

## APPENDIX C

### Current Control Measures

## Table of Contents

<b>C.</b>	<b>Current Control Measures .....</b>	<b>C-5</b>
<b>C.I.</b>	<b>CARB Mobile Source Program: Key Mobile Source Regulations and Programs Providing Emission Reductions .....</b>	<b>C-5</b>
C.I.A.	Light-Duty Vehicles .....	C-6
C.I.A.1.	Advanced Clean Cars .....	C-7
C.I.A.2.	On Board Diagnostics (OBD) .....	C-8
C.I.A.3.	California Enhanced Smog Check Program.....	C-8
C.I.A.4.	Reformulated Gasoline (CaRFG).....	C-9
C.I.A.5.	Incentive Programs .....	C-9
C.I.A.5.a.	Low Carbon Transportation Investments and Air Quality Improvement Program (Clean Transportation Incentives) .....	C-10
C.I.A.5.a.i.	Clean Vehicle Rebate Program (CVRP).....	C-11
C.I.A.5.a.ii.	Clean Cars 4 All (CC4A).....	C-11
C.I.A.5.a.iii.	Other Clean Transportation Equity Investments.....	C-11
C.I.A.6.	Consumer Assistance Program .....	C-12
C.I.B.	Medium- and Heavy-Duty On-Road Trucks .....	C-12
C.I.B.1.	Heavy-Duty Engine Standards .....	C-12
C.I.B.2.	Optional Low- NO <sub>x</sub> Standards for Heavy-Duty Diesel Engines .....	C-12
C.I.B.3.	Heavy-Duty Engine and Vehicle Omnibus Regulation .....	C-13
C.I.B.4.	Cleaner In-Use Heavy-Duty Trucks (Truck and Bus Regulation) .....	C-13
C.I.B.5.	Heavy-Duty Inspection and Maintenance Regulation .....	C-14
C.I.B.6.	Heavy-Duty On-Board Diagnostics (HD OBD) .....	C-14
C.I.B.7.	Clean Diesel Fuel.....	C-15
C.I.B.8.	Advanced Clean Truck Regulation (ACT) .....	C-15
C.I.B.9.	Innovative Clean Transit (ICT) and Zero-Emission Airport Shuttle Regulation .....	C-15
C.I.B.10.	Incentive Programs.....	C-16
C.I.B.10.a.	Low Carbon Transportation Investments and Air Quality Improvement Program (Clean Transportation Incentives) .....	C-16
C.I.B.10.a.i.	Hybrid and Zero-Emission Truck and Bus Voucher Incentive Project (HVIP) .....	C-17
C.I.B.10.a.ii.	Truck Loan Assistance Program.....	C-17
C.I.B.10.a.iii.	Demonstration and Pilot projects.....	C-17
C.I.B.10.a.iv.	Clean Transportation Equity Investments.....	C-18
C.I.B.10.b.	Moyer Program.....	C-18
C.I.B.10.c.	Goods Movement Emission Reduction Program (Prop 1B) .....	C-19
C.I.B.10.d.	Volkswagen (VW) Mitigation Trust .....	C-20
C.I.B.10.e.	Community Air Protection Incentives (AB 617   Community Air Protection Program).....	C-20
C.I.C.	Off-Road Sources .....	C-21

C.I.C.1.	Off-Road Engine Standards .....	C-21
C.I.C.2.	Cleaner In-Use Off-Road Equipment (Off-Road Regulation) .....	C-22
C.I.C.3.	Clean Diesel Fuel.....	C-23
C.I.C.4.	Locomotive Engine Standards .....	C-23
C.I.C.5.	Marine Sources and Ocean-Going Vessels (OGVs) .....	C-24
C.I.C.6.	Large Spark-Ignition (LSI) Engines and Forklifts.....	C-25
C.I.C.7.	Cargo Handling Equipment (CHE) .....	C-26
C.I.C.8.	Incentive Programs .....	C-26
C.I.C.8.a.	Low Carbon Transportation Investments and Air Quality Improvement Program (Clean Transportation Incentives) .....	C-26
C.I.C.8.a.i.	Clean Off-Road Equipment Voucher Incentive Project.....	C-27
C.I.C.8.a.ii.	Demonstration and Pilot Projects .....	C-27
C.I.C.8.b.	Funding Agricultural Replacement Measures for Emission Reductions (FARMER) .....	C-28
C.I.C.8.c.	Moyer Program.....	C-28
C.I.C.8.d.	Goods Movement Emission Reduction Program (Prop 1B) .....	C-28
C.I.D.	Conclusions .....	C-28
<b>C.II.</b>	<b>Current local stationary and area sources control measures .....</b>	<b>C-30</b>
C.II.A.	Existing Local VOC Control Measures.....	C-30
C.II.A.1.	Adhesives and Sealants.....	C-32
C.II.A.2.	Architectural Coatings .....	C-33
C.II.A.3.	Asphalt Paving Material .....	C-33
C.II.A.4.	Bakeries .....	C-33
C.II.A.5.	Bulk Terminal .....	C-33
C.II.A.6.	Confined Animal Facility.....	C-33
C.II.A.7.	Dry Cleaning .....	C-34
C.II.A.8.	Fugitive Emissions .....	C-34
C.II.A.9.	Gasoline Dispensing Facility .....	C-34
C.II.A.10.	Graphic Arts.....	C-34
C.II.A.11.	Landfill Gas.....	C-34
C.II.A.12.	Polyester Resin Operations .....	C-34
C.II.A.13.	Semiconductor Manufacturing .....	C-35
C.II.A.14.	Surface Coating Operations .....	C-35
C.II.A.15.	Surface Preparation/Cleanup .....	C-35
C.II.A.16.	Synthetic Organics Chemical Manufacturing Industry .....	C-35
C.II.B.	Existing Local NO <sub>x</sub> Control Measures .....	C-35
C.II.B.1.	Boilers, Process Heaters, and Steam Generators.....	C-36
C.II.B.2.	Gas Turbines.....	C-37
C.II.B.3.	Internal Combustion Engines .....	C-37

C.II.B.4.	Residential & Small Water Heaters .....	C-37
C.II.B.5.	Furnace .....	C-38
C.II.B.6.	Miscellaneous Combustion Sources .....	C-38

## Table of Figures

Figure C-1 Light-Duty Emission Standards.....	C-6
Figure C-2 Off-Road Vehicle and Equipment Control Programs.....	C-21

## Table of Tables

Table C-1 Current VOC Rules by SFNA Air District.....	C-30
Table C-2 Current NO <sub>x</sub> Rules by SFNA Air District .....	C-36

## **C. Current Control Measures**

### **C.I. CARB Mobile Source Program: Key Mobile Source Regulations and Programs Providing Emission Reductions**

Given the severity of California's air quality challenges and the need for ongoing emission reductions, the California Air Resources Board (CARB or Board) has implemented the most comprehensive mobile source emissions control program in the nation. CARB's comprehensive program relies on four fundamental approaches:

- Stringent emissions standards that minimize emissions from new vehicles and equipment;
- In-use programs that target the existing fleet and require the use of the cleanest vehicles and emissions control technologies;
- Cleaner fuels that minimize emissions during combustion; and
- Incentive programs that remove older, dirtier vehicles and equipment and replace those vehicles with the cleanest technologies.

This multi-faceted approach has spurred the development of increasingly cleaner technologies and fuels and achieved significant emission reductions across all mobile source sectors that go far beyond national programs or programs in other states. These efforts extend back to the first mobile source regulations adopted in the 1960s, and pre-date the federal Clean Air Act Amendments (CAAA or Act) of 1970, which established the basic national framework for controlling air pollution. In recognition of the pioneering nature of CARB's efforts, the Act provides California unique authority to regulate mobile sources more stringently than the federal government by providing a waiver of preemption for its new vehicle emission standards under Section 209(b). This waiver provision preserves a pivotal role for California in the control of emissions from new motor vehicles, recognizing that California serves as a laboratory for setting motor vehicle emission standards. Since then, CARB has consistently sought and obtained waivers and authorizations for its new motor vehicle regulations. CARB's history of progressively strengthening standards as technology advances, coupled with the waiver process requirements, ensures that California's regulations remain the most stringent in the nation.

