline Cost)
Truck TRU	$25	$64	$38
Trailer TRU and DSC TRU	$66	$166	$100

A TRU may need recharging to restore its nominal charge amount throughout its useful life. Table IX-5 shows the maintenance cost comparison between R-452A and R-404A refrigerant. Staff calculated refrigerant maintenance costs based on an assumed leak rate of 15 percent per year[105] (for all refrigerants) and the refrigerant capacity for truck TRUs, trailer TRUs, and DSC TRUs discussed previously. Based on

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[100] Claimed confidential data obtained from an industry source that requested non-attribution.
[101] Carrier Transicold, Supra S8 Performance Specifications, December 2020. (web link: https://www.shareddocs.com/hvac/docs/2000/Public/05/62-12105.pdf)
[102] Thermo King, T-690 and T-690 Max Specifications, February 2020. (web link: https://2v0usj4e6l6t2qrqk1maqr81-wpengine.netdna-ssl.com/wp-content/uploads/2019/12/T-690-Spec-Sheet.pdf)
[103] Carrier Transicold, X4 7300 Performance Specifications, February 6, 2020. (web link: https://www.shareddocs.com/hvac/docs/2000/Public/0C/62-11663.pdf)
[104] Thermo King, Precedent S-610DE Specification Sheet, April 2017. (web link: https://2v0usj4e6l6t2qrqk1maqr81-wpengine.netdna-ssl.com/wp-content/uploads/2015/04/2020-Precedent-S-610DE-Spec-Sheet.pdf)
[105] California Air Resources Board, California's High Global Warming Potential Gases Emission Inventory Methodology and Technical Support Document, April 2016. (web link: https://ww3.arb.ca.gov/cc/inventory/slcp/doc/hfc_inventory_tsd_20160411.pdf)

conversations with industry stakeholders, staff expect that as R-404A is phased out and R-452A becomes the predominant refrigerant in response to the Proposed Amendments, the cost of R-452A will decrease.

Table IX-5. Refrigerant Maintenance Costs (2019$)

Equipment Type	Baseline Cost (R-404A)	Proposed Cost (R-452A)	Incremental Cost (Proposed Cost – Baseline Cost)
Truck TRU	$6	$14	$8
Trailer TRU and DSC TRU	$14	$35	$19

5. Refrigerant Technology under Development

U.S. EPA approved R-744 for use in transport refrigeration applications in 2014.[106] R-744 is refrigerant-grade CO2, used as a replacement for R-404A in ultra-low, low, and medium temperature refrigeration applications. CO2 refrigerant has a GWP of 1, roughly 2,000 times lower than R-452A and 4,000 times lower than R-404A. It is also non-flammable, non-ozone-depleting, globally available, and cost-effective.

A challenge with the application of CO2 as a refrigerant is the higher operating pressures compared to other commercial refrigerants. As a result, system components, tools, and equipment must be rated to safely operate at these higher pressures.

Carrier has successfully applied CO2 refrigerant in stationary commercial refrigeration systems widely used throughout Europe, including NaturaLINE container refrigeration systems used by container shipping lines and prototype trailer refrigeration trials with two European supermarket chains.[107] In Europe, Thermo King offers the CryoTech indirect liquid CO2 (using R-744 refrigerant) system as the CT-15 Spectrum multi-temp trailer unit, CT-15 single-temp trailer unit, CT-10 Spectrum multi-temp truck unit, and the CT-10 single temp truck unit.[108] The application of CO2 as a refrigerant in the United States is still under development.

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[106] United States Environmental Protection Agency, Federal Register, Vol. 79, No. 203, October 21, 2014. (web link: https://www.govinfo.gov/content/pkg/FR-2014-10-21/pdf/2014-24989.pdf)
[107] Freight Waves, "Carrier Transicold reefer unit uses CO2 as refrigerant," October 9, 2013. (web link: https://www.freightwaves.com/news/carrier-transicold-reefer-unit-uses-co2-as-refrigerant)
[108] Thermo King, CryoTech Brochure, 2020. (web link: https://europe.thermoking.com/wp-content/uploads/2019/07/TK80.22_CryoTech-08-2020-EN_V1.0.pdf)

X. Standardized Regulatory Impact Analysis

Government Code sections 11346.2(b)(2) and 11346.3(c) require the preparation of a SRIA for a major regulation as defined by DOF regulations. The Proposed Amendments are a major regulation requiring a SRIA because the economic impact of the regulation is projected to exceed $50 million in a 12-month period. This chapter summarizes the economic impact of the Proposed Amendments as presented in the SRIA, which can be found in Appendix B, as well as on the DOF website. CARB responses to comments received from DOF can be found in Appendix C.

A. Direct Costs

The total net cost of the Proposed Amendments from 2022 to 2034 is estimated to be $1.04 billion. Direct costs include capital costs for ZE truck TRUs and supporting infrastructure, new TRUs equipped with engines certified to meet the PM standard, lower-GWP refrigerant, TRU refrigerant maintenance costs, truck TRU infrastructure maintenance costs, electricity usage, CARB fees, and administrative costs for registration and reporting. Cost savings include truck TRU capital costs, truck TRU maintenance cost savings, truck TRU diesel fuel savings, and LCFS credit revenue. Aside from LCFS credit revenue, the cost analysis does not include incentive funding. The actual cost of the Proposed Amendments may be lower if TRU owners take advantage of existing funding programs.

1. Changes Made since the SRIA

The Proposed Amendments have been updated since the release of the SRIA on May 12, 2021. These changes include increasing the number of CARB staff needed to implement and enforce the Proposed Amendments and updating the salary amount used for the Staff Services Manager I position. These changes resulted in an increase of proposed TRU operating and applicable facility operating fees. In the SRIA, the TRU operating fee for a diesel TRU was $43, the TRU operating fee for a ZE TRU was $22, and the applicable facility registration fee was $43. In the updated proposal, the TRU operating fee for a diesel TRU is $54, the TRU operating fee for a ZE TRU s $27, and the applicable facility registration fee is $54.

Staff also updated the economic analysis to account for sales taxes on the capital cost of truck TRU charging infrastructure and additional costs to CARB, including the indirect labor cost for new CARB staff and operational costs (e.g., compliance labels, envelopes, and postage). As a result of these changes, the net cost of the Proposed Amendments from 2022 to 2034 is estimated to be $1.04 billion (previously $1.03 billion).

2. Cost Inputs

a. TRU Populations, New Sales, and TRU Activity

The Proposed Amendments include different requirements and associated costs for each TRU type. Staff divided the affected TRU population into five categories for the economic analysis, including truck TRUs, trailer TRUs, DSC TRUs, railcar TRUs, and TRU gen sets. All estimates for annual TRU populations, new sales, and TRU activity are from the statewide TRU emission inventory. The data sources and methodology used in the statewide TRU emission inventory are described in Appendix H.

b. Applicable Facility Populations

The Proposed Amendments include refrigerated WHDCs with a building size of 20,000 square feet or greater, grocery stores with a building size of 15,000 square feet or greater, seaport facilities, and intermodal railyards. To determine the number of applicable facilities subject to the facility registration, registration fee, and reporting requirements in the Proposed Amendments, staff developed a refrigerated facility inventory based on datasets from various sources, including CARB, other State departments, contracted businesses, and online refrigerated business sites. More information on the applicable facilities included in the Proposed Amendments is provided in Appendix F.

Staff estimated the statewide number of applicable facilities subject to the Proposed Amendments by determining the number of facilities above the proposed size threshold for each facility type in the refrigerated facility inventory. Table X-1 provides the estimated statewide applicable facility population by type in 2020. Staff applied a 1.6 percent annual growth rate in future years, which is equal to the TRU growth rate used in the statewide TRU emission inventory.

Table X-1. Estimated Statewide Applicable Facility Population in 2020

Facility Type	Population
Refrigerated WHDC - (Building size greater than or equal to 20,000)	2,167
Grocery Store - (Building size greater than or equal to 15,000 square feet)	3,918
Seaport Facility (No size threshold)	25
Intermodal Railyard (No size threshold)	9
Total	6,119

c. Equipment Capital Costs to TRU Owners

i. ZE Truck TRU Purchases

The Proposed Amendments require TRU owners to transition a percentage of their truck TRU fleet to ZE technology each year starting in 2023. Truck TRU owners can comply with the Proposed Amendments using a combination of battery-electric, cold plate, solar, and cryogenic ZE technologies. It is difficult to predict TRU owners' future plans for complying with the Proposed Amendments, especially as battery technologies improve and costs continue to decline. Although cold plate units are less expensive, staff assumed TRU owners would comply with the ZE truck TRU requirement by purchasing battery-electric truck TRUs. This is based on stakeholder input,[109] and that many products require TRUs to both heat and cool in order to maintain a stable temperature while controlling humidity and promoting adequate airflow, which other technologies are not capable of.

Staff estimated the cost of a battery-electric truck TRU by adding electric component, energy storage, and additional labor costs to a conventional diesel-powered TRU. The battery cost is the largest contributing factor associated with the price of a battery-electric TRU. Straight truck box lengths vary between 12 and 28 feet. The required size of the battery is dependent on the size of the truck, as well as other factors specific to each operation, including the length of the route, product being transported, temperature of the load, number of door openings on the route, and outdoor temperature.

The current average battery capacity for light-duty electric vehicles is 45 kWh,[110] which is comparable in size to current offerings of battery-electric truck TRUs ranging in size from 10 to 60 kWh. Therefore, staff used current price projections for light-duty batteries.[111] Staff derived costs for the remaining components, such as the battery management system, power system, controllers, and labor from cost estimates from a small-scale manufacturer of battery-electric TRUs.

The total cost of a battery-electric truck TRU (based on battery costs in 2023) ranges from $35,600 to $50,600 depending on the battery size, compared to the average cost of a diesel-powered truck TRU, which ranges from $17,700 to $21,000.[112] For this analysis, staff used the cost of a battery-electric truck TRU with a median battery size of 40 kWh. Estimated battery size is based on the current offerings of battery-electric

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[109] Stakeholder comments during TRU Infrastructure Work Group Meeting on December 17, 2019.
[110] Statista, "Estimated average battery capacity in electric vehicles worldwide from 2017 to 2025, by type of vehicle," February 25, 2021. (web link: https://www.statista.com/statistics/309584/battery-capacity-estimates-for-electric-vehicles-worldwide/)
[111] Bloomberg, "QuickTake Better Batteries," October 2019. (web link: https://www.bloomberg.com/quicktake/batteries)
[112] Claimed confidential data obtained from industry sources that requested non-attribution.

truck TRUs, which use batteries ranging in size from 10 to 60 kWh capable of handling an 8-to-12-hour route, depending on operational needs.[113] Staff determined that this operating range was sufficient for truck TRUs because they are generally used only for local and regional operations.

Staff amortized the capital cost of new ZE truck TRU purchases over a period of 5 years at an interest rate of 5 percent. The amortized costs result in a level cost incurred for every year until the capital cost of the TRU is fully paid and also reflect normal purchasing patterns in which businesses generally do not pay the total capital cost up front. The 5 percent interest rate reflects the rate of return on an inflation-adjusted 10-year treasury security (about 2 percent in the past five years), plus the CalEPA recommended 3 percent risk premium.[114] Additionally, 5 percent is the average of what the United States Office of Management and Budget recommends (7 percent) and what U.S. EPA has used historically for regulatory analyses.[115] Staff used a 5-year timeframe to reflect approximately half the expected lifetime for a TRU.

ii. ZE Truck TRU Infrastructure

The Proposed Amendments do not include a specific infrastructure requirement. However, staff accounted for the capital cost of infrastructure needed to support operation of battery-electric truck TRUs purchased to comply with the ZE truck TRU requirement. Staff assumed truck TRU home base facility owners would install infrastructure on the same schedule as the truck TRUs transition to ZE technology, adding enough chargers to support the battery-electric truck TRU population each year beginning in 2023 to accommodate changing fleet sizes and minimize capital and maintenance costs for unused chargers.

The most common infrastructure for a battery-electric truck TRU is a vehicle charger or an EVSE at the Level 2 power level that requires a 208- or 240-volt wall outlet using a J1772 connector. Level 2 EVSE are already installed and operational throughout the State, primarily powering light- and medium-duty vehicles. As of May 2021, approximately 27,000 Level 2 charging outlets are located at over 13,000 stations statewide.[116] Additional stations are in the planning, design, and construction phase

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[113] Claimed confidential data obtained from an industry source that requested non-attribution.
[114] California Air Resources Board, Economic Evaluation Supplement, Climate Change Draft Scoping Plan Pursuant to AB 32 The California Global Warming Solutions Act of 2006, Appendix I: Modeling Assumptions for Economic Analysis of the Draft Scoping Plan, September 2008. (web link: https://ww3.arb.ca.gov/cc/scopingplan/document/economic_appendix1.pdf)
[115] United States Environmental Protection Agency, Guidelines for Preparing Economic Analyses, Chapter 6, December 2010. (web link: https://www.epa.gov/sites/production/files/2017-09/documents/ee-0568-06.pdf)
[116] U.S. Department of Energy, Energy Efficiency and Renewable Energy Alternative Fuels Data Center, Alternative Fueling Station Counts by State. (web link: https://afdc.energy.gov/stations/states, last accessed May 12 2021)

and will soon be operational as part of California's ZE Vehicle Action Plan.[117] However, as a conservative cost assumption and to ensure truck TRUs are sufficiently charged after their daily operations, staff assumed truck TRU owners would not rely on publicly accessible charging infrastructure. Staff assumed that truck TRU owners would install one single-port Level 2 charger per truck TRU at their home base facility. This would allow truck TRUs to complete their daily operations and return home to their home base facility to charge overnight. Nighttime charging at the home base facility during off-peak times would also avoid time-of-use electricity charges. Therefore, the number of chargers needed to support operation of the approximately 8,800 battery-electric truck TRUs that would be purchased to meet the ZE truck TRU requirements from 2022 to 2034 is 8,800.

Level 2 chargers have a variety of power outputs from 16 to 48 amps at 208- or 240-volts. The higher power output results in faster charging and meets the specifications of existing ZE truck TRUs. Level 2 chargers available on the market today have a variety of different features and power ratings resulting in cost variability. Given a lack of data on individual needs relative to power and wall or pedestal mounted chargers, all types of charging units are assumed available to truck TRU home base facility owners based on individual purchase decisions. The cost of a commercial Level 2 charger with a single port ranges from $608[118] to $2,004.[119] This includes the Level 2 charger, the necessary outlet, and power cord. For this analysis, staff used an average cost of $1,154 per charger, which represents the average of units with power output ranging from 7.2 to 11.5 kWh, as well as wall mount and pedestal installations.