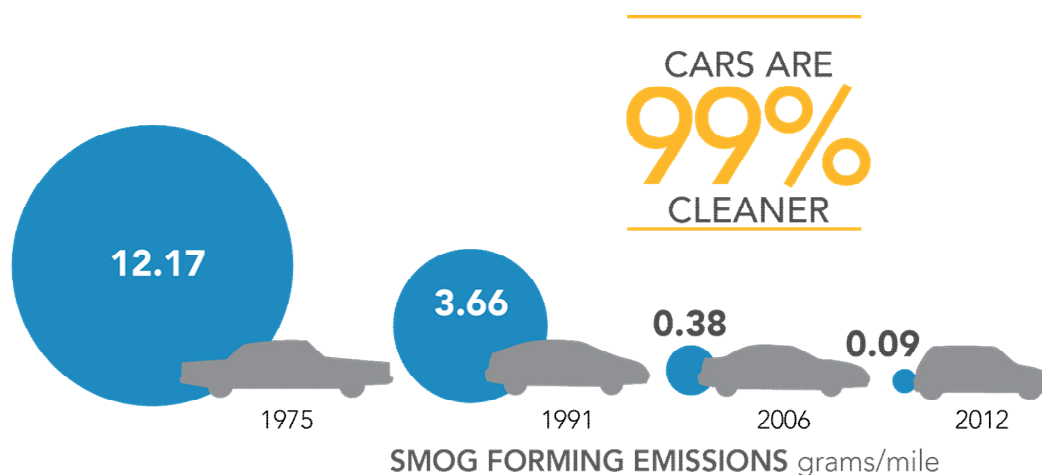
In 1998, CARB identified diesel particulate matter as a toxic air contaminant. Since then, CARB adopted numerous regulations aimed at reducing exposure to diesel particulate matter while concurrently providing reductions in oxides of nitrogen (NO<sub>x</sub>) from freight transport sources like heavy-duty diesel trucks, transportation sources like passenger cars and buses, and off-road sources like large construction equipment. Phased implementation of these regulations will continue to produce emission reduction benefits through 2032 and beyond, as the regulated fleets are retrofitted, and as older and dirtier portions of the fleets are replaced with newer and cleaner models at an accelerated pace.

Further, CARB and District staff work closely on identifying and distributing incentive funds to accelerate cleanup of vehicles and engines. Key incentive programs include: Low Carbon Transportation, Air Quality Improvement Program, VW Mitigation Trust, Community Air Protection, Carl Moyer Program, Goods Movement Program, Clean Off-Road Equipment (CORE) and Funding Agricultural Replacement Measures for Emission Reductions (FARMER). These incentive-based programs work in tandem with regulations to accelerate deployment of cleaner technology.

### C.I.A. Light-Duty Vehicles

Figure C-1 illustrates the trend in CARB smog forming emission standards for light-duty vehicles. Cars are 99 percent cleaner than they were in 1975 due to CARB's longstanding light-duty mobile source program. Since setting the nation's first motor vehicle exhaust emission standards in 1966 that led to the first pollution controls, California has dramatically tightened emission standards for light-duty vehicles. In 1970, CARB required auto manufacturers to meet the first standards to control NO<sub>x</sub> emissions along with hydrocarbon emissions. The simultaneous control of emissions from motor vehicles and fuels led to the use of cleaner-burning reformulated gasoline (RFG) that has removed the emissions equivalent of 3.5 million vehicles from California's roads. Since CARB first adopted it in 1990, the Low Emission Vehicle Program (LEV and LEV II) and Zero-Emission Vehicle (ZEV) Program have resulted in the production and sales of hundreds of thousands of zero-emission vehicles (ZEVs) in California.

Figure C-1 Light-Duty Emission Standards



As a result of these efforts, light-duty vehicle emissions in the Sacramento Metropolitan nonattainment area (Sacramento Metro area) have been reduced significantly since 1990 and will continue to go down through 2032. From today, light-duty vehicle NO<sub>x</sub> emissions are projected to decrease by over 64 percent in 2032. Key light-duty programs include Advanced Clean Cars (ACC), On-Board Diagnostics, Reformulated Gasoline, Incentive Programs, and the Enhanced Smog Check Program.

### C.I.A.1. Advanced Clean Cars

CARB's groundbreaking ACC program is now providing the next generation of emission reductions in California and ushering in a new zero emission passenger transportation system. The success of this program is evident: California is the world's largest market for Zero Emission Vehicles (ZEVs), with over 87 models available today, including battery-electric, plug-in hybrid electric, and fuel cell electric vehicles. A wide variety are now available at lower price points, attracting new consumers. As of February 2022, Californians, who drive only 10 percent of the nation's cars, now account for over 40 percent of all zero-emission cars in the country. The U.S. makes up about half of the world market. This movement towards commercialization of advanced clean cars has occurred due to CARB's ZEV requirements, part of ACC, which affects passenger cars and light-duty trucks.

CARB's ACC Program, approved in January 2012, is a pioneering approach of a 'package' of regulations that - although separate in construction - are related in terms of the synergy developed to address both ambient air quality needs and climate change. The ACC program combines the control of smog, soot causing pollutants and greenhouse gas (GHG) emissions into a single coordinated package of requirements for model years 2015 through 2025. The program assures the development of environmentally superior cars that will continue to deliver the performance, utility, and safety vehicle owners have come to expect.

The ACC Program also included amendments affecting the current ZEV requirements through the 2017 model year in order to enable manufacturers to successfully meet 2018 and subsequent model year requirements. These ZEV amendments are intended to achieve commercialization through simplifying the regulation and pushing technology to higher volume production in order to achieve cost reductions. The ACC Program will continue to achieve benefits into the future as new cleaner cars enter the fleet and displace older and dirtier vehicles.

Going beyond these regulations, California will be transitioning to zero emissions. In support of California's transition to zero-emission vehicles, in 2020, Governor Newsom signed Executive Order N-79-201 which established a goal that 100 percent of California sales of new passenger cars and trucks be zero-emission by 2035. Advanced Clean Cars II (ACC II), a measure in the 2016 State SIP Strategy, is a significant effort critical to meeting air quality standards and was adopted by the CARB Board in August 2022. ACC II is consistent with the Governor Newsom's Executive Order and has the goal of cutting emissions from new combustion vehicles while taking all new vehicle sales to 100 percent zero-emission no later than 2035.

---

<sup>1</sup> Executive Order N-79-20 <https://www.gov.ca.gov/wp-content/uploads/2020/09/9.23.20-EO-N-79-20-Climate.pdf>

With this order and many other recent actions, Governor Newsom has recognized that air pollution remains a challenge for California that requires bold action. Zero-emission vehicle commercialization in the light-duty sector is well underway. Longer-range battery electric vehicles are coming to market that are cost-competitive with gasoline fueled vehicles and hydrogen fuel cell vehicles are now also seeing significant sales. Autonomous and connected vehicle technologies are being installed on an increasing number of new car models. A growing network of retail hydrogen stations is now available, along with a rapidly growing battery charger network.

#### C.I.A.2. On Board Diagnostics (OBD)

OBD systems serve an important role in helping to ensure that engines and vehicles maintain low emissions throughout their full life. OBD systems are designed to identify when a vehicle's emission control systems or other emission-related computer-controlled components are malfunctioning, causing emissions to be elevated above the vehicle manufacturer's specifications. Many states currently use the OBD system as the basis for passing and failing vehicles in their inspection and maintenance programs, as is exemplified by California's Smog Check program.

California's first OBD regulation required manufacturers to monitor some of the emission control components on vehicles starting with the 1988 model year. In 1989, CARB adopted OBD II, which required 1996 and subsequent model year passenger cars, light duty trucks, and medium duty vehicles and engines to be equipped with second generation OBD systems. The Board has modified the OBD II regulation in regular updates since initial adoption to address manufacturers' implementation concerns and, where needed, to strengthen specific monitoring requirements. Most recently, the Board amended the regulation in 2021 to require manufacturers to implement Unified Diagnostic Services (UDS) for OBD communications, which will provide more information related to emissions-related malfunctions that are detected by OBD systems, improve the usefulness of the generic scan tool to repair vehicles, and provide needed information on in-use monitoring performance. UDS implementation would be required for all 2027 and subsequent model year light- and medium-duty vehicles and engines, as well as some heavy-duty vehicles and engines.

#### C.I.A.3. California Enhanced Smog Check Program

The Bureau of Automotive Repair (BAR) is the State agency charged with administration and implementation of the Smog Check Program. The Smog Check Program is designed to reduce air pollution from California registered vehicles by requiring periodic inspections for emission-control system problems, and by requiring repairs for any problems found. In 1998, the Enhanced Smog Check program began in which Smog Check stations relied on the BAR-97 Emissions Inspection System (EIS) to test tailpipe emissions with either a Two-Speed Idle (TSI) or Acceleration Simulation Mode (ASM) test depending on where the vehicle was registered. For instance, vehicles registered in urbanized areas received an ASM test, while vehicles in rural areas received a TSI test.



In 2009, the following requirements were added in to improve and enhance the Smog Check Program, making it more inclusive of motor vehicles and effective on smog reductions:

- Low pressure evaporative test;
- More stringent pass/fail cut points;
- Visible smoke test; and
- Inspection of light- and medium-duty diesel vehicles.

The next major change in the Program was due to AB 2289, adopted in October 2010, a new law restructuring California's Smog Check Program, streamlining and strengthening inspections, increasing penalties for misconduct, and reducing costs to motorists. This new law, supported by CARB and BAR, promised faster and less expensive Smog Check inspections by taking advantage of the second generation of OBD software installed on all vehicles. The new law also directs vehicles without this equipment to high-performing stations, helping to ensure that these cars comply with current emission standards. This program will reduce consumer costs by having stations take advantage of diagnostic software that monitors pollution-reduction components and tailpipe emissions. Beginning mid-2013, testing of passenger vehicles using OBD was required on all vehicles model years 2000 or newer.

#### C.I.A.4. Reformulated Gasoline (CaRFG)

Since 1992, CARB has been regulating the formulation of gasoline through the California Reformulated Gasoline program (CaRFG). The CaRFG program has been implemented in three phases, and has resulted in California gasoline being the cleanest in the world. California's cleaner-burning gasoline regulation is one of the cornerstones of the State's efforts to reduce air pollution and cancer risk. Reformulated gasoline is fuel that meets specifications and requirements established by CARB, which reduced motor vehicle toxics by about 40 percent and reactive organic gases by about 15 percent. The results from cleaning up fuel can have an immediate impact as soon as it is sold in the State. Vehicle manufacturers design low-emission emission vehicles to take full advantage of cleaner-burning gasoline properties.

#### C.I.A.5. Incentive Programs

There are many different incentive programs focusing on light-duty vehicles that produce extra emission reductions beyond traditional regulations. Incentive programs encourage both the early retirement of dirty, older cars and the purchase of newer, lower-emitting vehicle engines and technologies. Several State and local incentive funding pools have been used historically -- and remain available -- to fund the accelerated turnover of on-road heavy-duty vehicles.

The State, in partnership with the local air districts, has a well-established history of using incentive programs to advance technology development and deployment, and to achieve early emission reductions. Since 1998, CARB and California's local air districts have been

administering incentive funding to accelerate the deployment and turnover to cleaner vehicles, starting with the Moyer Program. In recognition of the key role that incentives play in complementing State and local air quality regulations to reduce emissions, the scope and scale of California's air quality incentive programs has since greatly expanded. Each of CARB's incentive programs has its own statutory requirements, goals, and categories of eligible projects that collectively provide for a diverse and complex incentives portfolio. CARB uses this portfolio approach to incentives to accelerate development and early commercial deployment of the cleanest mobile source technologies and to improve access to clean transportation.

The Fiscal Year (FY) 2021-22 State Budget included an unprecedented level of investment in ZEVs, with \$2.3 billion allocated for CARB over the next three years, specifically dedicated to incentive-based turnover of mobile source vehicles and equipment, as part of a \$3.9 billion comprehensive, multi-agency package to accelerate progress toward the State's zero-emission vehicle goals established under Executive Order N-79-20. With the 2022-23 State Budget, Governor Newsom is further reinforcing California's commitment to transitioning away from combustion vehicles with an additional \$6.1 billion in ZEV investments over the next 5 years.

#### **C.I.A.5.a. Low Carbon Transportation Investments and Air Quality Improvement Program (Clean Transportation Incentives)**

California's Low Carbon Transportation Investments and the Air Quality Improvement Program form CARB's major incentive funding program, which works in concert with the State's larger portfolio of clean transportation investments. Together, the Low Carbon Transportation Investments and Air Quality Improvement Program are known as the Clean Transportation Incentives program; they provide mobile source incentives to reduce greenhouse gas, criteria pollutant, and toxic air contaminant emissions through the deployment of advanced technology and clean transportation in the light-duty and heavy-duty sectors.

The Clean Transportation Incentives Program is part of California Climate Investments and is designed to accelerate the transition to advanced technology low carbon freight and passenger transportation, with a priority on providing health and economic benefits to California's most disadvantaged communities, and with a focus on increasing deployment of zero-emission vehicles and equipment wherever possible. Low Carbon Transportation Investments are supported by California's Cap-and-Trade auction proceeds. The Air Quality Improvement Program (AQIP) is a mobile source incentive program that focuses on reducing criteria pollutant and diesel particulate emissions with concurrent GHG reductions. AQIP is appropriated from the Air Quality Improvement Fund.

Each year, the legislature appropriates funding to CARB for the Low Carbon Transportation Investments and Air Quality Improvement Programs, and allocations are used to fund multiple programs in the passenger vehicle, on-road heavy-duty, and

off-road vehicle sectors, including: the Clean Vehicle Rebate Project (CVRP); Enhanced Fleet Modernization Program and Plus-Up Pilot Project (Clean Cars 4 All); and the Hybrid and Zero-Emission Truck and Bus Voucher Incentive Project (HVIP).

#### C.I.A.5.a.i. Clean Vehicle Rebate Program (CVRP)

As one of the programs funded through the Clean Transportation Incentives program, CVRP is a vehicle purchasing incentives program that provides consumer rebates to reduce the price for new ZEV purchases, and is designed to offer vehicle rebates on a first-come, first-serve basis for light-duty ZEVs, plug-in hybrid electric vehicles, and zero-emission motorcycles. In FY 2021-22, CVRP was allocated \$525 million.

#### C.I.A.5.a.ii. Clean Cars 4 All (CC4A)

Clean Cars 4 All (formerly known as the Enhanced Fleet Modernization Program Plus-Up Pilot Project) is another Clean Transportation Incentives program for passenger vehicles. Clean Cars 4 All provides incentives for lower-income consumers living in and near disadvantaged communities who scrap their old vehicles and purchase new or used hybrid, plug-in hybrid, or zero-emission vehicle replacement vehicles. The budget for FY 2021-22 included \$75 million for the statewide expansion of CC4A.

#### C.I.A.5.a.iii. Other Clean Transportation Equity Investments

CARB also funds a suite of transportation equity pilot projects aimed at increasing access to clean transportation and mobility options for priority populations in disadvantaged and low-income communities, and for lower-income households. This includes clean vehicle ownership projects, clean mobility options, streamlining access to funding and financing opportunities, and increasing community outreach, education and exposure to clean technologies. Clean Transportation Equity pilot projects exemplify the importance of understanding the unique needs across communities and provide lessons for how we most directly address barriers to collectively achieve our equity, air quality, and climate goals. Major Clean Transportation Equity Investment programs include: Clean Mobility Options, Clean Mobility in Schools, Financing Assistance; and Sustainable Transportation Equity Project (STEP). Clean Transportation Equity Investment projects were allocated \$150 million in the FY 2021-22 budget, which includes the \$75 million for CC4A mentioned above.

Financing Assistance provides eligible consumers buy-down and financing opportunities to purchase or lease a new or used clean vehicle, such as a conventional hybrid electric vehicle (HEV), plug-in hybrid (PHEV), or battery electric vehicle (BEV). Clean Mobility in Schools Projects are located within disadvantaged communities and are intended to encourage and accelerate the deployment of new zero-emission school buses, school fleet vehicles, passenger cars, lawn and garden equipment, and can incorporate alternative modes of transportation like transit vouchers, active transportation elements, and bicycle share programs. In the light-duty sector, some of the Clean Mobility Options programs that CARB funds include the Clean Mobility Options Voucher Pilot Program

(CMO). CMO provides voucher-based funding for low-income, tribal, and disadvantaged communities to fund zero-emission shared and on-demand services such as carsharing, ridesharing, bike sharing, and innovative transit services. STEP is a new transportation equity pilot program that funds zero-emission carsharing, bike sharing, public transit, and shared mobility subsidies, among other projects.

#### **C.I.A.6. Consumer Assistance Program**

California's voluntary vehicle retirement program, the Consumer Assistance Program (CAP), is administered by BAR and provides low-income consumers repair assistance including up to \$1,200 in emissions-related repairs if their vehicle fails its biennial Smog Check Test inspection, and/or up to \$1,500 per vehicle for retiring operational vehicles at BAR-contracted dismantler sites.

#### **C.I.B. Medium- and Heavy-Duty On-Road Trucks**

Due to the benefits of CARB's longstanding heavy-duty mobile source program, heavy-duty on-road vehicle emissions in the Sacramento Metro nonattainment area have been reduced significantly since 1990 and will continue to decrease through 2032. From today, medium- and heavy-duty NO<sub>x</sub> emissions are projected to decrease by over 71 percent in 2032. Key programs contributing to those reductions include new heavy-duty engine standards, cleaner diesel fuel requirements, California's Truck and Bus Regulation and incentive programs.