Installation costs also vary due to site-specific factors, such as the existing electric panel capacity, installation location, and regional labor costs. Based on a report by the International Council on Clean Transportation (ICCT), per-charger costs decline as more chargers are installed. Level 2 charger installation costs range from $2,840 for more than six chargers to $4,150 for a single charger.[120] These costs are based on installations in Southern California and include labor, materials, permits, taxes, and utility upgrades, which may or may not include costs associated with the need to bring

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[117] California Governor's Office of Business and Economic Development, 2018 ZEV Action Plan Priorities Update, September 2018. (web link: https://static.business.ca.gov/wp-content/uploads/2019/12/2018-ZEV-Action-Plan-Priorities-Update.pdf)

[118] Clipper Creek, HCS-50, 40A, L2 EVSE, 240V, w/25 ft cable. (web link: https://store.clippercreek.com/hcs-50-hcs-50P-40-amp-ev-charging-station, last accessed January 29, 2021)

[119] EV Charge Solutions, PowerCharge P20SP Commercial EV Charger. (web link: https://www.evchargesolutions.com/PowerCharge-P20SP-Commercial-EV-Charger-p/p20sp.htm, last accessed January 29, 2021)

[120] The International Council on Clean Transportation, Estimating Electric Vehicle Charging Infrastructure Costs Across Major U.S. Metropolitan Areas, August 2019. (web link: https://theicct.org/sites/default/files/publications/ICCT_EV_Charging_Cost_20190813.pdf)

additional power to the site. As previously discussed, CARB staff assumed truck TRU infrastructure would be installed on the same schedule that truck TRUs are required to transition to ZE technology, adding enough chargers to accommodate the battery-electric truck TRU population each year. Based on the ZE truck TRU fleet percentages in the Proposed Amendments, only fleets with 10 or more truck TRUs require the purchase of more than one ZE truck TRU and multiple charger installations in a given year. According to ARBER, less than 8 percent of truck TRU fleets have more than 10 truck TRUs. Therefore, staff used the installation cost for a single charger. The ICCT report also recommends a 10 percent reduction for workplace charging, which is the most similar to the truck TRU application. Therefore, for this analysis, staff assumed an average installation cost of $3,733 per charger.

Staff annualized the purchase and installation costs for charging infrastructure at truck TRU home base facilities using the same methodology used for ZE truck TRU capital costs. Staff amortized infrastructure costs over a period of 5 years at an interest rate of 5 percent, to reflect approximately half the expected lifetime for charging equipment.[121]

iii. PM Emission Standard

The Proposed Amendments require MY 2023 and newer trailer TRU, DSC TRU, railcar TRU, and TRU gen set engines to meet a PM emission standard of 0.02 g/hp-hr or lower. MY 2013 and newer TRU engines in the greater than 25 horsepower category certified to the U.S. EPA Tier 4 final off-road engine standards meet the 0.02 g/hp-hr PM emission standard. The incremental capital cost for new TRUs equipped with an engine that meets the PM emission standard for each TRU category is shown in Table X-2.[122]

Table X-2. Trailer TRU, DSC TRU, Railcar TRU, and TRU Gen Set Capital Costs (2019$)

Equipment Type	Baseline Cost	Proposed Cost	Incremental Cost
Diesel Trailer TRU/DSC TRU/Railcar TRU	$25,530	$28,390	$2,860
TRU Gen Set	$17,300	$19,900	$2,600

Staff amortized the capital costs for new TRUs equipped with an engine that meets the PM emission standard over a period of 5 years at an interest rate of 5 percent using the same methodology used for truck TRU capital costs.

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[121] United States Department of Energy, Costs Associated with Non-Residential Electric Vehicle Supply Equipment, November 2015. (web link: https://afdc.energy.gov/files/u/publication/evse_cost_report_2015.pdf)
[122] Please see Appendix B for cost references.

iv. Lower-GWP Refrigerant

The Proposed Amendments require TRU OEMs and TRU dealers to manufacture and sell new truck TRUs, trailer TRUs, and DSC TRUs with lower-GWP refrigerant. Although staff assumed refrigerant costs would be passed on to TRU owners and reflected in a higher capital cost for compliant TRUs compared to what would have been purchased in the Baseline, refrigerant capital costs were analyzed separately.

The incremental cost to switch to lower-GWP refrigerants is due to the higher cost for alternative refrigerants to comply with the Proposed Amendments. Staff estimated that approximately 10 percent of new units currently use HFC-134a (GWP = 1,430). HFC-134a is generally used for medium low temperature applications and is not suitable for very low temperatures. HFC-134a would continue to be allowed under the Proposed Amendments because its GWP value is less than the proposed threshold of 2,200. Therefore, staff assumed that 10 percent of new units would continue to use HFC-134a.

The remaining 90 percent of new units currently use R-404A. For the purpose of this analysis, staff assumed this portion of the new units would switch to R-452A (GWP = 2,141) to comply with the Proposed Amendments, because it is a "design-compatible" replacement for R-404A, suitable for both very low and medium low temperatures, commercialized in the European markets and is already being offered as an optional alternative by manufacturers in the North American markets.[123,124] Staff estimated the average initial charge with R-452A would cost $38 more for a truck TRU and $100 more for a trailer TRU or DSC TRU as compared with an initial charge with R-404A. Table X-3 shows the refrigerant capital costs.[125]

Table X-3. Refrigerant Capital Costs (2019$)

Equipment Type	Baseline Cost	Proposed Cost	Incremental Cost
Truck TRU	$25	$64	$38
Trailer TRU and DSC TRU	$66	$166	$100

[123] Carrier Press Release, Carrier Transicold Strengthens Sustainability Initiatives with Lower GWP Refrigerant for North America Truck and Trailer Systems, December 15, 2020. (web link: https://www.carrier.com/truck-trailer/en/north-america/news/news-article/carrier_transicold_strengthens_sustainability_initiatives_with_lower_gwp_refrigerant_for_north_america_truck_and_trailer_systems.html)

[124] Fleet Owner, Thermo King offers products to help reduce emissions, July 28, 2017. (web link: https://www.fleetowner.com/running-green/emissions/article/21696418/thermo-king-offers-products-to-help-reduce-emissions)

[125] Please see Appendix B for cost references.

Staff amortized the refrigerant capital costs over a period of 5 years at an interest rate of 5 percent using the same methodology used for truck TRU capital costs.

v. Sales Tax

Sales tax is an additional cost levied on the purchase of TRUs and infrastructure. Sales tax varies across the State from a minimum of 7.25 percent up to 10.5 percent in some municipalities. Staff used a value of 8.6 percent, which is a weighted average based on county-level output.[126, 127] Staff applied the additional sales tax cost to the capital cost for TRUs based in California and truck TRU infrastructure. This results in higher costs for California-based owners and higher revenue for local and State government.

d. Maintenance and Operational Costs

i. TRU Maintenance Costs

TRU maintenance costs reflect the cost of labor and parts for routine maintenance, preventative maintenance, and repairing broken components. Maintenance costs for battery-electric truck TRUs are generally lower than diesel-powered TRUs in part due to fewer moving components. For truck TRUs, staff used an estimated maintenance cost of $0.95 per hour of operation for a diesel-powered TRU and $0.50 per hour of operation for a battery-electric truck TRU.[128] Staff calculated annual TRU maintenance costs by multiplying the TRU maintenance rate by the annual activity within California per TRU and the total TRU population per calendar year.

For trailer TRUs, DSC TRUs, railcar TRUs, and TRU gen sets, staff assumed the TRU maintenance costs would be the same in the Baseline and the Proposed Amendments because TRUs equipped with an engine that meets the proposed PM emission standard would incur the same maintenance cost as those equipped with engines that do not.

TRU refrigerant maintenance costs reflect the labor and material cost for a service technician to recharge the refrigerant in a TRU. Refrigerant maintenance costs are based on an assumed leak rate of 15 percent per year[129] (for all refrigerants) and the refrigerant capacity for truck TRUs, trailer TRUs, and DSC TRUs discussed previously.

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[126] County-level output derived from Regional Economic Models, Inc. (REMI) Policy Insight Plus Version 2.4.1. Output is defined as the amount of production, including all intermediate goods purchased as well as value added (compensation and profit). Can also be thought of as sales or supply. The components of Output are Self Supply and Exports (Multiregions, Rest of Nation, and Rest of World).
[127] California Department of Tax and Fee Administration, California City & County Sales & Use Tax Rates, October 2020. (web link: https://www.cdtfa.ca.gov/taxes-and-fees/sales-use-tax-rates.htm)
[128] Claimed confidential data obtained from industry sources that requested non-attribution.
[129] California Air Resources Board, California's High Global Warming Potential Gases Emission Inventory Methodology and Technical Support Document, April 2016. (web link: https://ww3.arb.ca.gov/cc/inventory/slcp/doc/hfc_inventory_tsd_20160411.pdf)

The estimated annual maintenance cost for R-404A refrigerant is $6 per truck TRU and $14 per trailer TRU and DSC TRU. Under the Proposed Amendments, newly-manufactured truck TRUs, trailer TRUs, and DSC TRUs would use the lower-GWP R-452A refrigerant, with an estimated annual maintenance cost of $14 per truck TRU and $35 per trailer TRU and DSC TRU.

ii. ZE Truck TRU Infrastructure Maintenance Costs

Level 2 charger maintenance costs include the cost to replace charger heads, connectors, and other components, as well as labor costs for regular inspections.[130] Annual maintenance costs are estimated to be $92.50 per unit.[131] Staff calculated maintenance costs by multiplying the annual maintenance cost by the number of chargers. These costs also incorporate a 1.6 percent annual industry growth rate (see Appendix H).

iii. Diesel Fuel and Electricity Costs

Staff calculated diesel fuel and electricity costs for truck TRUs by using total fuel used per year and the cost of fuel per unit. For diesel units, fuel consumption is rated in gallons per hour (gal/hr). Staff used a fuel consumption rate of 0.55 gal/hr for diesel-powered truck TRUs, which staff derived from the statewide TRU inventory model. Annual electricity usage is based on the truck TRU battery size, number of operating days, and the total ZE truck TRU population per calendar year. Electricity usage also accounts for a 10 percent battery charging loss factor.[132]

Staff used diesel fuel and electricity prices to 2031 from CEC's Transportation Energy Demand Forecast 2020 IEPR Update.[133] Staff took diesel price projections from the mid-case scenario in the 2020 IEPR update and electricity price projections from commercial electricity prices in the mid-case scenario in the 2020 IEPR update. The Energy Information Administration's (EIA) 2020 Annual Energy Outlook for the Pacific

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[130] California Air Resources Board, Standardized Regulatory Impact Assessment for the Advanced Clean Trucks Regulation, August 8, 2019. (web link: http://www.dof.ca.gov/Forecasting/Economics/Major_Regulations/Major_Regulations_Table/documents/SRIA-Advanced_Clean_Truck_080819_DOF.pdf)
[131] Avista Corp, Electric Vehicle Supply Equipment Pilot Final Report, October 18, 2019. (web link: https://smartenergycc.org/wp-content/uploads/2019/10/Avista-EVSE-Pilot-Project-Review.pdf)
[132] Eudy, Leslie, and Matthew Jeffers. Foothill Transit Battery Electric Bus Demonstration Results: Second Report, National Renewable Energy Laboratory, June 2017. (web link: https://www.nrel.gov/docs/fy17osti/67698.pdf)
[133] California Energy Commission, Transportation Energy Demand Forecast 2020 IEPR Update, December 3, 2020. (web link: https://efiling.energy.ca.gov/GetDocument.aspx?tn=235841&DocumentContentId=68785)

region was used to calculate fuel prices past 2031.[134] Staff applied the annual percentage change in EIA diesel fuel and electricity prices past 2031 to the 2031 CEC diesel and electricity prices to estimate price changes past 2031.

Staff adjusted the CEC diesel fuel prices because TRUs are considered to be off-road equipment and are not subject to certain taxes included in the CEC values. Staff subtracted the federal excise tax rate equal to $0.385 per gallon,[135] as well as State diesel tax and local district tax estimated to be 13 percent and 1.36 percent,[136] respectively. When used off-road, diesel is taxed at the combined statewide sales tax rate, plus applicable district taxes. Therefore, staff applied the combined State and local sales tax rate of 8.6 percent, which is a weighted average based on county-level output, with 3.94 percent[137] going towards State sales tax and 4.67 percent[138] going towards local sales tax. Table X-4 shows the diesel and electricity prices used for the economic analysis.

Table X-4. Diesel and Electricity Price Projections from 2022-2034 (2019$)

Year	Diesel Price per Gallon	Electricity Price per kWh
2022	$2.40	$0.19
2023	$2.38	$0.19
2024	$2.38	$0.19
2025	$2.35	$0.19
2026	$2.34	$0.20
2027	$2.28	$0.20
2028	$2.25	$0.20
2029	$2.19	$0.21
2030	$2.15	$0.21
2031	$2.15	$0.21
2032	$2.16	$0.21
2033	$2.20	$0.21
2034	$2.21	$0.21

[134] United States Energy Information Administration, Annual Energy Outlook 2020. (web link: https://www.eia.gov/outlooks/aeo/data/browser/#/?id=3-AEO2020&region=1-9&cases=ref2020&start=2018&end=2050&f=A&linechart=ref2020-d112119a.3-3-AEO2020.1-9&map=ref2020-d112119a.4-3-AEO2020.1-9&sourcekey=0%00, last accessed May 11, 2021)
[135] California Department of Tax and Fee Administration, Tax Rates for Motor Vehicles and Diesel Fuels, May 2020. (web link: https://cdtfa.ca.gov/formspubs/L739.pdf)
[136] California Department of Tax and Fee Administration, Sales Tax Rates for Fuels. (web link: https://www.cdtfa.ca.gov/taxes-and-fees/sales-tax-rates-for-fuels.htm, last accessed May 24, 2021)
[137] California Department of Tax and Fee Administration, Detailed Description of the Sales & Use Tax Rate. (web link: https://www.cdtfa.ca.gov/taxes-and-fees/sut-rates-description.htm, last accessed May 24, 2021)
[138] California Department of Tax and Fee Administration, California City & County Sales & Use Tax Rates, October 2020. (web link: https://www.cdtfa.ca.gov/taxes-and-fees/sales-use-tax-rates.htm)

Truck TRU owners would incur electricity costs beginning in 2024, but would incur diesel fuel cost savings from 2024–2032. For trailer TRUs, DSC TRUs, railcar TRUs, and TRU gen sets, staff assumed diesel fuel costs would be the same in the Baseline and the Proposed Amendments. The total truck TRU electricity costs are estimated to be $189.4 million from 2022–2034.

e. Administrative Costs

i. TRU Reporting Costs

The Proposed Amendments require TRU owners to report TRUs that operate in California to CARB beginning in 2023, regardless of the state they are based in. The current TRU ATCM requires that owners report California-based TRUs to CARB. Although a number of out-of-state fleets already voluntarily report to CARB, staff accounted for the costs associated with the time it would take to report out-of-state based TRUs because it is not currently a requirement in the TRU ATCM. Based on the amount of information TRU owners would be required to report, staff estimated that it would take on average 10 minutes to report each TRU at an estimated rate of $50 per hour for staffing and lost revenue from the employee assigned to pull and submit the information.

ii. Applicable Facility Registration Costs

The Proposed Amendments require applicable facility owners to register their facilities with CARB in 2023. Based on the amount of information facilities would be required to report, staff estimated that it would take on average one hour per facility to do this at a rate of $50 per hour for staffing and lost revenue from the employee assigned to pull and submit the information.

iii. CARB Fees

The Proposed Amendments include TRU operating fees and applicable facility registration fees. The proposed fees will result in revenue to the State to offset costs needed to implement and enforce the Proposed Amendments. More information on the proposed fees can be found in Appendix G.