##### **C.I.B.1. Heavy-Duty Engine Standards**

Since 1990, heavy-duty engine NO<sub>x</sub> emission standards have become dramatically more stringent, dropping from 6 grams per brake horsepower-hour (g/bhp-hr) in 1990 down to the current 0.2 g/bhp-hr standard, which took effect in 2010. In addition to mandatory NO<sub>x</sub> standards, there have been several generations of optional lower NO<sub>x</sub> standards put in place over the past 15 years. Most recently in 2015, engine manufacturers were allowed to certify to three optional NO<sub>x</sub> emission standards of 0.1g/bhp-hr, 0.05 g/bhp-hr, and 0.02 g/bhp-hr (i.e., 50 percent, 75 percent, and 90 percent lower than the current mandatory standard of 0.2 g/bhp-hr). The optional standards allow local air districts and CARB to preferentially provide incentive funding to buyers of cleaner trucks, and to encourage the development of cleaner engines.

##### **C.I.B.2. Optional Low- NO<sub>x</sub> Standards for Heavy-Duty Diesel Engines**

In 2013, California established optional low- NO<sub>x</sub> standards for heavy-duty diesel engines (Optional Reduced Emissions Standards for Heavy-Duty Engines regulation), with the most aggressive standard being 0.02 g/bhp-hr, 90 percent below the federally required standard. The optional low- NO<sub>x</sub> standards were developed to pave the way for more stringent mandatory standards by encouraging manufacturers to develop and certify low-NO<sub>x</sub> engines and incentivizing potential customers to purchase these low-NO<sub>x</sub> engines. By 2019, a total of fifteen engines families, some using natural gas and others using liquefied petroleum gas, had been certified to the optional low-NO<sub>x</sub> standards.

### C.I.B.3. Heavy-Duty Engine and Vehicle Omnibus Regulation

In 2021, CARB comprehensively overhauled how NO<sub>x</sub> emissions from new heavy-duty engines are regulated in California through the adoption of the Heavy-Duty Engine and Vehicle Omnibus Regulation which reduces NO<sub>x</sub> emissions from the engines in medium- and heavy-duty vehicle classes. The Omnibus Regulation includes NO<sub>x</sub> certification emission standards and in-use standards that significantly reduce tailpipe NO<sub>x</sub> emissions during most vehicle operating modes such as high-speed steady-state, transient, low load urban driving, and idling modes of operation. Additionally, revisions to the emissions warranty, useful life, emissions warranty and reporting information and corrective action procedures, and durability demonstration procedures provide additional emission benefits by encouraging more timely repairs to emission-related malfunctions and encouraging manufacturers to produce more durable emission control components, thereby reducing the rate at which engine emission controls fail and emissions increase.

### C.I.B.4. Cleaner In-Use Heavy-Duty Trucks (Truck and Bus Regulation)

California's Truck and Bus Regulation or In-Use Heavy-Duty Truck Rule was first adopted in December 2008. This rule represents a multi-year effort to turn over the legacy fleet of heavy-duty on-road engines and replace them with the cleanest technology available. In December 2010, CARB revised specific provisions of the In-Use Heavy-duty Truck Rule, in recognition of the deep economic effects of the recession on businesses and the corresponding decline in emissions.

Starting in 2012, the Truck and Bus Regulation phases in requirements applicable to an increasingly larger percentage of California's truck and bus fleet over time, so that by 2023 nearly all older vehicles will be upgraded to have exhaust emissions meeting 2010 model year engine emissions levels. The regulation applies to nearly all diesel-fueled trucks and buses with a gross vehicle weight rating (GVWR) greater than 14,000 pounds that are privately or federally owned, including on-road and off-road agricultural yard goat trucks, and privately and publicly owned school buses. Moreover, the regulation applies to any person, business, school district, or federal government agency that owns, operates, leases or rents affected vehicles. The regulation also establishes requirements for any in-State or out-of-state motor carrier, California-based broker, or any California resident who directs or dispatches vehicles subject to the regulation. Finally, California sellers of a vehicle subject to the regulation would have to disclose the regulation's potential applicability to buyers of the vehicles. Approximately 170,000 businesses in nearly all industry sectors in California, and almost a million vehicles that operate on California roads each year are affected. Some common industry sectors that operate vehicles subject to the regulation include: for-hire transportation, construction, manufacturing, retail and wholesale trade, vehicle leasing and rental, bus lines, and agriculture.

In 2017, California passed legislation ensuring compliance with the Truck and Bus Regulation through the California Department of Motor Vehicles (DMV) vehicle



registration program. Starting January 1, 2020, DMV verifies compliance to ensure that vehicles subject to the Truck and Bus Regulation meet the requirements prior to obtaining DMV vehicle registration. The law requires the DMV to deny registration for any vehicle that is non-compliant or has not been reported to CARB as compliant or exempt from the Truck and Bus Regulation.

CARB compliance assistance and outreach activities that are key in support of the Truck and Bus Regulation include:

- The Truck Regulations Upload and Compliance Reporting System (TRUCRS), an online reporting tool developed and maintained by CARB staff;
- The Truck and Bus regulation's fleet calculator, a tool designed to assist fleet owners in evaluating various compliance strategies;
- Targeted training sessions all over the State; and
- Out-of-state training sessions conducted by a contractor.

CARB staff also develops regulatory assistance tools, conducts and coordinates compliance assistance and outreach activities, administers incentive programs, and actively enforces the entire suite of regulations. Accordingly, CARB's approach to ensuring compliance is based on a comprehensive outreach and education effort.

#### C.I.B.5. Heavy-Duty Inspection and Maintenance Regulation

To ensure heavy-duty trucks remain clean in-use, CARB adopted in 2021 the Heavy-Duty Inspection and Maintenance Regulation, which requires periodic demonstrations that vehicles' emissions control systems are properly functioning in order to legally operate within the State. This regulation is designed to achieve criteria emissions reductions by ensuring that malfunctioning emissions control systems are repaired in a timely fashion.

#### C.I.B.6. Heavy-Duty On-Board Diagnostics (HD OBD)

OBD systems serve an important role in helping to ensure that engines and vehicles maintain low emissions throughout their full life. OBD systems monitor virtually all emission controls on gasoline and diesel engines, including catalysts, particulate matter (PM) filters, exhaust gas recirculation systems, oxygen sensors, evaporative systems, fuel systems, and electronic powertrain components as well as other components and systems that can affect emissions when malfunctioning. The systems also provide specific diagnostic information in a standardized format through a standardized serial data link on-board the vehicles. The use and operation of OBD systems ensure reductions of in-use motor vehicle and motor vehicle engine emissions through improvements in emission system durability and performance.

The CARB originally adopted comprehensive Heavy-Duty OBD regulations in 2005 for model year 2010 and subsequent heavy-duty engines and vehicles, referred to as HD OBD. In 2009, the Board updated the HD OBD regulation, adopted specific enforcement requirements, and aligned the HD OBD with OBD requirements for medium-duty vehicles.

In 2021, CARB again amended the HD OBD regulation; the 2021 amendments require manufacturers to implement Unified Diagnostic Services for OBD communications, which will provide more information related to emissions-related malfunctions that are detected by OBD systems, improve the usefulness of the generic scan tool to repair vehicles, and provide needed information on in-use monitoring performance.

#### C.I.B.7. Clean Diesel Fuel

Since 1993, CARB has required that diesel fuel have a limit on the aromatic hydrocarbon content and sulfur content of the fuel. Diesel powered vehicles account for a disproportionate amount of diesel particulate matter, which is considered a toxic air contaminant in California. In 2006, CARB required a low-sulfur diesel fuel to be used not only by on-road diesel vehicles but also for off-road engines. The diesel fuel regulation allows alternative diesel formulations as long as emission reductions are equivalent to the CARB formulation.

#### C.I.B.8. Advanced Clean Truck Regulation (ACT)

In June 2020, CARB adopted the Advanced Clean Trucks regulation, a first of its kind regulation requiring medium- and heavy-duty manufacturers to produce ZEVs as an increasing portion of their sales beginning in 2024. The Advanced Clean Trucks regulation is a manufacturers ZEV sales requirement and a one-time reporting requirement for large entities and fleets. This regulation is expected to result in roughly 100,000 heavy-duty ZEVs operating on California's roads by 2030 and nearly 300,000 heavy-duty ZEVs by 2035. With the adoption of the Advanced Clean Trucks regulation, CARB Resolution 20-19 directs staff to return to the Board with a zero-emission fleet rule and sets the following targets for transitioning California's heavy-duty vehicle sectors to ZEVs:

- 100 percent zero-emission drayage, last mile delivery, and government fleets by 2035;
- 100 percent zero-emission refuse trucks and local buses by 2040;
- 100 percent zero-emission-capable vehicles in utility fleets by 2040; and
- 100 percent zero-emission everywhere else, where feasible, by 2045.