Staff determined that compliance monitoring and enforcement activities related to ZE TRUs will be less resource intensive and therefore have a lower operating fee. Table X-5 shows the fee amounts under the Proposed Amendments.

Table X-5. Fee Amounts

Fee Type	Fee Amount (per TRU or Facility)
TRU Operating Fee, paid once every three years	$54
Applicable Facility Registration Fee, paid once every three years	$54
ZE TRU Operating Fee, paid once every three years	$27

iv. Applicable Facility Reporting Costs

The Proposed Amendments require applicable facility owners to ensure that TRUs operating on their property are compliant. Owners may choose one of the following options:

- Reporting Option 1: Report all TRUs that operate on applicable facility property to CARB.
- Reporting Option 2: Provide a declaration to CARB, under penalty of perjury, that non-compliant TRUs subject to this regulation will not be permitted to operate on applicable facility property.

The estimated cost to applicable facility owners to comply with the applicable facility reporting requirements can be found in Appendix B, Section C.1.g.iii.

v. Truck TRU Owner Extension Costs

Staff have worked closely with TRU OEMs and electric utilities to ensure the regulatory compliance dates and annual ZE truck TRU percentages required by the Proposed Amendments are feasible. Staff do not anticipate delays to the availability of ZE truck TRUs or the installation infrastructure needed to support ZE truck TRUs. However, to be conservative, staff quantified the costs that truck TRU owners would incur to apply for an extension. Truck TRU owners may apply for an extension if compliance technology is not available due to a TRU OEM delay or if infrastructure cannot be installed on time. Staff used historical data on the number of OEM related extension applications received for the current TRU ATCM to derive the TRU OEM extension estimate. To estimate the number of infrastructure related extensions, staff considered the number and location of truck TRU home base facilities, as well as the estimated number of truck TRUs and subsequent amount of infrastructure staff expect to be installed at each truck TRU home base facility. Based on this analysis, staff estimated that the number of truck TRU owners that may apply for an extension from 2022 to 2034 ranges from 0 to 75, depending on the year. This represents at most, approximately 7.5 percent of the total number of truck TRU owners. Staff estimated it will take on average 2 to 10 hours per truck TRU owner to apply for an extension depending on the type at rate of $100 per hour.

f. Cost Savings

i. ZE Truck TRU Capital Cost Savings

Truck TRU owners would see equipment capital cost savings beginning in 2032 because they would no longer need to take compliance action every seven years. As a result, the number of new truck TRU sales from 2032–2034 would be lower than in the Baseline.

ii. Truck TRU Maintenance Cost Savings

Maintenance costs for battery-electric truck TRUs are generally lower than diesel-powered TRUs due in part to fewer moving components. Staff used an estimated maintenance cost of $0.95 per hour of operation for a diesel-powered TRU and $0.50 per hour of operation for a battery-electric truck TRU.[139]

iii. Diesel Fuel Savings

As truck TRU owners transition their fleets to ZE, they will incur diesel cost savings.

iv. LCFS Credit Revenue

The LCFS Regulation reduces GHG emissions by requiring fuel producers to reduce the carbon intensity in fuel or purchase credits from those who supply low carbon fuel. The regulation incentivizes the use of low carbon fuels, including electricity, hydrogen, natural gas, and biofuels.[140] TRU owners who use electricity as a power source to charge their ZE truck TRUs can generate credits based on the amount of energy they use. Staff expect that all parties eligible to generate LCFS credits will take advantage of the incentive provided by LCFS. Staff calculated credit values for electricity using the LCFS Credit Price Calculator.[141]

g. Total Direct Costs and Cost Savings

Table X-6 shows the total direct costs of the Proposed Amendments from 2022 to 2034. Table X-7 shows the direct costs, cost savings, and total net cost of the Proposed Amendments from 2022 to 2034. Direct costs include capital costs for ZE truck TRUs and supporting infrastructure, new TRUs equipped with engines certified to meet the PM standard, lower-GWP refrigerant, TRU refrigerant maintenance costs,

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[139] Claimed confidential data obtained from industry sources that requested non-attribution.
[140] California Air Resources Board, Unofficial Electronic Version of the Low Carbon Fuel Standard Regulation, July 2020. (web link: https://ww2.arb.ca.gov/sites/default/files/2020-07/2020_lcfs_fro_oal-approved_unofficial_06302020.pdf)
[141] California Air Resources Board, LCFS Credit Price Calculator. (web link: https://www.arb.ca.gov/fuels/lcfs/dashboard/creditpricecalculator.xlsx, last accessed May 2021)

truck TRU infrastructure maintenance costs, electricity usage, CARB fees, and administrative costs for registration and reporting. Cost savings include truck TRU capital costs, truck TRU maintenance cost savings, truck TRU diesel fuel savings, and LCFS credit revenue.

Table X-6. Total Direct Costs of the Proposed Amendments from 2022 to 2034 (2019$)

Year	TRU Capital Costs	TRU Maintenance Costs	Infrastructure Capital Costs	Infrastructure Maintenance Costs	Truck TRU Electricity Costs	Administrative Costs	Total
2022	$0	$0	$0	$0	$0	$0	$0
2023	$17,700,000	$900,000	$1,100,000	$0	$0	$13,100,000	$32,800,000
2024	$36,500,000	$1,400,000	$2,500,000	$200,000	$2,400,000	$4,600,000	$47,600,000
2025	$54,700,000	$1,700,000	$3,700,000	$400,000	$5,700,000	$4,500,000	$70,700,000
2026	$81,800,000	$2,200,000	$5,500,000	$600,000	$8,600,000	$12,900,000	$111,600,000
2027	$114,700,000	$2,600,000	$7,100,000	$900,000	$13,100,000	$6,500,000	$144,900,000
2028	$118,900,000	$3,400,000	$7,400,000	$1,100,000	$17,000,000	$7,500,000	$155,300,000
2029	$117,000,000	$3,900,000	$6,800,000	$1,400,000	$20,800,000	$9,300,000	$159,200,000
2030	$108,600,000	$3,900,000	$5,800,000	$1,500,000	$23,300,000	$7,900,000	$151,000,000
2031	$91,300,000	$4,000,000	$4,100,000	$1,500,000	$24,200,000	$9,000,000	$134,100,000
2032	$72,300,000	$4,000,000	$2,700,000	$1,600,000	$24,500,000	$8,500,000	$113,600,000
2033	$72,900,000	$4,100,000	$1,500,000	$1,600,000	$24,900,000	$8,200,000	$113,200,000
2034	$75,300,000	$4,200,000	$800,000	$1,600,000	$25,300,000	$9,600,000	$116,800,000
Total	$961,700,000	$36,300,000	$49,000,000	$12,400,000	$189,800,000	$101,600,000	$1,350,800,000

Table X-7. Total Direct Costs, Cost Savings, and Net Cost of the Proposed Amendments from 2022 to 2034 (2019$)

Year	Total Costs	Truck TRU Capital Cost Savings	Truck TRU Diesel Fuel Cost Savings	Truck TRU Maintenance Cost Savings	LCFS Credit Revenue	Total Cost Savings	Total
2022	$0	$0	$0	$0	$0	$0	$0
2023	$32,800,000	$0	$0	$0	$0	$0	$32,800,000
2024	$47,600,000	$0	(-$600,000)	(-$1,700,000)	(-$1,900,000)	(-$4,200,000)	$43,400,000
2025	$70,700,000	$0	(-$1,300,000)	(-$3,800,000)	(-$4,100,000)	(-$9,200,000)	$61,500,000
2026	$111,600,000	$0	(-$1,900,000)	(-$5,600,000)	(-$6,000,000)	(-$13,500,000)	$98,100,000
2027	$144,900,000	$0	(-$2,900,000)	(-$8,200,000)	(-$9,000,000)	(-$20,100,000)	$124,800,000
2028	$155,300,000	$0	(-$3,700,000)	(-$10,300,000)	(-$10,700,000)	(-$24,700,000)	$130,600,000
2029	$159,200,000	$0	(-$4,400,000)	(-$12,100,000)	(-$12,900,000)	(-$29,400,000)	$129,800,000
2030	$151,000,000	$0	(-$4,900,000)	(-$13,100,000)	(-$14,200,000)	(-$32,200,000)	$118,800,000
2031	$134,100,000	$0	(-$5,000,000)	(-$13,200,000)	(-$14,100,000)	(-$32,300,000)	$101,800,000
2032	$113,600,000	(-$5,200,000)	(-$5,100,000)	(-$13,600,000)	(-$14,100,000)	(-$38,000,000)	$75,600,000
2033	$113,200,000	(-$16,900,000)	(-$5,100,000)	(-$14,000,000)	(-$14,000,000)	(-$50,000,000)	$63,200,000
2034	$116,800,000	(-$23,800,000)	(-$5,200,000)	(-$14,300,000)	(-$13,900,000)	(-$57,200,000)	$59,600,000
Total	$1,350,800,000	(-$45,900,000)	(-$40,100,000)	(-$109,900,000)	(-$114,900,000)	(-$310,800,000)	$1,040,000,000

3. Direct Costs on Businesses and Individuals

Staff calculated the cost for typical and small businesses owning truck TRUs and trailer TRUs to comply with the Proposed Amendments as compared to the Baseline. Costs to typical and small businesses owning applicable facilities can be found in Appendix B, Section C.2.b and Section C.3.b, respectively.

a. Direct Costs on Typical Businesses

i. Truck TRU Owner

For the purposes of the Proposed Amendments, typical businesses are defined as all affected establishments in the State that are not small businesses. Based on CARB's ARBER and Dun and Bradstreet[142] databases, the average number of truck TRUs owned by companies with more than 100 employees is 8. Therefore, to illustrate the costs to a typical business, staff considered an average fleet with eight truck TRUs. An owner of a fleet consisting of eight truck TRUs would be required to purchase ZE truck TRUs beginning in 2023, as shown in Table X-8.

Table X-8. Annual Number of Zero-Emission Truck TRU Purchases Required by the Proposed Amendments for a Typical Business Owning Truck TRUs from 2022 to 2034

Year	Number of Zero-Emission Truck TRUs Purchased
2022	0
2023	1
2024	1
2025	2
2026	1
2027	1
2028	1
2029	1
2030	0
2031	0
2032	0
2033	0
2034	0
Total	8

To assess the costs to a typical business that owns truck TRUs, staff also estimated the cost to install supporting infrastructure. As discussed previously, staff assumed truck

[142] Dun and Bradstreet Database, Employee data for companies that own truck TRUs, Proprietary, 2019. (web link: https://www.dnb.com/ca-en/)

TRU owners will install infrastructure on the same schedule as the truck TRUs transition to ZE technology, adding enough chargers to accommodate changing fleet sizes and avoid paying capital costs and maintenance fees on unused chargers.

Table X-9 shows the annual amortized cost for a typical business owning truck TRUs to comply with the Proposed Amendments from 2022 to 2034, which ranges from -$6,020 to $65,280. The total amortized cost for a typical business owning truck TRUs to comply with the Proposed Amendments from 2022 to 2034 is estimated to be $361,660. To show the feasibility of compliance for a typical business owning truck TRUs, staff compared the maximum amortized annual cost of $65,280 to the annual revenue of a typical business in the truck transportation industry, which is $36.5 million.[143] The maximum amortized annual cost for a typical business owning truck TRUs to comply with the Proposed Amendments is less than one percent of their annual revenue.

[143] United States Census Bureau, 2012 SUSB Annual Datasets by Establishment Industry, 2015. (web link: https://www.census.gov/data/datasets/2012/econ/susb/2012-susb.html, last accessed March 12, 2021)

Table X-9. Estimated Annual Cost to a Typical Business Owning Truck TRUs to Comply with the Proposed Amendments from 2022 to 2034 (2019$)

Year	TRU Capital Costs	TRU Maintenance Costs	Infrastructure Capital Costs	Infrastructure Maintenance Costs	Diesel Costs	Electricity Costs	LCFS Credits	TRU Operating Fees	Total
2022	$0	$0	$0	$0	$0	$0	$0	$0	$0
2023	$11,200	$0	$1,200	$0	$0	$0	$0	$410	$12,810
2024	$0	(-$600)	$2,300	$200	(-$1,800)	$2,600	(-$2,000)	$30	$730
2025	$34,600	(-$1,200)	$4,600	$400	(-$3,500)	$5,200	(-$3,700)	$50	$36,450
2026	$45,500	(-$2,400)	$5,800	$700	(-$7,000)	$10,700	(-$7,500)	$220	$46,020
2027	$56,300	(-$3,000)	$6,900	$900	(-$8,500)	$13,600	(-$9,400)	$50	$56,850
2028	$55,800	(-$3,600)	$6,900	$1,100	(-$10,100)	$16,600	(-$10,500)	$80	$56,280
2029	$65,100	(-$4,200)	$6,900	$1,300	(-$11,500)	$19,800	(-$12,200)	$80	$65,280
2030	$43,100	(-$4,800)	$4,600	$1,500	(-$12,900)	$23,000	(-$14,000)	$50	$40,550
2031	$32,200	(-$4,800)	$3,500	$1,500	(-$12,800)	$23,400	(-$13,700)	$80	$29,380
2032	$21,400	(-$4,800)	$2,300	$1,500	(-$12,900)	$23,400	(-$13,400)	$80	$17,580
2033	$10,700	(-$4,800)	$1,200	$1,500	(-$13,100)	$23,400	(-$13,200)	$50	$5,750
2034	$0	(-$4,800)	$0	$1,500	(-$13,300)	$23,400	(-$12,900)	$80	(-$6,020)
Total	$375,900	(-$39,000)	$46,200	$12,100	(-$107,400)	$185,100	(-$112,500)	$1,260	$361,660

ii. Trailer TRU Owner

Based on CARB's ARBER and Dun and Bradstreet[144] databases, the average number of trailer TRUs owned by companies with more than 100 employees is 7. Therefore, to illustrate the costs to a typical business, staff considered an average trailer TRU fleet with seven trailer TRUs. Trailer TRU fleet owners would incur capital costs for new units purchased beginning in 2023 to comply with the PM emission standard. To determine the number of new trailer TRUs that would be purchased by a typical business owning trailer TRUs, staff used the current average age of the trailer TRU fleet. Based on the statewide TRU inventory, the average age of a trailer TRU is five years old. With an average useful life of 10 years and assuming that all of the TRUs were the same age and did not already meet the PM emission standard, a typical business owning trailer TRUs would turnover their fleet and purchase seven new units in 2027.

Table X-10 shows the annual amortized cost for a typical business owning trailer TRUs to comply with the Proposed Amendments from 2022 to 2034, which ranges from $0 to $5,600. The total amortized cost for a typical business owning trailer TRUs to comply with the Proposed Amendments from 2022 to 2034 is estimated to be $28,300. To show the feasibility of compliance for a typical business owning trailer TRUs, staff compared the maximum amortized annual cost of $5,600 to the annual revenue of a typical business in the truck transportation industry, which is $36.5 million.[145] The maximum amortized annual cost for a typical business owning trailer TRUs to comply with the Proposed Amendments is less than 1/10th of one percent of their annual revenue.

[144] Dun and Bradstreet Database, Employee data for companies that own trailer TRUs, Proprietary, 2019. (web link: https://www.dnb.com/ca-en/)
[145] United States Census Bureau, 2012 SUSB Annual Datasets by Establishment Industry, 2015. (web link: https://www.census.gov/data/datasets/2012/econ/susb/2012-susb.html, last accessed March 12, 2021)

Table X-10. Estimated Annual Cost to a Typical Business Owning Trailer TRUs to Comply with the Proposed Amendments from 2022 to 2034 (2019$)

Year	PM Emission Standard Costs	Refrigerant Costs	Refrigerant Maintenance Costs	TRU Operating Fees	Total
2022	$0	$0	$0	$0	$0
2023	$0	$0	$0	$400	$400
2024	$0	$0	$0	$0	$0
2025	$0	$0	$0	$0	$0
2026	$0	$0	$0	$400	$400
2027	$4,900	$200	$100	$400	$5,600
2028	$4,900	$200	$100	$0	$5,200
2029	$4,900	$200	$100	$0	$5,200
2030	$4,900	$200	$100	$400	$5,600
2031	$4,900	$200	$100	$0	$5,200
2032	$0	$0	$100	$0	$100
2033	$0	$0	$100	$400	$500
2034	$0	$0	$100	$0	$100
Total	$24,500	$1,000	$800	$2,000	$28,300

b. Direct Costs on Small Businesses

For the purposes of the Proposed Amendments, companies with 100 or fewer employees are considered small businesses.[146] Meeting the small business criteria does not relieve TRU or applicable facility owners of any requirements in the Proposed Amendments. Staff used the small business criteria for analysis purposes only.

i. Truck TRU Owner

Based on CARB's ARBER and Dun and Bradstreet[147] databases, 95 percent of truck TRU fleets are considered small business. The average number of truck TRUs owned by companies with 100 or fewer employees is 5. Therefore, to illustrate the costs to a small business, staff considered an average fleet with five truck TRUs. An owner of a

[146] California Government Code, Title 2, Division 3, Part 5.5, Chapter 6.5, §14837. (web link: https://leginfo.legislature.ca.gov/faces/codes_displaySection.xhtml?lawCode=GOV&sectionNum=14837.)

[147] Dun and Bradstreet Database, Employee data for companies that own truck TRUs, Proprietary, 2019. (web link: https://www.dnb.com/ca-en/)

fleet consisting of five truck TRUs would be required to purchase ZE truck TRUs beginning in 2023, as shown in Table X-11.

Table X-11. Annual Number of Zero-Emission Truck TRU Purchases Required by the Proposed Amendments for a Small Business Owning Truck TRUs from 2022 to 2034

Year	Number of Zero-Emission Truck TRUs Purchased
2022	0
2023	1
2024	1
2025	0
2026	1
2027	1
2028	1
2029	0
2030	0
2031	0
2032	0
2033	0
2034	0
Total	5

To assess the costs to a small business that owns truck TRUs, staff also estimated the cost to install supporting infrastructure. As discussed previously, staff assumed truck TRU owners will install infrastructure on the same schedule as the truck TRUs transition to ZE technology, adding enough chargers to accommodate changing fleet sizes and avoid paying capital costs and maintenance fees on unused chargers.

Table X-12 shows the amortized annual cost for a small business owning truck TRUs to comply with the Proposed Amendments from 2022 to 2034, which ranges from -$4,050 to $40,550. The total cost for a small business owning truck TRUs to comply with the Proposed Amendments from 2022 to 2034 is estimated to be $223,820. To show the feasibility of compliance for a small business owning truck TRUs, staff compared the maximum amortized annual cost of $40,550 to the annual revenue of a small business in the truck transportation industry, which is $1.5 million.[148] The maximum amortized annual cost for a small business owning truck TRUs to comply with the Proposed Amendments is less than 3 percent of their annual revenue.

[148] United States Census Bureau, 2012 SUSB Annual Datasets by Establishment Industry, 2015. (web link: https://www.census.gov/data/datasets/2012/econ/susb/2012-susb.html, last accessed March 12, 2021)

Table X-12. Estimated Annual Cost to a Small Business Owning Truck TRUs to Comply with the Proposed Amendments from 2022 to 2034 (2019$)

Year	TRU Capital Costs	TRU Maintenance Costs	Infrastructure Capital Costs	Infrastructure Maintenance Costs	Diesel Costs	Electricity Costs	LCFS Credits	TRU Operating Fees	Total
2022	$0	$0	$0	$0	$0	$0	$0	$0	$0
2023	$11,200	$0	$1,200	$0	$0	$0	$0	$240	$12,640
2024	$1,800	(-$1,900)	$2,300	$200	(-$3,600)	$2,600	$0	$30	$1,430
2025	$17,500	(-$1,200)	$2,300	$400	(-$3,500)	$5,200	(-$2,000)	$0	$18,700
2026	$28,300	(-$1,800)	$3,500	$400	(-$5,200)	$8,000	(-$3,700)	$110	$29,610
2027	$39,200	(-$2,400)	$4,600	$600	(-$6,800)	$10,900	(-$5,600)	$50	$40,550
2028	$38,700	(-$3,000)	$4,600	$700	(-$8,400)	$13,900	(-$7,500)	$30	$39,030
2029	$32,400	(-$3,000)	$3,500	$900	(-$8,200)	$14,100	(-$8,700)	$50	$31,050
2030	$32,400	(-$3,000)	$3,500	$900	(-$8,100)	$14,400	(-$8,700)	$50	$31,450
2031	$21,500	(-$3,000)	$2,300	$900	(-$8,000)	$14,600	(-$8,700)	$30	$19,630
2032	$10,700	(-$3,000)	$1,200	$900	(-$8,100)	$14,600	(-$8,600)	$50	$7,750
2033	$0	(-$3,000)	$0	$900	(-$8,200)	$14,600	(-$8,400)	$50	(-$4,050)
2034	$0	(-$3,000)	$0	$900	(-$8,300)	$14,600	(-$8,200)	$30	(-$3,970)
Total	$233,700	(-$28,300)	$29,000	$7,700	(-$76,400)	$127,500	(-$70,100)	$720	$223,820

ii. Trailer TRU Owner

Based on CARB's ARBER and Dun and Bradstreet[149] databases, 90 percent of trailer TRU fleets are considered small business. The average number of trailer TRUs owned by companies considered to be small business is seven. This is the same number of trailer TRUs owned by a typical business.

Therefore, the cost of owning trailer TRUs for a small business would be the same as the costs described for a typical business above. To show the feasibility of compliance for a small business owning trailer TRUs, staff compared the maximum amortized annual cost of $5,600 to the annual revenue of a small business in the truck transportation industry, which is $1.5 million.[150] The maximum amortized annual cost for a small business owning trailer TRUs to comply with the Proposed Amendments is less than 1 percent of their annual revenue.

The similar trailer TRU fleet size for a typical business (more than 100 employees) and small business (100 or fewer employees) may be due to the small sample size in which staff only had employee data from Dun and Bradstreet for 63 trailer TRU fleets reported in ARBER. It may also be due to the possibility that typical trucking companies may not specialize solely in refrigerated transport and their fleets may also include non-refrigerated trucks or trailers.

c. Direct Costs on Individuals

The Proposed Amendments will not result in any direct costs on individuals. However, staff anticipate the Proposed Amendments will result in indirect costs to individuals to the extent that affected businesses pass compliance costs through to consumers of refrigerated products. Assuming the total net costs of the Proposed Amendments are fully passed through to consumers, staff estimated the cost per California household by dividing the total cost of the Proposed Amendments by 13,272,939 California households.[151] Table X-13 shows the total impact of the Proposed Amendments from 2022 to 2034 is $78.35 per household with a yearly average of $6.03.

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[149] Dun and Bradstreet Database, Employee data for companies that own trailer TRUs, Proprietary, 2019. (web link: https://www.dnb.com/ca-en/)
[150] United States Census Bureau, 2012 SUSB Annual Datasets by Establishment Industry, 2015. (web link: https://www.census.gov/data/datasets/2012/econ/susb/2012-susb.html, last accessed March 12, 2021)
[151] California Department of Finance, Demographic Research Unit, "P-4 Projected Households, Household Population, Group Quarters and Persons per Household for the Counties and State of California," June 10, 2020. (web link: https://www.dof.ca.gov/forecasting/demographics/projections/documents/P4_HHProjections_B2019.xlsx)

Table X-13. Cost of the Proposed Amendments per California Household from 2022 to 2034[152]

Year	Annual Net Cost of Proposed Amendments	Cost per Household
2022	$0	$0.00
2023	$32,800,000	$2.47
2024	$43,400,000	$3.27
2025	$61,500,000	$4.63
2026	$98,100,000	$7.39
2027	$124,800,000	$9.40
2028	$130,600,000	$9.84
2029	$129,800,000	$9.78
2030	$118,800,000	$8.95
2031	$101,800,000	$7.67
2032	$75,600,000	$5.70
2033	$63,200,000	$4.76
2034	$59,600,000	$4.49
Total	$1,040,000,000	$78.35

B. Benefits

1. Benefits to California Businesses

The Proposed Amendments provide opportunities for design, engineering, construction, and project management firms to design new and expanded infrastructure at an estimated 1,000 truck TRU home base facilities statewide. The increase in electric charging and fueling infrastructure will also benefit ZE fuel providers, infrastructure suppliers, equipment installers, and electricians. All of the installations will be in California and some of the infrastructure equipment may be manufactured in California. One manufacturer, ESL Power Systems, has primary operations based in California.[153]

Increased purchases of ZE TRUs under the Proposed Amendments will also benefit ZE TRU manufacturers, wholesalers, and retailers, as well as various businesses in the ZE TRU supply chain, including those involved in battery, fuel cell, cold plate, and solar photovoltaic technology throughout the State. One ZE TRU manufacturer, Clean Cold Power, has indicated to staff that equipment will be assembled in California.[154]

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[152] If the net costs to comply with the Proposed Amendments are not passed through to consumers of refrigerated products, the indirect cost to individuals will be lower than the numbers presented in this table.

[153] ESL Power Systems, Inc. (web link: https://eslpwr.com/, last accessed May 11, 2021)

[154] Phone conversation between Brett Gipe and Michael Britt (Clean Cold Power) and Lea Yamashita (CARB) on December 10, 2020.

Individual businesses that own ZE TRUs may also be able to lower their total cost of ownership with operational and maintenance cost savings and credits generated under the LCFS program.

2. Benefits to Small Businesses

Electricians, engineering, construction, and project management companies; parts and components businesses; and others involved in designing, installing, and maintaining electric and fueling infrastructure equipment may fall into the small business category. The benefits to ZE TRU manufacturers and other related businesses discussed above also apply to small businesses.

3. Benefits to Individuals

The Proposed Amendments benefit California residents by reducing cancer risk near facilities where TRUs operate; reducing non-cancer health impacts by lower direct PM exposure and secondary formation of PM2.5 from NOx; improving air quality and resulting ozone exposure from reductions in NOx; and providing GHG emission reductions needed to combat climate change. The Proposed Amendments are also expected to reduce occupational exposure of on-site workers, including, but not limited to TRU operators, truck drivers, and other individuals who work at facilities where TRUs operate. Staff estimated the statewide value of health benefits from reduced PM2.5 and NOx emissions, as well as the value of GHG emission reductions using the social cost of carbon, as described in Chapter V.

C. Fiscal Impacts

The Proposed Amendments will result in direct costs and cost benefits to local, State, and federal government agencies that own TRUs or applicable facilities. Local government agencies will also experience changes in revenue from utility user taxes, diesel fuel sales taxes, and local sales taxes. State government will experience changes in revenue from diesel fuel sales taxes, Energy Resources Fees, CARB fees, and State sales taxes. Costs to CARB include staffing and resources needed to implement and enforce the Proposed Amendments. In addition, the Proposed Amendments will result in health benefits to individuals in California, which may translate to cost savings for local and State healthcare providers.