As mentioned earlier, the Governor signed Executive Order N-79-20 in September 2020, which directs CARB to adopt regulations to transition the State's transportation fleet to ZEVs. This includes transitioning the State's drayage fleet to ZEVs by 2035 and transitioning the State's truck and bus fleet to ZEVs by 2045 where feasible.

#### C.I.B.9. Innovative Clean Transit (ICT) and Zero-Emission Airport Shuttle Regulation

To achieve the needed emission reductions from heavy-duty applications, CARB is driving the use of zero-emission heavy-duty vehicles in strategic applications, including urban transit buses and airport ground transportation. The Innovative Clean Transit regulation was the first of these programs. It was adopted in December 2018 and requires all public transit agencies to gradually transition to a 100 percent zero-emission bus fleet

and encourages them to provide innovative first- and last-mile connectivity and improved mobility for transit riders. Beginning in 2029, 100 percent of new purchases by transit agencies must be Zero Emission Buses, with a goal for full transition by 2040. It applies to all transit agencies that own, operate, or lease buses in California with a GVWR greater than 14,000 lbs. It includes standard, articulated, over-the-road, double-decker, and cutaway buses.

The Zero-Emission Airport Shuttle Regulation, adopted in June 2019, requires airport shuttle operators in California to transition to 100 percent ZEV technologies. Airport shuttle operators must begin adding zero-emission shuttles to their fleets in 2027 and complete the transition to ZEVs by the end of 2035. The regulation applies to airport shuttle operators who own, operate, or lease vehicles at any of the 13 California airports regulated under this rule.

#### C.I.B.10. Incentive Programs

There are many different incentive programs focusing on heavy-duty vehicles that accelerate turnover to cleaner technologies, and thereby produce extra emission reductions beyond traditional regulations. Several State and local incentive funding pools have been used historically -- and remain available -- to fund the accelerated turnover of on-road heavy-duty vehicles.

##### C.I.B.10.a. Low Carbon Transportation Investments and Air Quality Improvement Program (Clean Transportation Incentives)

In addition to funding passenger vehicle incentive programs, the Low Carbon Transportation Investments and the Air Quality Improvement Program (Clean Transportation Incentives) also provides incentive funding for heavy-duty vehicles. This program both funds projects to accelerate fleet and engine turnover to cleaner existing technologies through the Hybrid and Zero-Emission Truck and Bus Voucher Incentive Project (HVIP) and Truck Loan Assistance program, as well as funding demonstration and pilot projects.

Beyond the vehicle purchasing incentives programs (CVRP and Clean Cars 4 All) and Clean Transportation Equity Investments, an additional \$873 million was allocated in the FY 2020-2021 budget for on-road heavy-duty trucks and off-road equipment. CARB provides these incentive funds following the principles of the portfolio approach, meaning that funding is provided across multiple sectors and applications – as well as across multiple technologies to support both the technologies that are providing emission reductions today, as well as those that are needed to meet future goals as the technology matures. This includes funding for demonstration and pilot projects, vouchers for advanced clean technologies, and financing and support for small fleets transitioning to cleaner technologies. Additionally, this year funding was set aside specifically for drayage trucks, transit buses, and school buses, all of which are primed to rapid transition to zero-emission.



C.I.B.10.a.i. Hybrid and Zero-Emission Truck and Bus Voucher Incentive Project (HVIP)

CARB's Hybrid and Zero-Emission Truck and Bus Voucher Incentive Project (HVIP) serves as the cornerstone program in CARB's advanced technology heavy-duty incentive portfolio. HVIP has provided funding since 2010 to support the long-term transition to cleaner combustion and zero-emission vehicles in the heavy-duty market. The program helps offset the higher costs of clean vehicles, and additional incentives are available for providing disadvantaged community benefits. HVIP responds to a key market challenge by making clean vehicles more affordable for fleets through point-of-purchase price reductions. With an HVIP voucher, technology-leading vehicles can be as affordable as their traditional fossil-fueled counterparts, enabling fleets of all sizes to deploy advanced technologies that are cleaner and quieter. HVIP is the earliest model in the United States to demonstrate the function, flexibility, and effectiveness of first-come first-served incentives that reduce the incremental cost of commercial vehicles. HVIP is fleet-focused, providing a streamlined and user-friendly option to encourage purchases and leases of advanced clean trucks and buses throughout California. Approved dealers are a key part of HVIP success and are trained to facilitate the application process. Vocations include freight and drayage trucks, delivery vans, utility vehicles, transit, school, and shuttle buses, refuse trucks, and more. In FY 2021-22, the Legislature allocated \$569.5 million for HVIP.

C.I.B.10.a.ii. Truck Loan Assistance Program

CARB's Truck Loan Assistance Program was created through a one-time appropriation of approximately \$35 million in the 2008 State Budget to implement a heavy-duty loan program that assists on-road fleets affected by the Truck and Bus Regulation and the Heavy-Duty Tractor-Trailer Greenhouse Gas Regulation. CARB has continued to operate this program with subsequently appropriated AQIP funds of around \$28 million annually to provide financing opportunities to small-business truckers who don't meet conventional lending criteria and are unable to qualify for traditional financing for cleaner trucks. As of February 2022, about \$187 million in Truck Loan Assistance Program funding has been provided to small business truckers for the purchase of approximately 36,000 cleaner trucks, exhaust retrofits, and trailers. In FY 2021-22, \$28.6 million was allocated for the Truck Loan Assistance Program.

C.I.B.10.a.iii. Demonstration and Pilot projects

In addition to funding HVIP and the Truck Loan Assistance Program, the Clean Transportation Incentives program is the only program in CARB's portfolio, and one of the only programs in the State, that funds demonstration and pilot projects to support early market deployment of nascent zero-emission technologies. The purpose of the Advanced Technology Demonstration and Pilot Projects is to help accelerate the next generation of advanced technology vehicles, equipment, or emission controls, which are not yet commercialized. As such, it provides a testing ground for innovative projects

focused on improving access to clean transportation for priority communities. In FY 2021-22, \$80 million was allocated for heavy-duty advanced technology demonstration and pilot projects, which are intended to help bring to market-readiness zero emission (ZE) heavy-duty technologies that are poised to deploy commercially in the near future in both on- and off-road applications. This includes zero-emission long-haul trucks, strategic truck range extenders, and ZE applications along freight facilities/corridors.

In heavy-duty applications, the goods movement sector is a focus for incentive funding, with CARB funding multiple demonstration and pilot programs to drive zero-emission technologies in last mile delivery trucks, drayage trucks, and heavy-duty trucks and tractors. The *USPS Zero-Emission Delivery Truck Pilot Commercial Deployment Project* is deploying battery electric last-mile delivery trucks in the USPS fleet, together with the associated charging infrastructure. The project will demonstrate the practicality and economic viability of the widespread adoption of a variety of ZE medium- and heavy-duty vehicle technologies in delivery applications. The *Battery Electric Drayage Truck Demonstration* project is a \$40 million Statewide demonstration of forty-four zero-emission battery electric and plug-in hybrid drayage trucks that, since 2018, have been in operation serving major California ports in five air districts (South Coast, Bay Area, San Joaquin Valley, Sacramento, and San Diego). Battery electric drayage trucks are used to transport cargo to or from California's ports and intermodal rail yards. Installation of charging infrastructure that enables safe charging of the trucks for statewide demonstration is also included as part of this project. To accelerate the deployment of zero-emission technologies in heavier freight applications, the \$44.8 million *Volvo Low Impact Green Heavy Transportation Solutions* project is funding Class 8 heavy-duty battery electric trucks equipped with battery electric tractors to facilitate creation of a zero-emission goods movement system from the Ports of Long Beach and Los Angeles to four freight handling facilities in disadvantaged communities.

Clean transportation incentives have also funded demonstrations and pilot projects for ZE urban transit buses. The \$22.3 million *Fuel Cell Electric Bus Commercialization Consortium* in the Bay Area and Southern California is funding battery and fuel cell urban transit buses, which will better serve communities' transit needs, substantially reduce greenhouse gas emissions, eliminate criteria pollutants, and provide economic benefits.

#### C.I.B.10.a.iv. Clean Transportation Equity Investments

As mentioned earlier, Clean Mobility in Schools Projects are also encouraging and accelerating the deployment of new zero-emission heavy-duty engines and vehicles, including battery electric school buses and clean school fleet vehicles.