1. Local Government

a. TRU and Applicable Facility Owner Costs

The Proposed Amendments will have a small fiscal impact to local government agencies that own TRUs or applicable facilities, relative to the total estimated cost of the Proposed Amendments. Using 2019 ARBER data, staff determined that local government owns 256 TRUs or 0.132 percent of the total number of TRUs. This percentage was applied to the total equipment-related direct costs in Table X-6 to estimate the costs incurred by local government TRU owners. Staff determined that

local government owns 25 truck TRU home base facilities and 19 applicable facilities.[155] Table X-14 shows the estimated direct costs to local government TRU and applicable facility owners from 2022 to 2034.

[155] California Air Resources Board, TRU Applicable Facility Inventory, April 2020.

Table X-14. Total Direct Equipment and Infrastructure-Related Costs to Local Government from 2022 to 2034 (2019$)

Year	TRU Capital Costs	TRU Maintenance Costs	Truck TRU Infrastructure Capital Costs	Truck TRU Infrastructure Maintenance Costs	Diesel Fuel Costs	Electricity Costs	LCFS Credit Revenue	Administrative Costs	Total
2022	$0	$0	$0	$0	$0	$0	$0	$0	$0
2023	$23,000	$1,000	$28,000	$0	$0	$0	$0	$18,000	$70,000
2024	$48,000	$1,000	$63,000	$4,000	(-$2,000)	$3,000	(-$3,000)	$83,000	$197,000
2025	$72,000	$1,000	$93,000	$10,000	(-$5,000)	$8,000	(-$5,000)	$84,000	$258,000
2026	$108,000	$0	$140,000	$15,000	(-$7,000)	$11,000	(-$8,000)	$98,000	$357,000
2027	$152,000	$0	$179,000	$22,000	(-$11,000)	$17,000	(-$12,000)	$89,000	$436,000
2028	$157,000	$0	$186,000	$29,000	(-$14,000)	$23,000	(-$14,000)	$92,000	$459,000
2029	$155,000	(-$1,000)	$173,000	$34,000	(-$16,000)	$27,000	(-$17,000)	$97,000	$452,000
2030	$144,000	(-$1,000)	$147,000	$38,000	(-$17,000)	$31,000	(-$19,000)	$95,000	$418,000
2031	$121,000	(-$1,000)	$104,000	$39,000	(-$18,000)	$32,000	(-$19,000)	$98,000	$356,000
2032	$89,000	(-$1,000)	$69,000	$39,000	(-$18,000)	$32,000	(-$19,000)	$100,000	$291,000
2033	$74,000	(-$1,000)	$38,000	$40,000	(-$19,000)	$33,000	(-$19,000)	$99,000	$245,000
2034	$68,000	(-$1,000)	$20,000	$40,000	(-$19,000)	$33,000	(-$18,000)	$102,000	$225,000
Total	$1,211,000	(-$3,000)	$1,240,000	$310,000	(-$146,000)	$250,000	(-$153,000)	$1,055,000	$3,764,000

Note: Totals may not add due to rounding.

b. Utility User Tax

Several cities and counties in California levy a utility user tax on electricity usage. This tax varies from city to city and ranges from no tax to 11 percent. Staff used a value of 3.53 percent, representing a population-weighted average.[156] By increasing the amount of electricity used, the amount of utility user tax revenue collected by cities and counties will increase accordingly.

c. Diesel Fuel Sales Tax

Off-road diesel is exempt from on-road diesel taxes, but does incur sales tax.[157] Displacing diesel with electricity would decrease the total amount of diesel fuel dispensed in the State, resulting in a reduction in tax revenue collected by local governments. For this analysis, staff used the combined State and local sales tax rate of 8.6 percent, which is a weighted average based on county-level output, with 3.94 percent[158] going towards State sales tax and 4.67 percent[159] going towards local sales tax.

d. Local Sales Tax

Sales tax is levied in California to fund a variety of programs at the local and State levels. The Proposed Amendments will result in the sale of more expensive TRUs and infrastructure in California, which will result in a direct increase in sales tax revenue collected by local government. However, overall, local sales tax revenue may increase less than the direct increase from TRU and infrastructure sales if overall business spending does not increase. For this analysis, staff used the combined State and local sales tax rate of 8.6 percent, which is a weighted average based on county-level output, with 3.94 percent[160] going towards State sales tax and 4.67 percent[161] going towards local sales tax.

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[156] California State Controller's Office, California Cities Utility Users Taxes Revenue and Tax Rate Fiscal Year 2018-19, November 2020. (web link: https://www.sco.ca.gov/Files-ARD-Local/LocRep/2018-19_Cities_UUT.pdf)
[157] California Department of Tax and Fee Administration, California City & County Sales & Use Tax Rates, October 2020. (web link: https://www.cdtfa.ca.gov/taxes-and-fees/sales-use-tax-rates.htm)
[158] California Department of Tax and Fee Administration, Detailed Description of the Sales & Use Tax Rate. (web link: https://www.cdtfa.ca.gov/taxes-and-fees/sut-rates-description.htm, last accessed May 24, 2021)
[159] California Department of Tax and Fee Administration, California City & County Sales & Use Tax Rates, October 2020. (web link: https://www.cdtfa.ca.gov/taxes-and-fees/sales-use-tax-rates.htm)
[160] California Department of Tax and Fee Administration, Detailed Description of the Sales & Use Tax Rate. (web link: https://www.cdtfa.ca.gov/taxes-and-fees/sut-rates-description.htm, last accessed May 24, 2021)
[161] California Department of Tax and Fee Administration, California City & County Sales & Use Tax Rates, October 2020. (web link: https://www.cdtfa.ca.gov/taxes-and-fees/sales-use-tax-rates.htm)

e. Fiscal Impact on Local Government

From 2022 to 2034, staff estimated the cost to local government due to the Proposed Amendments to be $3.8 million as a result of TRUs and applicable facilities owned by local government. Local government will also see a direct increase in utility user and local sales tax revenue of $19.1 million and a decrease in diesel fuel sales tax revenue of $4.9 million. Table X-15 shows the total fiscal impact on local government, which is estimated to be -$10.4 million from 2022 to 2034.

Table X-15. Estimated Fiscal Impact on Local Government from 2022 to 2034 (2019$)

Year	TRU and Applicable Facility Owner Costs	Utility User Tax Revenue	Local Diesel Fuel Sales Tax	Local Sales Tax	Total
2022	$0	$0	$0	$0	$0
2023	$70,000	$0	$0	($1,638,000)	($1,568,000)
2024	$197,000	(-$84,000)	$76,000	($2,204,000)	($2,015,000)
2025	$258,000	(-$195,000)	$170,000	($1,735,000)	($1,502,000)
2026	$357,000	(-$292,000)	$250,000	($3,332,000)	($3,017,000)
2027	$436,000	(-$445,000)	$366,000	($2,571,000)	($2,214,000)
2028	$459,000	(-$580,000)	$461,000	($2,108,000)	($1,768,000)
2029	$452,000	(-$708,000)	$538,000	($1,090,000)	($808,000)
2030	$418,000	(-$796,000)	$584,000	$392,000	$598,000
2031	$356,000	(-$824,000)	$591,000	$416,000	$539,000
2032	$291,000	(-$836,000)	$605,000	$436,000	$496,000
2033	$245,000	(-$848,000)	$625,000	$447,000	$469,000
2034	$225,000	(-$863,000)	$640,000	$384,000	$386,000
Total	$3,764,000	(-$6,471,000)	$4,906,000	($12,603,000)	($10,404,000)

2. State Government

a. TRU and Applicable Facility Owner Costs

The Proposed Amendments will have a small fiscal impact to State government agencies that own TRUs or applicable facilities, relative to the total estimated cost of the Proposed Amendments. Using 2019 ARBER data, staff determined that State government owns 154 TRUs, or 0.08 percent of the total number of TRUs. This percentage was applied to the total equipment-related direct costs in Table X-6 to estimate the costs incurred by State government TRU owners. Staff determined that

State government owns 6 truck TRU home base facilities and 2 applicable facilities.[162] Table X-16 shows the estimated direct costs to State government TRU and applicable facility owners from 2022 to 2034.

[162] California Air Resources Board, TRU Applicable Facility Inventory, April 2020.

Table X-16. Total Direct Equipment and Infrastructure-Related Cost to State Government from 2022 to 2034 (2019$)

Year	TRU Capital Costs	TRU Maintenance Costs	Truck TRU Infrastructure Capital Costs	Truck TRU Infrastructure Maintenance Costs	Diesel Fuel Costs	Electricity Costs	LCFS Credit Revenue	Administrative Costs	Total
2022	$0	$0	$0	$0	$0	$0	$0	$0	$0
2023	$14,000	$1,000	$7,000	$0	$0	$0	$0	$9,000	$31,000
2024	$29,000	$1,000	$15,000	$1,000	(-$1,000)	$2,000	(-$2,000)	$2,000	$47,000
2025	$44,000	$0	$22,000	$2,000	(-$3,000)	$5,000	(-$3,000)	$2,000	$69,000
2026	$65,000	$0	$34,000	$4,000	(-$4,000)	$7,000	(-$5,000)	$8,000	$109,000
2027	$91,000	$0	$43,000	$5,000	(-$7,000)	$10,000	(-$7,000)	$3,000	$138,000
2028	$95,000	$0	$45,000	$7,000	(-$8,000)	$14,000	(-$9,000)	$4,000	$148,000
2029	$93,000	$0	$42,000	$8,000	(-$10,000)	$17,000	(-$10,000)	$5,000	$145,000
2030	$86,000	(-$1,000)	$35,000	$9,000	(-$10,000)	$19,000	(-$11,000)	$4,000	$131,000
2031	$73,000	(-$1,000)	$25,000	$9,000	(-$11,000)	$19,000	(-$11,000)	$5,000	$108,000
2032	$53,000	(-$1,000)	$17,000	$9,000	(-$11,000)	$20,000	(-$11,000)	$4,000	$80,000
2033	$45,000	(-$1,000)	$9,000	$10,000	(-$11,000)	$20,000	(-$11,000)	$4,000	$65,000
2034	$41,000	(-$1,000)	$5,000	$10,000	(-$11,000)	$20,000	(-$11,000)	$5,000	$58,000
Total	$729,000	(-$3,000)	$299,000	$74,000	(-$87,000)	$153,000	(-$91,000)	$55,000	$1,129,000

b. Diesel Fuel Sales Tax

Displacing diesel with electricity would decrease the total amount of diesel fuel dispensed in the State, resulting in a reduction in sales tax revenue collected by State government. For this analysis, staff used the combined State and local sales tax rate of 8.6 percent, which is a weighted average based on county-level output, with 3.94 percent[163] going towards State sales tax and 4.67 percent[164] going towards local sales tax.

c. Energy Resources Fee

The Energy Resources Fee is a $0.0003/kWh surcharge levied on consumers of electricity purchased from electrical utilities.[165] The revenue collected is deposited into the Energy Resources Programs Account of the General Fund which is used for ongoing energy programs and projects deemed appropriate by the Legislature, including but not limited to, activities of the California Energy Commission.

d. CARB Fees

The Proposed Amendments include TRU operating fees and applicable facility registration fees. The proposed fee schedule is presented in Table X-5. The proposed fees will result in revenue to the State to offset costs to CARB to implement and enforce the Proposed Amendments.

e. State Sales Tax

Sales tax is levied in California to fund a variety of programs at the local and State levels. The Proposed Amendments will result in the sale of more expensive TRUs and infrastructure in California, which will result in a direct increase in sales tax revenue collected by the State. However, overall, State sales tax revenue may increase less than the direct increase from TRU and infrastructure sales if overall business spending does not increase. Staff used a combined State and local sales tax rate of 8.6 percent, which is a weighted average based on county-level output, with 3.94 percent[166] going towards State sales tax and 4.67 percent[167] going towards local sales tax.

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[163] California Department of Tax and Fee Administration, Detailed Description of the Sales & Use Tax Rate. (web link: https://www.cdtfa.ca.gov/taxes-and-fees/sut-rates-description.htm, last accessed May 24, 2021)
[164] California Department of Tax and Fee Administration, California City & County Sales & Use Tax Rates, October 2020. (web link: https://www.cdtfa.ca.gov/taxes-and-fees/sales-use-tax-rates.htm)
[165] California Department of Tax and Fee Administration, 2020 Electrical Energy Surcharge Rate, December 2019. (web link: https://www.cdtfa.ca.gov/formspubs/l725.pdf)
[166] California Department of Tax and Fee Administration, Detailed Description of the Sales & Use Tax Rate. (web link: https://www.cdtfa.ca.gov/taxes-and-fees/sut-rates-description.htm, last accessed May 24, 2021)
[167] California Department of Tax and Fee Administration, California City & County Sales & Use Tax Rates, October 2020. (web link: https://www.cdtfa.ca.gov/taxes-and-fees/sales-use-tax-rates.htm)

f. Costs to CARB

The estimated costs to CARB as a result of the Proposed Amendments include the direct and indirect labor costs for the additional positions needed to successfully implement and enforce the Proposed Amendments as described below and operational costs (e.g., compliance labels, envelopes, and postage).

- 3.0 Air Pollution Specialist (APS) positions and 6.0 Air Resources Technician (ART) II positions in Fiscal Year 2022-2023.
- 1.0 Air Resources Supervisor I, 1.0 Staff Services Manager, 1.0 APS, and 10.0 ART II positions in Fiscal Year 2023-2024.

Implementation duties include assisting owners with TRU reporting and applicable facility registration, providing technical assistance, and issuing compliance labels. Enforcement duties include conducting unit, fleet, and facility inspections; fleet and facility investigations; and issuing and processing citations. The need for additional staff is due to added requirements in the Proposed Amendments requiring out-of-state based TRU reporting, TRU operating fees, applicable facility registration, applicable facility registration fees, and applicable facility reporting. Table X-17 shows the number of positions needed by CARB and the cost for each classification in 2021.

Table X-17. Number of CARB Positions Needed and 2021 Costs

Position	Number of Positions	Initial Budget Year Cost (Annual Salary plus Benefits per Position)	Ongoing Cost (Annual Salary plus Benefits per Position)
Air Resources Supervisor I	1	$238,000	$237,000
Staff Services Manager I	1	$168,000	$167,000
Air Pollution Specialist	4	$195,000	$194,000
Air Resources Technician II	16	$101,000	$100,000

SB 854 authorizes CARB to assess fees to cover its reasonable costs, with specific considerations, on all off-road and other mobile sources certification and compliance programs not currently covered under the existing fee regulation authority (Health & Saf. Code section 43019).[168] The Proposed Amendments include TRU operating fees and applicable facility registration fees. CARB intends to seek authority to use the collected fees to cover program costs.

[168] California Health and Safety Code § 43019.1, Division 26, Senate Bill No. 854, July 27, 2018. (web link: https://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill_id=201720180SB854)

g. Fiscal Impact on State Government

From 2022 to 2034, staff estimated the cost to State government due to the Proposed Amendments to be $1.1 million, resulting from TRUs and applicable facilities owned by State government; and approximately $47.1 million in costs to CARB. State government will also see a direct increase in revenue from Energy Resources Fees, TRU operating fees, applicable facility registration fees, and State sales tax of $71.8 million; as well as a decrease in diesel fuel tax revenue of $22.6 million. Table X-18 shows the total fiscal impact to State government agencies, which is estimated to be -$927,000 from 2022 to 2034. CARB will seek authorization to use collected fees to offset costs incurred to implement and enforce the Proposed Amendments.

Table X-18. Estimated Fiscal Impact to State Government from 2022 to 2034 (2019$)

Year	Costs to CARB	TRU and Facility Owner Costs	State Diesel Fuel Sales Tax	Energy Resources Fee	TRU Operating Fee and Applicable Facility Registration Fee	State Sales Tax	Total
2022	$750,000	$0	$0	$0	$0	$0	750,000
2023	$2,962,000	$31,000	$0	$0	(-$11,449,000)	(-$1,391,000)	(-$9,847,000)
2024	$3,955,000	$47,000	$331,000	(-$4,000)	(-$1,369,000)	(-$1,873,000)	$1,087,000
2025	$3,947,000	$69,000	$748,000	(-$9,000)	(-$1,203,000)	(-$1,474,000)	$2,078,000
2026	$3,947,000	$108,000	$1,099,000	(-$13,000)	(-$9,474,000)	(-$2,831,000)	(-$7,164,000)
2027	$3,947,000	$139,000	$1,641,000	(-$20,000)	(-$2,917,000)	(-$2,184,000)	$606,000
2028	$3,947,000	$147,000	$2,092,000	(-$25,000)	(-$4,037,000)	(-$1,791,000)	$333,000
2029	$3,947,000	$144,000	$2,495,000	(-$30,000)	(-$5,720,000)	($926,000)	(-$90,000)
2030	$3,947,000	$131,000	$2,746,000	(-$33,000)	(-$4,284,000)	$333,000	$2,840,000
2031	$3,947,000	$109,000	$2,789,000	(-$34,000)	(-$5,393,000)	$353,000	$1,771,000
2032	$3,947,000	$81,000	$2,837,000	(-$35,000)	(-$4,819,000)	$370,000	$2,381,000
2033	$3,947,000	$64,000	$2,891,000	(-$35,000)	(-$4,398,000)	$380,000	$2,849,000
2034	$3,947,000	$58,000	$2,941,000	(-$36,000)	(-$5,757,000)	$326,000	$1,479,000
Total	$47,137,000	$1,128,000	$22,610,000	(-$274,000)	(-$60,820,000)	(-$10,708,000)	(-$927,000)

3. Federal Government

a. TRU and Applicable Facility Owner Costs

The Proposed Amendments will have a small fiscal impact to federal government agencies that own TRUs or applicable facilities, relative to the total estimated cost of the Proposed Amendments. Using 2019 ARBER data, staff determined that federal government owns 7 TRUs, or 0.004 percent of the total number of TRUs. This percentage was applied to the total equipment-related direct costs in Table X-6 to estimate the costs incurred by federal government TRU owners. Staff determined that federal government owns 1 truck TRU home base facility and 12 applicable facilities.[169] Table X-19 shows the estimated direct costs to federal government TRU and applicable facility owners, which is estimated to be $119,800 from 2022 to 2034.

[169] California Air Resources Board, TRU Applicable Facility Inventory, April 2020.

Table X-19. Total Direct Equipment and Infrastructure-Related Costs to Federal Government from 2022 to 2034 (2019$)

Year	TRU Capital Costs	TRU Maintenance Costs	Infrastructure Capital Costs	Infrastructure Maintenance Costs	Diesel Fuel Costs	Electricity Costs	LCFS Credit Revenue	Administrative Costs	Total
2022	$0	$0	$0	$0	(-$)	$0	$0	$0	$0
2023	$600	$0	$1,100	$0	(-$)	$0	$0	$1,300	$3,000
2024	$1,300	$0	$2,500	$200	(-$100)	$100	(-$100)	$1,900	$5,800
2025	$2,000	$0	$3,700	$400	(-$100)	$200	(-$100)	$1,900	$8,000
2026	$3,000	$0	$5,600	$600	(-$200)	$300	(-$200)	$2,700	$11,800
2027	$4,100	$0	$7,100	$900	(-$300)	$500	(-$300)	$2,000	$14,000
2028	$4,300	$0	$7,400	$1,100	(-$400)	$600	(-$400)	$2,000	$14,600
2029	$4,200	$0	$6,900	$1,400	(-$400)	$800	(-$500)	$2,800	$15,200
2030	$3,900	$0	$5,900	$1,500	(-$500)	$800	(-$500)	$2,100	$13,200
2031	$3,300	$0	$4,200	$1,500	(-$500)	$900	(-$500)	$2,100	$11,000
2032	$2,400	$0	$2,800	$1,600	(-$500)	$900	(-$500)	$2,900	$9,600
2033	$2,000	$0	$1,500	$1,600	(-$500)	$900	(-$500)	$2,200	$7,200
2034	$1,900	$0	$800	$1,600	(-$500)	$900	(-$500)	$2,200	$6,400
Total	$33,000	$0	$49,500	$12,400	(-$4,000)	$6,900	(-$4,100)	$26,100	$119,800

b. Fiscal Impact on Federal Government

Staff do not anticipate any additional fiscal impact on federal government other than the direct costs discussed above.

D. Creation or Elimination of Jobs within the State of California.

Staff anticipate the statewide employment impacts of the Proposed Amendments to be slightly positive in 2023 and 2024, corresponding with demand for ZE truck TRUs and supporting infrastructure from in-state fleets. From 2025 through 2034, the employment impacts are estimated to be negative as the overall costs of the Proposed Amendments offset the positive impacts of additional in-state demand.

Staff used Regional Economic Models, Inc. (REMI) Policy Insight Plus Version 2.4.1 to estimate the macroeconomic impacts of the Proposed Amendments on the California economy. REMI is a structural economic forecasting and policy analysis model that integrates input-output, computable general equilibrium, and econometric and economic geography methodologies. The REMI model estimated at most a 0.01 percent increase or decrease in statewide employment, relative to the baseline, in any given year due to the Proposed Amendments. The economy is expected to grow over this period and therefore, reduced employment, relative to the baseline, can be interpreted as a reduction in employment growth. This amounted to a total increase in employment of 151 jobs in the year with the greatest positive impact and decreases in employment of -1,438 jobs in the year with the most negative impact.

E. Creation of New Business or the Elimination of Existing Businesses within the State of California

Staff do not anticipate the Proposed Amendments will directly result in business creation or elimination. However, the Proposed Amendments may have a small indirect impact on business creation or elimination. TRU fleets and applicable facilities face compliance costs. The potential for some of these businesses to be eliminated cannot be ruled out.

While changes in jobs for the California economy cannot directly estimate the broader impacts of business creation and elimination, job changes can be used to understand some of the potential impacts to businesses. The overall job impacts of the Proposed Amendments are small relative to the total California economy. The changes in statewide employment represent, at most, a 0.01 percent change relative to baseline California employment in any given year.

F. Expansion of Businesses Currently Doing Business within the State

Increased purchases of ZE TRUs under the Proposed Amendments will lead to increased revenue for ZE TRU manufacturers, wholesalers, and retailers, as well as various businesses in the ZE TRU supply chain, including those involved in battery, fuel cell, cold plate, and solar photovoltaic technology throughout the State.

The increased number of ZE TRUs will also lead to an increase in the number of ZE fueling and charging infrastructure installations in the State, which will benefit businesses that provide services for design, engineering, construction, and project management, as well as ZE infrastructure suppliers, equipment installers, electricians, and ZE fuel providers.

G. Competitive Advantages or Disadvantages for Businesses Currently Doing Business within the State

Staff anticipate businesses that own TRUs that do not operate in California may gain a slight competitive advantage compared to businesses that own TRUs that operate in California. CARB staff do not consider these impacts significant. This is because of California's extensive freight industry and the large volume of refrigerated traffic that moves through the State. Most fleets would need to upgrade a majority of their fleet because they have little control over where a certain TRU operates and require flexibility to move loads to any destination.

Staff do not anticipate impacts to the competitive advantage or disadvantage of businesses currently doing business in the State because the Proposed Amendments impose requirements equally on all TRUs that operate in California, whether the business that owns or operates them is based in-state or out-of-state. All businesses owning or operating TRUs would be subject to the same ZE truck TRU, PM emission standard, lower-GWP refrigerant, and administrative requirements, regardless of in-state or out-of-state ownership status. Thus, the Proposed Amendments would not create any competitive disadvantage to businesses located in California.

Businesses that already use ZE TRU technologies may gain a competitive advantage compared to fleets that rely on diesel-powered TRUs in the Baseline. Some businesses may already be using cold plate and cryogenic TRUs in addition to battery-electric TRUs. Such businesses will not have large compliance costs associated with the Proposed Amendments and may also gain a competitive advantage compared to fleets that rely on diesel-powered TRUs in the Baseline.

Applicable facilities are required to pay registration fees and ensure that TRUs operating on their property are compliant. The applicable facilities are based on size thresholds and facilities below these specific thresholds will not face direct costs

associated with the Proposed Amendments. Therefore, facilities below the threshold may gain a slight competitive advantage compared to larger facilities. Out-of-state facilities will not face the same registration fees and reporting costs. Therefore, California-based facilities may also face a competitive disadvantage to other similar-sized applicable facilities in close proximity, but in another state. Staff do not consider these impacts significant because fees and reporting costs are relatively small compared to the total revenue of these facilities and the total cost of the Proposed Amendments.

H. Increase or Decrease of Investment in the State

Private domestic investment consists of purchases of residential and nonresidential structures and of equipment and software by private businesses and nonprofit institutions. It is used as a proxy for impacts on investments in California because it provides an indicator of the future productive capacity of the economy.

Table X-20 provides the changes in private investment for the Proposed Amendments, relative to the Baseline. The change in private investment ranges from a decrease of $2 million in 2023 to a decrease of $48 million in 2029. In any given year, the change in private investment represents less than 0.01 percent of baseline investment.

Table X-20. Changes in Gross Domestic Private Investment

Units	2023	2025	2027	2029	2031	2033
Private Investment (2019B$)	448	484	493	503	514	530
Percent Change	0.00%	0.00%	-0.01%	-0.01%	-0.01%	0.00%
Change (2019M$)	-2	-14	-36	-48	-39	-13

I. Incentives for Innovation in Products, Materials, or Processes

The Proposed Amendments provide a strong signal for the development of ZE TRU technologies and help in building a robust market for advanced technologies. Staff anticipate growth in the industries that manufacture ZE TRU technologies, which will strengthen the supply chain and result in technology improvements earlier than they would have otherwise occurred. For example, improvements in battery weight and range are needed to improve market acceptance and bring overall battery-electric technology costs down. These improvements will allow advanced technologies to expand further into extended range TRU applications, as well as other off-road sectors. In addition, due to the large volume of refrigerated freight that moves through California, there is the possibility that the Proposed Amendments will compel TRU OEMs to incorporate advanced technologies and lower-GWP refrigerant into units sold outside of the State.

XI. Evaluation of Regulatory Alternatives

Government Code section 11346.2, subdivision (b)(4) requires CARB to consider and evaluate reasonable alternatives to the proposed regulatory action and provide reasons for rejecting those alternatives. This section discusses alternatives evaluated and provides reasons why these alternatives were not included in the proposal. As explained below, no alternative proposed was found to be less burdensome and equally effective in achieving the purposes of the regulation in a manner than ensures full compliance with the authorizing law. The Board has not identified any reasonable alternatives that would lessen any adverse impact on small business.

Staff solicited public input regarding alternatives to achieving the purposes of the Proposed Amendments throughout the development process and specifically at public workshops held on August 28, 2019 in Fontana, California, September 3, 2019 in Fresno, California, and September 11, 2019 in Sacramento, California. The Sacramento workshop was webcast with the ability to submit questions online to ensure the opportunity for broader public participation. Staff evaluated four alternatives as described below.

A. Alternative 1: ZE Truck TRUs, Stationary Operating Time Limit, Diesel Emission Standards, and Lower-GWP Refrigerant

Alternative 1 is a more stringent requirement for trailer TRUs, DSC TRUs, railcar TRUs, and TRU gen sets operating in California. Under this alternative, all trailer TRUs, DSC TRUs, railcar TRUs, and TRU gen set engines would be required to meet diesel emission standards for PM, NOx, and CO. This is in contrast to the Proposed Amendments, which only require newly-manufactured trailer TRUs, DSC TRUs, railcar TRUs, and TRU gen set engines to meet a PM standard. Additionally, trailer TRUs, DSC TRUs, and TRU gen sets would be subject to a stationary operating time limit, in which they would be required to use ZE operation while stationary at certain facilities in California and be equipped with an electronic telematics system. Railcar TRUs would not be subject to the stationary operating time limit. Requirements for lower-GWP refrigerant and ZE truck TRUs would remain unchanged from the Proposed Amendments.

Alternative 1 would result in higher costs compared to the Proposed Amendments. The higher cost of Alternative 1 is due to the cost of trailer TRUs and DSC TRUs that meet the diesel emission standards, are capable of ZE operation, and equipped with an electronic telematics system; as well as the purchase and installation of 38,000 plugs at applicable facilities to support ZE operation of TRUs onsite. Alternative 1 would result in greater PM2.5, NOx, and GHG emission reductions than the Proposed Amendments. Staff evaluated the costs and benefits of Alternative 1 in the SRIA analysis (see Appendix B).

Staff rejected Alternative 1 because it does not meet the directive of EO N-79-20, which set a goal for 100 percent ZE off-road vehicles and equipment by 2035. In addition to the ZE truck TRU requirements in the Proposed Amendments, staff intend to pursue an additional rulemaking to transition the remaining TRU categories to ZE per the EO. Alternative 1 would impose significant costs on the TRU industry only to be subject to additional ZE requirements in the near future. Stakeholders have also expressed concern regarding the feasibility of the ZE operation while stationary requirement included in Alternative 1 because TRUs and the facilities where they operate are often not under the same ownership. In addition, there is not a standardized plug for electric-standby or hybrid-electric trailer TRUs that would be used to comply with the ZE operation requirement. Without plug standardization between the two major TRU manufacturers, it would be difficult to ensure compatibility between TRUs and facility infrastructure owned by different entities.