#### C.I.B.10.b. Moyer Program

The Carl Moyer Memorial Air Quality Standards Attainment Program (Moyer Program), funded by dedicated revenue from the DMV's smog abatement fee and a fee on the purchase of new tires, provides approximately \$60 million in grant funding annually through local air districts for cleaner-than-required engines and equipment. Since 1998,

approximately \$1 billion has been allocated to date. The Moyer Program provides monetary grants to private companies and public agencies to clean up their heavy-duty engines beyond that required by law through retrofitting, repowering or replacing their engines with newer and cleaner ones. These grants are issued locally by air districts. Projects that reduce emissions from heavy-duty on-road engines qualify, including heavy-duty trucks, drayage trucks, emergency vehicles, public agency and utility vehicles, school buses, solid waste collection vehicles, and transit fleet vehicles.

As the regulatory, technological and incentives landscape have changed significantly since the creation of the Moyer Program and to address evolving needs, the Legislature has periodically modified the program to better serve California. Most recently, Senate Bill (SB) 513 (Beall, 2015) has provided new opportunities for the Moyer Program to contribute significant emission reductions alongside implemented regulations, advance zero and near-zero technologies, and combine program funds with those of other incentive programs.

In the FY 2021-22 budget, the Legislature appropriated an additional \$45 million in Moyer Program funding to support the replacement of diesel trucks with ultra-low  $\text{NO}_x$  trucks certified to meet the 0.02 g/bhp-hr  $\text{NO}_x$  standard or lower. Currently, only the South Coast Air Quality Management District and the San Joaquin Valley Air Pollution Control District would be eligible for these funds. In November 2021, the Board approved increases to the Moyer Program cost-effectiveness limits and funding caps for optional advanced technology and zero-emission replacement projects for on-road heavy-duty trucks. Increasing the cost-effectiveness thresholds is designed to increase funding opportunities and ensures that the Moyer Program continues to focus on developing the most advanced zero-emission and low emission technologies, consistent with encouraging further emissions reductions. These changes included increasing the threshold for on-road zero-emission vehicles, which includes zero-emission school buses, from \$100,000 to \$500,000 per unit.

The Moyer Program also funds CARB's On-Road Heavy-Duty Voucher Incentive Program (VIP), which provides funding opportunities for small fleet owners with 10 or fewer vehicles to quickly replace their older heavy-duty diesel or alternative fuel vehicles. Under this program, fleet owners may be eligible for funding of up to \$410,000 for replacing their existing vehicle(s) to be scrapped and replaced by new trucks (zero-emission or certified to the optional 0.02 g/bhp-hr  $\text{NO}_x$  standard), or up to \$50,000 for replacing their existing fleet with used vehicles with 2013 model year or later engines. Air districts have the discretion to set certain local eligibility requirements based upon local priorities.

#### **C.I.B.10.c. Goods Movement Emission Reduction Program (Prop 1B)**

The Prop 1B Program was created to reduce exposure for populations living near freight corridors and facilities that were being adversely impacted by emissions from goods movement. This program provided incentives to owners of equipment used in freight

movement to upgrade to cleaner technologies sooner than required by law or regulation. Voters approved \$1 billion in total funding for the air quality element of the Prop 1B Program to complement \$2 billion in freight infrastructure funding under the same ballot initiative.

Beginning in 2008, the Goods Movement Emission Reduction Program funded by Prop 1B has funded cleaner trucks for the region's transportation corridors; the final increment of funds implemented projects through 2020. The \$1 billion program was a partnership between CARB and local agencies, air districts, and seaports to quickly reduce air pollution emissions and health risk from freight movement along California's trade corridors. While all Prop 1B Program funds have been awarded to the local air districts for implementation, the program framework exists to serve as a mechanism to award clean truck funds through newer funding programs.

#### **C.I.B.10.d. Volkswagen (VW) Mitigation Trust**

In 2015, after a CARB-led investigation, in concert with the United States Environmental Protection Agency (EPA), VW admitted to deliberately installing emission defeat devices on nearly 600,000 VW, Audi, and Porsche diesel vehicles sold in the United States, approximately 85,000 of which were sold in California. The VW California settlement agreement includes both a Mitigation Trust to mitigate the excess NO<sub>x</sub> emissions caused by the company's use of illegal defeat devices in their vehicles, as well as a ZEV Investment Commitment to help grow the State's expanding ZEV program. The Mitigation Trust includes approximately \$423 million for California to be used as specified in the settlement agreement. Per the Beneficiary Mitigation Plan approved by CARB in 2018, this funding will be used to replace older heavy-duty trucks, buses, and freight vehicles and equipment with cleaner models, with a focus on zero-emission technologies where available and cleaner combustion everywhere else, as well as to fund light-duty ZEV infrastructure. In addition, there have been mitigation funds established as the result of other settlements from which funding is used to support clean technologies.

#### **C.I.B.10.e. Community Air Protection Incentives (AB 617 | Community Air Protection Program)**

Since the 2016 State SIP Strategy elucidated the need for additional legislative assistance in funding turnover programs to accelerate the deployment and adoption of cleaner technologies, the Legislature has since 2017 established a number of new incentive programs that are implemented through CARB through various budget bills. The State Legislature has provided substantial funding to achieve early emissions reductions in the communities most impacted by air pollution. In its 2018 funding allocation, the Legislature expanded the possible uses of AB 617 funds to include Moyer and Proposition 1B eligible projects with a priority on zero-emission projects, zero-emission charging infrastructure, stationary source projects, and additional projects consistent with the CERPs.

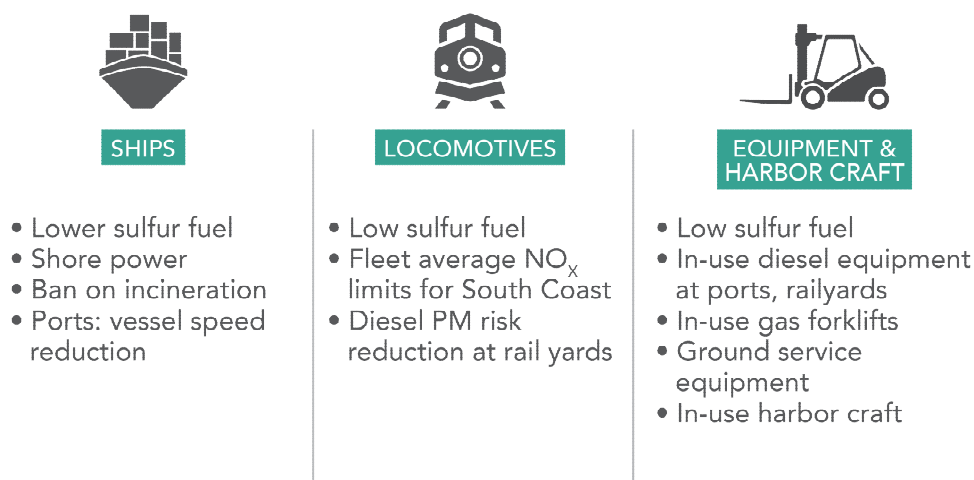
CARB and air districts partner to run the programs, with CARB developing guidelines and the districts administering funds for their regions. In most cases throughout the State, selected communities have identified mobile source emissions as a target for reductions. It is likely that a significant portion of the AB 617-allocated funding will incentivize the accelerated turnover to cleaner vehicles and equipment in and around low-income and disadvantaged communities.

### C.I.C. Off-Road Sources

Off-road sources encompass equipment powered by an engine that does not operate on the road. Sources vary from ships to lawn and garden equipment and for example, include sources like locomotives, aircraft, tractors, harbor craft, off-road recreational vehicles, construction equipment, forklifts, and cargo handling equipment.

Figure C-2 illustrates the comprehensive suite of emission control measures applicable to the broad variety of engines and vehicles that fall under the Off-Road category. As a result of these emission control efforts, off-road emissions in the Sacramento Metro nonattainment area have been reduced significantly since 1990 and will continue to decrease through 2032. From today, NO<sub>x</sub> emissions from off-road sources that are not primarily regulated Federally are projected to decrease by over 52 percent by 2032. Key programs in this sector include the Off-Road Engine Standards, Locomotive Engine Standards, Clean Diesel Fuel, Cleaner In-Use Off-Road Regulation, and the In-Use Large Spark Ignition (LSI) Fleet Regulation.

Figure C-2 Off-Road Vehicle and Equipment Control Programs



#### C.I.C.1. Off-Road Engine Standards

The Clean Air Act preempts states, including California, from adopting requirements for new off-road engines less than 175 HP used in farm or construction equipment. California may adopt emission standards for in-use off-road engines pursuant to Section 209(e)(2) but must receive authorization from EPA before it may enforce the adopted standards.