B. Alternative 2: ZE Requirement for All TRUs

Alternative 2 is a more stringent requirement for TRUs operating in California. Under this alternative, starting December 31, 2023, fleets would be required to transition 10 percent each year to ZE technology, such that all TRUs operating in California would be ZE by December 31, 2032. In contrast to the Proposed Amendments that only require the transition of truck TRUs to ZE technology, this alternative requires the transition of truck TRUs, trailer TRUs, DSC TRUs, and TRU gen sets to ZE technology. Similar to the ZE truck TRU requirement in the Proposed Amendments, Alternative 2 would not impose additional requirements such as the diesel emission standard, because TRUs would transition to ZE technology that has a higher incremental cost and would ultimately achieve the greatest emission reductions. Railcar TRUs would not be subject to the ZE requirement. This alternative aligns with proposals from environmental groups advocating for the full transition to ZE TRU operation and equipment as quickly as possible.[170]

Alternative 2 would result in higher costs compared to the Proposed Amendments. The higher cost of Alternative 2 is based on current cost estimates for ZE trailer TRUs, DSC TRUs, and TRU generators sets, as well as the purchase and installation of additional Level 2 chargers to support their operations. Alternative 2 would result in greater PM2.5, NOx, and GHG emission reductions than the Proposed Amendments.

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[170] Ageldis, Yasmine, et al., "Comments on the Transportation Refrigeration Unit Regulation Updated Concept," April 27, 2020. (web link: https://www.arb.ca.gov/lists/com-attach/12-truregulation-ws-AXVVIVQgWFQFYFQ7.pdf)

Staff rejected Alternative 2 because it has significantly higher costs than the Proposed Amendments. As previously mentioned, in addition to the ZE truck TRU requirements in the Proposed Amendments, staff intend to pursue an additional rulemaking to transition the remaining TRU categories to ZE per EO N-79-20. Staff plan to complete an assessment of ZE technologies for trailer TRUs and the remaining TRU categories, which will inform the development of requirements to transition all TRUs to ZE that are technologically feasible and cost-effective.

C. Alternative 3: Align Implementation of ZE Truck TRU Requirements with CARB's ZE Truck Rules

Alternative 3, proposed by TRU OEMs, would delay the requirements for ZE truck TRUs to align with CARB's implementation of ZE requirements for truck manufacturers and fleets.

Staff rejected Alternative 3 because it would result in extended use of diesel-powered truck TRUs, which would delay needed emission reductions. Alternative 3 also fails to foster the development of ZE TRU technology in the timeframe needed to support a subsequent rulemaking to transition trailer TRUs and the remaining TRU categories to ZE per EO N-79-20. As more fleets use ZE technologies in the truck TRU application as a result of the Proposed Amendments, the current state of ZE TRU technology will advance and expand into extended range applications needed to support the transition of trailer TRUs and the remaining TRU categories to ZE. Lastly, although CARB has adopted ZE requirements for truck manufacturers, the fleet rules are still under development. The current concept for the ZE truck fleet rule would not apply to all truck TRU types, resulting in further delays in emission reductions and technology advancement for all TRUs.

D. Alternative 4: Lower-GWP Refrigerant

Alternative 4, proposed by the Environmental Investigation Agency, would lower the GWP threshold for TRU refrigerant or include a second step for a further reduction in GWP to under 150 by 2025.[171]

Staff rejected Alternative 4 because although U.S. EPA approved R-744 (GWP = 1) for use in transport refrigeration applications in 2014 and both Carrier and Thermo King have successfully applied R-744 refrigerant in units in Europe, units with R-744 refrigerant are not yet available in North America. Staff are proposing a GWP threshold of 2,200 to ensure a quick transition to a lower-GWP alternative that is

[171] Starr, Christina, "Comments of the Environmental Investigation Agency re: Refrigerant GWP for New TRUs," October 11, 2019.

commercially available for the three equipment types (truck TRU, trailer TRU, and DSC TRU).

E. Small Business Alternative

The Board has not identified any reasonable alternatives that would lessen any adverse impact on small business.

F. Performance Standards in Place of Prescriptive Standards

Government Code sections 11346.2(b)(4)(A) and 11346.2(b)(1)[172] contain requirements for proposed regulations that would mandate the use of specific technologies or equipment. However, because the Proposed Amendments are performance-based and do not mandate the use of specific technologies or equipment, these Government Code requirements are not applicable.

G. Health and Safety Code Section 57005 Major Regulation Alternatives

CARB estimates the proposed regulation will have an economic impact on the State's business enterprises of more than $10 million in one or more years of implementation. CARB will evaluate alternatives submitted to CARB and consider whether there is a less costly alternative or combination of alternatives that would be equally as effective in achieving increments of environmental protection in full compliance with statutory mandates within the same amount of time as the proposed regulatory requirements, as required by Health & Saf. Code section 57005.[173]

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[172] Government Code §11346.2(b), Division 3, Public Participation: Procedure for Adoption of Regulations. (web link: https://leginfo.legislature.ca.gov/faces/codes_displaySection.xhtml?lawCode=GOV&sectionNum=11346.2.)

[173] California Health and Safety Code § 57005, Division 37, Regulation of Environmental Protection. (web link: https://leginfo.legislature.ca.gov/faces/codes_displaysection.xhtml?lawCode=HSC&sectionNum=57005)

XII. Justification for Adoption of Regulations Different from Federal Regulations Contained in the Code of Federal Regulations

U.S. EPA and CARB regulate TRU engines as mobile non-road (off-road) engines (referred to as off-road throughout this rulemaking). Federal off-road compression-ignition engine emission standards are set forth for new engines in 40 Code of Federal Regulations Part 89. California standards for new off-road compression-ignition engines align with federal requirements and are set forth in CCR, title 13, Article 4, sections 2420-2427, under "Heavy Duty Off-road Diesel Cycle Engines."

The Proposed Amendments require new TRU engines operating in California to meet emission standards that generally align with the harmonized federal/State off-road compression-ignition engine emission standards. More specifically, the Proposed Amendments require newly-manufactured (MY 2023 and newer) trailer TRU, DSC TRU, railcar TRU, and TRU gen set engines to meet a PM standard that aligns with the U.S. EPA Tier 4 final PM emission standard for engines greater than 25 horsepower, regardless of horsepower. Engines less than 25 horsepower would be required to meet a PM emission standard more stringent than the harmonized federal/California PM standard. In-use (MY 2022 and older) trailer TRU, DSC TRU, railcar TRU, and TRU gen set engines would continue to operate under the current TRU ATCM requirements.

The more stringent PM standard for newly-manufactured trailer TRU, DSC TRU, railcar TRU, and TRU gen set engines less than 25 horsepower is needed to address the emergence and growth in the number of units equipped with engines less than 25 horsepower. As discussed previously, the 2021 update to the statewide TRU emission inventory (Appendix H) indicates growing sales of trailer TRUs with less than 25 horsepower engines, which contrasts with previous inventories where all trailer TRU engines were over 25 horsepower. The California and federal PM off-road emission standard for engines less than 25 horsepower is 15 times higher than the standard for engines greater than 25 horsepower. As a result, diesel PM emissions have not been reduced under the TRU ATCM as expected. Similar trends are also expected for DSC TRUs, railcar TRUs, and TRU gen sets. Based on the TRU emission inventory, the number of units equipped with engines less than 25 horsepower will become responsible for the majority of PM emissions from TRUs in the near future, if current trends continue.

The Proposed Amendments follow the precedent set by the current TRU ATCM, which already requires more stringent in-use diesel emission standards than federal requirements. CARB adopted the TRU ATCM in 2004 and U.S. EPA authorized

California to enforce the regulation in 2009.[174] CARB subsequently adopted amendments in 2010 and 2011. U.S. EPA determined those amendments fell within the scope of the original authorization and also granted full authorization.[175, 176]

Section 209(e)(2) of the Clean Air Act sets forth the criteria for granting California authorization to adopt and enforce standards and other requirements relating to controlling emissions from new and in-use off-road engines that are not otherwise specifically preempted from all state regulations under section 209(e)(1). Under section 209(e)(2), the Administrator is directed to grant the authorization to California if it is determined that the State's standards will be, in the aggregate, at least as protective of public health and welfare as applicable federal standards, unless the Administrator finds that: (1) the protectiveness finding of the State is arbitrary and capricious; (2) California does not need separate state standards to meet compelling and extraordinary conditions; or (3) the State standards and accompanying enforcement procedures are not consistent with section 209 of the Clean Air Act.

First, in granting authorization, U.S. EPA acknowledged that the TRU ATCM is at least as protective of public health and welfare as applicable federal standards. Similarly, for new engines greater than 25 horsepower, the Proposed Amendments are at least as protective as federal standards for new engines. For new engines less than 25 horsepower, the Proposed Amendments are more protective than the federal PM standard for new engines.

Second, U.S. EPA agreed that unique circumstances exist in California necessitating the need for the State's own off-road mobile source pollution program. As discussed in Chapter II, California has a critical need to reduce exposure to air toxics such as diesel PM, as well as PM, NOx, and GHG emissions. The benefits of protecting public health and reducing emissions justify the cost of adopting regulations that differ from existing federal regulations.

Third, U.S. EPA determined that the TRU ATCM is consistent with section 209 of the Clean Air Act. Section 209(a) preempts all states and political subdivisions from adopting or attempting to enforce any standard relating to the control of emissions from new motor vehicles or new motor vehicle engines. TRUs are not covered by this preemption in that they are not a new motor vehicle or new motor vehicle engine.

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[174] United States Environmental Protection Agency, Federal Register, Vol. 74, No. 11, Page 3030, January 16, 2009. (web link: https://www.govinfo.gov/content/pkg/FR-2009-01-16/pdf/E9-907.pdf)
[175] United States Environmental Protection Agency, Federal Register, Vol. 78, No. 125, Page 39870, June 28, 2013. (web link: https://www.govinfo.gov/content/pkg/FR-2013-06-28/pdf/2013-15437.pdf)
[176] United States Environmental Protection Agency, Federal Register, Vol. 82, No. 12, Page 6525, January 19, 2017. (web link: https://thefederalregister.org/82-FR/6522/2017-01235.pdf)

Section 209(e)(1) establishes the federal preemption prohibiting states and local subdivisions from adopting or enforcing any standard or other requirement relating to the control of emissions of new engines used in farm and construction equipment that are smaller than 175 horsepower or engines used in new locomotives. Although TRU engines are less than 175 horsepower, they are not primarily used in farm and construction equipment and vehicles and are not used in locomotives.

Section 209(b)(1)(C) provides that no waiver shall be granted for on-road emission standards if the state standards and accompanying enforcement procedures are not consistent with section 202(a) of the Clean Air Act. Similarly, section 209(e)(2)(A)(iii) provides that no authorization shall be granted for nonroad emission standards if the state standards and accompanying enforcement procedures are not consistent with section 209 of the Clean Air Act. While section 209(b)(1)(C) does not apply here, section 209(e)(2)(A)(iii) does, and U.S. EPA has historically interpreted consistency under section 209(b)(1)(C) using a two-prong test: (1) that there is sufficient lead time to permit the development of technology necessary to meet the standards and other requirements, giving appropriate consideration to the cost of compliance in the time frame provided and (2) that the California and federal test procedures are sufficiently compatible to permit manufacturers to meet both the state and federal test requirements with one test vehicle or engine. As discussed in Chapter IX, the PM emission standard requirement is technically feasible, as both major TRU manufacturers have commercially available units with engines certified to meet the proposed standard.

There are no federal regulations establishing requirements on the use of ZE technologies or lower-GWP refrigerant for TRUs, as would be required by the Proposed Amendments.

XIII. Enforcement

CARB's goal is to ensure uniform compliance with its regulations to achieve a level playing-field and maximize emission reductions for public health and environmental protection. For this to happen, there must be an effective outreach campaign to inform stakeholders of the requirements under a given regulation and mechanisms in place to enforce compliance with regulatory requirements and deter violations. This includes mechanisms to quickly and easily identify all responsible parties subject to regulatory requirements, to hold all responsible parties accountable when violations are identified, to easily identify compliance, and include clear consequences for non-compliance. This chapter describes the mechanisms included in the Proposed Amendments that staff will use to uniformly enforce its requirements and staff's planned efforts to assist stakeholders in implementing the Proposed Amendments.

A. How will the Proposed Amendments be implemented?

Staff, in cooperation with stakeholders, will develop and conduct an extensive outreach campaign to ensure affected parties are aware of their responsibilities under the Proposed Amendments. This campaign will build on the outreach activities conducted throughout the regulatory development process. First, staff will continue to work with industry groups to inform their members about the Proposed Amendments. Second, staff will provide training and educational materials at workshops and via our website to help affected parties understand the requirements and help to determine a path to compliance. Third, staff will continue to operate a toll-free number to answer questions about the Proposed Amendments (1-888-878-2826). Staff will also notify affected parties prior to each compliance date as the Proposed Amendments take effect to ensure they are informed of requirements and their compliance deadlines. Lastly, staff will issue CARB compliance labels to enable staff and applicable facility owners and operators to easily determine the compliance status of a given TRU.

B. How will the Proposed Amendments be enforced?

CARB estimates that by 2023, approximately 35,000 TRUs and TRU gen sets based in California, and another 158,000 out-of-state TRUs and TRU gen sets will be operating in California. Learning from CARB's prior experience enforcing the current requirements of the TRU ATCM, staff have identified several compliance mechanisms necessary to include in the Proposed Amendments that work together beyond traditional inspections and investigations of TRUs alone to ensure industry-wide compliance, maximize emission reductions, and level the playing field between owners of compliant and non-compliant TRUs, and between owners of in-state and out-of-state TRUs.

These mechanisms include multiple-party responsibilities, added requirements for applicable facilities to ensure only compliant TRUs operate on their property, and expanded TRU reporting and labeling requirements. Staff will use the compliance mechanisms described below to enforce the Proposed Amendments by conducting unit, fleet, and facility inspections, and fleet and facility investigations. Inspections and investigations may result in corrective actions, including Department of Motor Vehicle registration holds on trucks where authorized and substantial civil penalties for violations of the Proposed Amendments.

1. Multiple-Party Responsibilities

The Proposed Amendments place responsibility on multiple parties to ensure compliance with regulatory requirements. The Proposed Amendments hold TRU owners, TRU operators, vehicle owners, drivers, and freight contractors responsible for checking a TRU's compliance status before hiring or transporting a TRU load and each party is liable for operating non-compliant units. To assist these parties with easily determining the compliance status of a TRU, the Proposed Amendments require each TRU operating in California to be reported to CARB and to display compliance labels. Placing responsibility on multiple parties will help to improve compliance, which in turn will ensure a level playing field between owners of compliant and non-compliant TRUs

2. Applicable Facility Reporting of TRUs

The Proposed Amendments require all applicable facilities to ensure that only compliant TRUs operate on their properties. To meet this requirement, the Proposed Amendments require applicable facilities to gather information on all TRUs that operate at their facilities and report that information to CARB quarterly. Alternatively, applicable facilities may provide a declaration, under penalty of perjury, that they do not allow non-compliant TRUs to operate on their properties. To assist an applicable facility with determining a TRU's compliance status, the Proposed Amendments require each TRU operating in California to display compliance labels.

TRU emissions are generated at applicable facilities and impact communities surrounding them. Therefore, applicable facility owners and operators should bear some responsibility for ensuring TRUs operating on their properties are compliant with regulatory requirements. Reporting accurate and comprehensive information on all TRUs that operate at applicable facilities will help staff better identify non-compliant TRUs operating in California and bring them into compliance. Alternatively, not allowing non-compliant TRUs to operate at an applicable facility incentivizes TRU owners to comply and achieves immediate emission reductions in impacted communities.

3. Expanded TRU Reporting and Labeling

The Proposed Amendments require TRU owners to report all TRUs that operate in California to CARB. TRU reporting helps CARB enforcement staff, as well as applicable facility owners, applicable facility operators, vehicle owners, drivers, and freight contractors, all of whom will be able to query CARB's website, to identify who is subject to the Proposed Amendments and the requirements that apply to them. CARB will verify self-reported TRU information using TRU OEM production reports.

The Proposed Amendments also include new compliance label requirements, in which TRU owners will be required to affix CARB-issued compliance labels to the TRU housing. Compliance labels will enable CARB enforcement staff and responsible parties to more quickly verify compliance of a TRU at the moment the TRU is operating. The ability to quickly and easily determine compliance is critical for responsible parties to meet the requirements of the Proposed Amendments. This ability is also critical for CARB enforcement staff to implement an efficient enforcement process that can reach a higher volume of units and therefore level the playing field even further.

The compliance labels will be valid for three years and non-compliant TRUs will not be issued new compliance labels if they remain out of compliance or have outstanding violations. Without a compliance label, these units run the risk of not being hired by a freight contractor, pulled by a vehicle owner, or allowed onto an applicable facility to avoid liability to these responsible parties, and/or being cited by CARB. This will incentivize owners to bring their non-compliant TRU into compliance in a timely manner.

XIV. Public Process for Development of the Proposed Action (Pre-Regulatory Information)

Consistent with Government Code sections 11346, subdivision (b), and 11346.45, subdivision (a), and with the Board's long-standing practice, staff held public workshops and had other meetings with interested persons during the development of the Proposed Amendments. These informal pre-rulemaking discussions provided useful information that staff considered during development of the Proposed Amendments that are now being proposed for formal public comment.

A. Public Engagement for Rulemaking Process

To ensure an open and transparent rulemaking, staff have engaged in an extensive public process since development of the Proposed Amendments began in early 2016. As of June 2021, staff have conducted more than 160 meetings with members of impacted communities, environmental justice advocates, air districts, industry stakeholders (including TRU owners and operators, TRU dealers and service centers, truck and trailer leasing companies, trade associations, TRU OEMs, electric utilities, freight facility owners and operators, infrastructure manufacturers, and ETS suppliers), and other interested parties. Meeting formats included public workshops, work group meetings, community meetings, informal meetings, phone calls, and site visits with individual stakeholders. Throughout the rulemaking process, access to information including meeting notices, slide presentations, and contact information were available on CARB's TRU Regulation website.

B. Public Workshops

Staff conducted eight public workshops to discuss regulatory concepts, methodology and data used to develop the emission inventory and conduct a health risk assessment (HRA), electric and fueling infrastructure considerations, enforcement and compliance mechanisms, as well as solicit stakeholder feedback. Staff notified stakeholders of all upcoming workshops with the issuance of a public notice at least three weeks prior to their occurrence. Staff posted the notices to the TRU Regulation website and distributed them through several public list serves that include over 17,000 recipients.[177] Each of these workshops was open to all members of the public. Staff

[177] Number of subscribers for the following CARB lists as of January 28, 2021: Agricultural Activities, Community Air, Environmental Justice ChERRP, Commerce, Environmental Justice ChERRP, Mira Loma, Environmental Justice ChERRP, Wilmington, Goods Movement Emission Reduction Program, Port Truck, Reduction of GHG Emissions from Refrigerated Shipping Containers, Stationary Equipment Refrigerant Management Program, Sustainable Freight Transport Initiative, and Transport Refrigeration Units.

posted meeting materials, including agendas, slide presentations, and draft regulatory language on CARB's TRU Regulation website in advance of the workshops.

Staff held an initial workshop on April 13, 2016, in Sacramento, California. During this workshop, staff discussed concepts to reduce emissions from stationary TRU operations and solicited stakeholder feedback and suggestions on additional ideas. The workshop was webcast with the ability to submit questions online to ensure all interested parties could access the information and participate in the discussion.

Staff held a second set of public workshops on August 16, 2017, in Sacramento, California, and on August 18, 2017, in Riverside, California. At these workshops, staff presented a draft concept to limit the amount of time that diesel-powered TRUs operate while they are stationary, as well as require an overall ZE mode operating time. Staff also discussed emission inventory updates, survey results, and information on available incentive funding. At these workshops, staff introduced stationary operating time limit and ETS requirements. The Sacramento workshop included 37 participants and 80 webcast participants. The Sacramento workshop was webcast with the ability to submit questions online to ensure the opportunity for broader public participation. The Riverside workshop included 21 participants.

Staff held a third set of public workshops on August 28, 2019, in Fontana, California, on September 3, 2019, in Fresno, California, and on September 11, 2019, in Sacramento, California. In response to the high costs associated with the concept presented at the previous workshops, staff presented a revised concept to require truck TRUs to transition to ZE technology, trailer TRUs to utilize ZE operation while stationary for more than 15 minutes at applicable facilities, and applicable facilities to install electric charging or fueling infrastructure. At these workshops, staff introduced diesel emission standards and lower-GWP refrigerant requirements. Staff also discussed infrastructure considerations, enforcement and compliance mechanisms, funding opportunities, and solicited stakeholder input on the concept as well as alternatives for the Standardized Regulatory Impact Assessment and EA prepared for the Proposed Amendments. These workshops therefore also served as CEQA scoping meetings. There were 30 participants at the Fontana workshop, 16 participants at the Fresno workshop, and 35 participants and 101 webcast participants at the Sacramento workshop. The Sacramento workshop was webcast with the ability to submit questions online to ensure the opportunity for broader public participation.

Staff held a non-regulatory workshop on October 31, 2019, in Sacramento, California, to discuss emission inventory updates and the preliminary health analyses for the draft concept of the Proposed Amendments. At this workshop, staff discussed updates to the statewide TRU emission inventory and presented draft results from these updates. Staff also presented the methodology, data inputs, and results related to the health impacts from TRUs. The workshop included 22 participants. The workshop was

webcast with the ability to submit questions online to ensure the opportunity for broader public participation.

Staff held a final workshop on March 19, 2020, via teleconference to discuss the updated concept in response to input received on the draft concept presented at workshops in August and September of 2019. During the call, staff discussed refined regulatory concepts, draft regulatory language, and health risk and emissions estimates. The teleconference included 299 participants. To facilitate the exchange of information, staff created an informal comment submittal form and made it available on the CARB website for stakeholders to submit comments on the draft regulatory language. The teleconference was open to the public and staff encouraged participation by all parties.

C. Freight Facility Workshops and Community Meetings

Staff conducted two workshops on August 29, 2017, in Los Angeles, California, and September 6, 2017, in Sacramento, California to discuss ways to reduce community health impacts from freight facilities. Staff presented potential sector-based and facility-based approaches, including requiring the use of ZE and near-ZE technologies for equipment, including TRUs, and supporting infrastructure at facilities, such as warehouses or distribution centers, seaports, and railyards.

Staff participated in four broader freight-focused community meetings during the week of September 18, 2017, in Lamont, Long Beach, Fontana, and Oakland, California with more than 130 attendees in total, including local residents and more than 70 organizations. Staff conducted the meetings using the World Café format, with one to two staff and multiple community members at each table. Staff set up tables for discussion topics related to achieving additional emission reductions at seaports, rail yards, warehouses, and distribution centers.

Staff also extended outreach efforts to communities surrounding facilities where TRUs operate by participating in meetings and monthly calls with the California Cleaner Freight Coalition (CCFC). These monthly calls focus on updating community advocacy groups on the development process of CARB's freight-related regulatory activities. In addition, staff met with representatives from the CCFC on September 21, 2018, in Long Beach, California to hear community advocates express their concerns, and to discuss staff's draft concepts for the Proposed Amendments.

D. Work Group Meetings

Staff conducted three work group meetings to discuss regulatory concepts, costs, infrastructure considerations, compliance and enforcement mechanisms, as well as solicit stakeholder feedback.

Staff held a work group meeting on November 3, 2017, in Sacramento, California to discuss costs, fleet operational needs, and technology readiness to successfully deploy and expand the ZE TRU market, as well as enforcement and infrastructure issues identified at the August 2017 workshops. To encourage focused discussions, staff invited key stakeholders. Participants included environmental justice advocate groups, air districts, TRU owners and operators, TRU dealers, trade associations, TRU OEMs, electric utilities, freight facility owners and operators, infrastructure manufacturers, and ETS suppliers. At the meeting, staff again requested suggestions for regulatory alternatives from the stakeholders present. The work group meeting included 47 participants.

Staff held a second work group meeting on December 17, 2019, in Sacramento, California, to discuss infrastructure related issues identified at the workshops held in August and September 2019. To encourage focused discussions, staff invited key stakeholders. Participants included TRU owners and operators, trade associations, TRU OEMs, fuel providers, freight facility owners and operators, and infrastructure manufacturers. At the meeting, staff discussed the proposed timeline for infrastructure, electricity costs, potential inclusion of a plug standard, and infrastructure related cost data and assumptions. Stakeholders indicated that CARB should not include a plug standard in the Proposed Amendments and allow the market and ongoing industry efforts to develop one. The work group meeting included 22 participants.

Staff held a third work group meeting on July 29, 2020, via webinar to discuss enforcement related issues identified at the workshops held in August 2019, September 2019, and March 2020. The work group meeting was open to the public. During the meeting, staff outlined potential enforcement strategies for each of the requirements in the Proposed Amendments and solicited stakeholder feedback. The work group meeting included 223 participants.

E. Stakeholder Meetings and Site Visits

Staff conducted informal meetings, phone calls, and site visits with a broad group of stakeholders to develop the Proposed Amendments, discuss concepts, and gather input. This includes members of impacted communities, environmental justice advocates, air districts, TRU owners and operators, trade associations, TRU OEMs, TRU dealers and service centers, truck and trailer dealers, truck and trailer leasing companies, freight brokers, forwarders, shippers, receivers, freight facility owners and operators, and other interested parties.

In addition to meeting with a wide range of stakeholders, staff also conducted targeted outreach to potential applicable facilities. This included mailing over 40,000 postcards to facilities with refrigerated operations potentially affected by the

Proposed Amendments to notify them of upcoming workshops and direct them to the TRU Regulation website for more information. In addition to meetings with facilities to discuss the Proposed Amendments, staff also visited several facilities, including refrigerated WHDCs, CSWs, seaport terminals, and railyards to learn more about their business operations and to better to understand potential implementation challenges associated with the Proposed Amendments.

Staff also had several meetings with agriculture stakeholders to discuss the Proposed Amendments. In 2017, staff traveled to Fresno, CA to discuss issues regarding freight facilities and TRUs. Staff held conference calls with several Agricultural Association representatives on August 15, 2018, and March 11, 2019, to brief them on the Proposed Amendments and received several comments regarding the industry's seasonal operations and their geographical distance from sensitive receptors. On September 3, 2019, staff traveled to Fresno to conduct a public workshop on the Proposed Amendments. Staff also provided an update to the San Joaquin Valley Air Pollution Control District Citizens Advisory Committee at their March 3, 2020 meeting and met with stakeholders to discuss the Proposed Amendments.

F. Preliminary Cost Document

In August 2020, staff posted a preliminary cost document on the TRU Regulation website for public comment which outlined the cost inputs and assumptions to be used for the economic analysis of the Proposed Amendments.

G. Outreach on Changes to the Regulatory Proposal

In October 2020, staff posted an update on the TRU Regulation website announcing the bifurcation of the draft TRU concept to transition diesel-powered TRUs to ZE technology in two parts. Previously, staff presented a draft TRU concept at public workshops held in 2019. The draft TRU concept included requirements for ZE truck TRUs; ZE operation while stationary for trailer TRUs, DSC TRUs, and TRU gen sets; infrastructure at applicable facilities; and the use of lower-GWP refrigerant. Because the Proposed Amendments are a subset of the draft concept previously workshopped, staff determined it was not necessary to conduct additional workshops. However, in response to stakeholder questions received, in January 2021, staff posted an informational document on the TRU Regulation website to provide additional clarification on the key elements included in the Proposed Amendments.

For additional information and a comprehensive list of outreach efforts, see Appendix E.

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XVI. Appendices

A. **Appendix A.1 and A.2: Proposed Regulation Order**

B. **Appendix B: Standardized Regulatory Impact Assessment (SRIA)**

C. **Appendix C: Summary and Response to DOF comments on the SRIA**

D. **Appendix D: Draft Supplemental Environmental Analysis**

E. **Appendix E: List of Public Workshops, Meetings, Conference Calls, Video Conferences, and Site Visits Supporting the Public Process for Development of the Proposed Amendments**

F. **Appendix F: Applicable Facility Determination Methodology**

G. **Appendix G: Fee Development**

H. **Appendix H: 2021 Update to the Statewide Emission Inventory for TRUs**

I. **Appendix I: Heath Analyses**