CARB first approved regulations to control exhaust emissions from small off-road engines (SORE) such as lawn and garden equipment in December 1990 with amendments in 1998, 2003, 2010, 2011, 2016, and 2021. The 1990 - 2016 regulations were implemented through three tiers of progressively more stringent exhaust emission standards that were phased in between 1995 and 2008. The most recent suite of amendments (December 2021) requires most newly manufactured SORE engines be zero emission starting in 2024.

Manufacturers of forklift engines are subject to new engine standards for both diesel and Large Spark Ignition (LSI) engines. Off-road diesel engines were first subject to engine standards and durability requirements in 1996 while the most recent Tier 4 Final emission standards were phased in starting in 2013. Tier 4 emission standards are based on the use of advanced after-treatment technologies such as diesel particulate filters and selective catalytic reduction. LSI engines have been subject to new engine standards that include both criteria pollutant and durability requirements since 2001 with the cleanest requirements phased-in starting in 2010.

To control emissions from Transport Refrigeration Units (TRUs), CARB adopted in 2004 the Airborne Toxic Control Measure (ATCM) for In-Use Diesel-Fueled TRUs, TRU Generator Sets, and Facilities where TRUs Operate, which set increasingly stringent engine standards to reduce diesel particulate matter emissions from TRUs and TRU generator sets. The ATCM for TRUs was subsequently amended in 2010 and 2011, and most recently in February 2022, as the first phase of CARB's current push to develop new requirements to transition diesel-powered TRUs to zero-emission technology in two phases. The February 2022 adoption, Part 1 amendments to the existing TRU Airborne Toxic Control Measure (ATCM), requires the transition of diesel-powered truck TRUs to zero-emission. CARB plans to develop a subsequent Part 2 regulation to require zero-emission trailer TRUs, domestic shipping container TRUs, railcar TRUs, and TRU generator sets, for future Board consideration.

#### C.I.C.2. Cleaner In-Use Off-Road Equipment (Off-Road Regulation)

The Off-Road Regulation was first approved in 2007 and subsequently amended in 2010 in light of the impacts of the economic recession. Equipment affected by this regulation is used in construction, manufacturing, the rental industry, road maintenance, airport ground support and landscaping. In December 2011, the Off-Road Regulation was modified to include on-road trucks with two diesel engines.

The Off-Road Regulation will significantly reduce emissions of diesel PM and NO<sub>x</sub> from the over 150,000 in-use off-road diesel vehicles that operate in California. The Regulation affects dozens of vehicle types used in thousands of fleets by requiring owners to modernize their fleets by replacing older engines or vehicles with newer, cleaner models, retiring older vehicles or using them less often, or by applying retrofit exhaust controls.

The Off-Road Regulation imposes idling limits on off-road diesel vehicles, requires a written idling policy, and requires a disclosure when selling vehicles. The Regulation also requires that all vehicles be reported to CARB and labeled, restricts the addition of older vehicles into fleets, and requires fleets to reduce their emissions by retiring, replacing, or repowering older engines, or installing verified exhaust retrofits. The requirements and compliance dates of the Off-Road Regulation vary by fleet size.

Fleets are subject to increasingly stringent restrictions on adding older vehicles. The regulation also sets performance requirements. While the regulation has many specific provisions, in general by each compliance deadline, a fleet must demonstrate that it has either met the fleet average target for that year or has completed the Best Available Control Technology requirements. The performance requirements of the Off-Road Regulation were phased in from January 1, 2014, through January 1, 2019.

Compliance assistance and outreach activities in support of the Off-Road Regulation include:

- The Diesel Off-road On-line Reporting System, an online reporting tool developed and maintained by CARB staff;
- The Diesel Hotline (866-6DIESEL), which provides the regulated public with questions about the regulations and access to CARB staff. Staff is able to respond to questions in English, Spanish and Punjabi; and
- The Off-road Listserv, providing equipment owners and dealerships with timely announcement of regulatory changes, regulatory assistance documents, and reminders for deadlines.

#### C.I.C.3. Clean Diesel Fuel

Since 1993, CARB has required that diesel fuel have a limit on the aromatic hydrocarbon content and sulfur content of the fuel. Diesel powered vehicles account for a disproportionate amount of diesel particulate matter which is considered a toxic air contaminant by the State of California. In 2006, CARB required a low-sulfur diesel fuel to be used not only by on-road diesel vehicles but also for off-road engines. The diesel fuel regulation allows alternative diesel formulations as long as emission reductions are equivalent to the CARB formulation.

#### C.I.C.4. Locomotive Engine Standards

The Clean Air Act and the EPA national locomotive regulations expressly preempt states and local governments from adopting or enforcing “any standard or other requirement relating to the control of emissions from new locomotives and new engines used in locomotives” (EPA interpreted new engines in locomotives to mean remanufactured engines, as well). EPA has approved two sets of national locomotive emission regulations (1998 and 2008). In 1998, EPA approved the initial set of national locomotive emission regulations. These regulations primarily emphasized NO<sub>x</sub> reductions through Tier 0, 1,

and 2 emission standards. Tier 2 NO<sub>x</sub> emission standards reduced older uncontrolled locomotive NO<sub>x</sub> emissions by up to 60 percent, from 13.2 to 5.5 g/bhphr.

In 2008, EPA approved a second set of national locomotive regulations. Older locomotives upon remanufacture are required to meet more stringent particulate matter (PM) emission standards which are about 50 percent cleaner than Tier 0-2 PM emission standards. EPA refers to the PM locomotive remanufacture emission standards as Tier 0+, Tier 1+, and Tier 2+. The new Tier 3 PM emission standard (0.1 g/bhphr), for model years 2012-2014, is the same as the Tier 2+ remanufacture PM emission standard. The 2008 regulations also included new Tier 4 (2015 and later model years) locomotive NO<sub>x</sub> and PM emission standards. The EPA Tier 4 NO<sub>x</sub> and PM emission standards further reduced emissions by approximately 95 percent from uncontrolled levels.

In April 2017, CARB petitioned EPA for rulemaking, seeking the amendment of emission standards for newly built locomotives and locomotive engines and lower emission standards for remanufactured locomotives and locomotive engines. The petition asks EPA to update its standards to take effect for remanufactured locomotives in 2023 and for newly built locomotives in 2025. The new emission standards would provide critical criteria pollutant reductions, particularly in the disadvantaged communities that surround railyards. EPA has not yet responded to this petition.

#### C.I.C.5. Marine Sources and Ocean-Going Vessels (OGVs)

To reduce emissions from Ocean Going Vessels (OGV), CARB has adopted the Ocean-Going Vessel Fuel Regulation, “Fuel Sulfur and Other Operational Requirements for Ocean-Going Vessels within California Waters and 24 Nautical Miles of the California Baseline” (2008) and the Ocean-Going Vessels At Berth Regulation (2007).

The At-Berth Regulation requires container ships, passenger ships, and refrigerated-cargo ships at six California ports to meet compliance requirements for auxiliary engines while they are docked, including emission or power reduction requirements. Reduced vessel speeds also provide emission reduction benefits, and programs are operated by local air districts along the California coast to incentivize lower speeds. CARB staff received comments during the public process about including a statewide vessel speed reduction program. In the 2022 State SIP Strategy, the CARB measure for ‘Future Emissions Reductions from Ocean-Going Vessels’ considers options available under CARB authority to achieve further emissions reductions, including developing a statewide vessel speed reduction program.

In 2007, CARB adopted the Commercial Harbor Craft Regulation (CHC Regulation), which reduces toxic and criteria emissions. Commercial harbor craft include any private, commercial, government, or military marine vessels including, but not limited to ferries, excursion vessels, tugboats (including ocean-going tugboats), barges, and commercial and commercial passenger fishing boats. This regulation was subsequently amended in 2010, and again in March 2022, to establish expanded and more stringent in-use



requirements to cover more vessel categories and mandate accelerated deployment of zero-emission and advanced technologies in vessel categories where technology feasibility has been demonstrated.

To control emissions from personal watercraft, CARB staff is also exploring development of Spark-Ignition Marine Engine Standards, as described in the 2022 State SIP Strategy. For this measure, CARB would develop and propose catalyst-based standards for outboard and personal watercraft engines greater than or equal to 40 kW in power that will gradually reduce emission standards to approximately 70 percent below current levels and consider actions that would require a percentage of outboard and personal watercraft vessels to be propelled by zero-emission technologies for certain applications.

#### C.I.C.6. Large Spark-Ignition (LSI) Engines and Forklifts

Forklift fleets are subject to in-use fleet requirements either under the LSI fleet regulation, if fueled by gasoline or propane, or under the off-road diesel fleet regulation, if fueled by diesel. Both regulations require fleets to retire, repower, or replace higher-emitting equipment in order to maintain fleet average standards.

Large spark-ignition engines, which are defined as spark-ignition (i.e., Otto-cycle) engines greater than 25 horsepower, are used in a variety of equipment, including, but not limited to, forklifts, airport ground support equipment (GSE), sweeper/scrubbers, industrial tow tractors, generator sets, and irrigation pumps. LSI equipment is found in approximately 2,000 fleets throughout the state operating at warehouses and distribution centers, seaports, airports, railyards, manufacturing plants, and many other commercial and industrial facilities.

CARB first adopted emission standards for off-road LSI engines in 1998. The original LSI regulation required engine manufacturers to certify new LSI engines to a 3.0 gram per brake horsepower-hour (g/bhp-hr) standard that, by 2004, represented a 75 percent reduction in emissions compared with uncontrolled LSI. Building on this success, in 2002, EPA subsequently harmonized the national standard with California's standard, starting with the 2004 model year and adopted a more stringent 2.0 g/bhp-hr standard for 2007 and subsequent model year engines. The federal program demonstrated that additional reductions from new engines were technically feasible and cost-effective. In the 2003 State Implementation Plan for Ozone (2003 SIP), California committed to two additional LSI measures—one for the development of more stringent new engine standards and another for the development of in-use fleet requirements.

CARB adopted these two LSI measures in a 2006 rulemaking, which harmonized California's standard with EPA's 2.0 g/bhp-hr standard starting with the 2007 model year, set forth a more stringent 0.6 g/bhp-hr California standard starting with the 2010 model year, and established in-use LSI fleet requirements. The 0.6 g/bhp-hr standard represents a 95 percent emission reduction versus uncontrolled LSI engines and is still in effect today.

The in-use element of the 2006 rulemaking, adopted as the Large Spark-Ignition Engine Fleet Requirements Regulation (LSI Fleet Regulation), which was eventually amended in 2010 and 2016, requires fleet operators with four or more LSI forklifts to meet fleet average emission standards. The 2006 LSI rulemaking and 2010 amendments required specific hydrocarbon + NO<sub>x</sub> fleet average emission level standards that became increasingly more stringent over time. The focus of the 2016 amendments was to collect data from fleet operators in order to inform the development of requirements that would support the broad-scale deployment of Zero-Emission equipment in LSI applications. The 2016 amendments also required fleet operators to report key compliance information to CARB and extended to 2023 requirements from the prior LSI Fleet Regulations that were otherwise due to sunset in 2016.

#### C.I.C.7. Cargo Handling Equipment (CHE)

Cargo handling equipment (CHE) includes yard trucks (hostlers), rubber-tired gantry cranes, container handlers, forklifts, dozers, and other types. The Cargo Handling Equipment (CHE) Regulation established requirements for in-use and newly purchased diesel-powered equipment at ports and intermodal rail yards. CARB adopted the CHE in 2005, which established best available control technology (BACT) for new and in-use mobile CHE that operate at California's ports and intermodal rail yards through accelerated turnover of older equipment through retrofits and/or replacement to cleaner on- or off-road engines. Since 2006, the CHE Regulation has resulted in reductions of diesel PM and NO<sub>x</sub> at ports and intermodal rail yards throughout California.

#### C.I.C.8. Incentive Programs

There are many different incentive programs focusing on off-road mobile sources that increase the penetration of cleaner technologies into the market. The incentive programs encourage the purchase of cleaner off-road combustion engines and equipment, and zero-emission technologies. CARB is expanding incentives for zero-emission off-road equipment through targeted demonstration and pilot project categories in the off-road sector, and increased funding.

##### C.I.C.8.a. Low Carbon Transportation Investments and Air Quality Improvement Program (Clean Transportation Incentives)

As mentioned earlier, \$873 million was allocated in the FY 2020-2021 budget for off-road equipment and on-road heavy-duty trucks under the Clean Transportation Incentives programs. In the off-road sector, major programs include the Clean Off-Road Equipment Voucher Incentive Project (CORE), and Demonstration and Pilot Programs. Off-road equipment categories that are prioritized for funding include agricultural and construction equipment, small off-road engines (SORE) such as lawn and garden equipment, heavier cargo handling equipment (CHE), and ZE applications at railyards, marine ports, freight facilities, and along freight corridors.

C.I.C.8.a.i. Clean Off-Road Equipment Voucher Incentive Project

The Clean Off-Road Equipment Voucher Incentive Project (CORE) is a voucher project similar to HVIP, but for advanced technology off-road equipment. CORE is intended to accelerate deployment of advanced technology in the off-road sector by providing a streamlined way for fleets to access funding that helps offset the incremental cost of such technology. CORE targets commercial-ready products that have not yet achieved a significant market foothold. By promoting the purchase of clean technology over internal combustion options, the project is expected to reduce emissions, particularly in areas that are most impacted, help build confidence in zero-emission technology in support of CARB strategies and subsequent regulatory efforts where possible, and provide other sector-wide benefits, such as technology transferability, reductions in advanced-technology component costs, and larger infrastructure investments. CORE provides vouchers to California purchasers and lessees of zero-emission off-road equipment on a first-come, first-served basis, with increased incentives for equipment located in disadvantaged communities.

CARB launched CORE at the end of 2019 through a one-time \$40 million allocation in the fiscal year 2017-18 Funding Plan to support zero-emission freight equipment through CORE. Since that time, CORE has been allocated significant additional funds, including \$194.95 million from the FY 2021-22 budget. This allocation includes \$30 million of dedicated funds appropriated by the Legislature in SB 170 to provide incentives for professional landscaping services in California operated by small businesses or sole proprietors to purchase zero-emission small off-road equipment.

C.I.C.8.a.ii. Demonstration and Pilot Projects

As mentioned earlier, in FY 2021-22, \$80 million was allocated for off-road and on-road heavy-duty advanced technology demonstration and pilot projects. CARB is focusing funding on off-road demonstration and pilot projects that include heavier cargo handling equipment (CHE), clean equipment in rail, marine, and ports applications, and zero-emission equipment along freight facilities/corridors.

For the *Port of LA Multi-Source Facility Demonstration Project*, the Los Angeles Harbor Department (Port of LA) was awarded \$14.5 million to operate multiple near zero- or zero-emission technologies to move goods from ships through the Green Omni Terminal. This project is demonstrating the viability of electrified CHE, forklifts, and a ships at-berth vessel emissions control system. The *Zero-Emission Freight "Shore to Store" Project* will use \$41.1 million to fund electric yard tractors, hydrogen fuel cell Class 8 on-road trucks, and a large capacity hydrogen fueling station in Ontario, CA. Additional zero- and near zero-emission freight facility projects include a \$5.8 million *Zero-Emission for California Ports* project at the Port of LA, which will fund hybrid fuel cell and electric yard trucks, as well as hydrogen fueling stations. Further, the San Joaquin Valley's *Net-Zero Farming and Freight Facility Demonstration Project* is funding battery electric trucks equipped with

all-electric transport refrigeration units (eTRUs) to facilitate clean freight transport, and transportation of agricultural produce between packing and warehouse facilities.

#### **C.I.C.8.b. Funding Agricultural Replacement Measures for Emission Reductions (FARMER)**

California's agricultural industry consists of approximately 77,500 farms and ranches, providing over 400 different commodities, making agriculture one of the State's most diverse industries. In recognition of the strong need and this industry's dedication to reducing their emissions, the Legislature has allocated over \$323 million towards the Funding Agricultural Replacement Measures for Emission Reductions (FARMER) Program since 2017. The program provides funding through local air districts for incentivizing the introduction of lower-emissions agricultural harvesting equipment, heavy-duty trucks, agricultural pump engines, tractors, and other equipment used in agricultural operations. Since October 2019, the FARMER Program also includes a project category for demonstration projects and modifications to the zero-emission agricultural utility terrain vehicle (UTV), heavy-duty agricultural truck, and off-road mobile agricultural equipment trade-up pilot project categories. As of March 31, 2022, the FARMER Program has spent \$298 million on over 7,000 pieces of agricultural equipment and will reduce 1,210 tons of PM<sub>2.5</sub> and 20,000 tons of NO<sub>x</sub> over the lifetime of the projects, Statewide.

#### **C.I.C.8.c. Moyer Program**

In addition to funding on-road incentives, the Moyer Program provides monetary grants to reduce emissions from off-road equipment such as construction and agricultural equipment, marine vessels and locomotives, forklifts, TRUs, and airport ground support equipment.

#### **C.I.C.8.d. Goods Movement Emission Reduction Program (Prop 1B)**

As discussed earlier, Proposition 1B was a \$1 billion partnership between CARB and local agencies, air districts, and seaports to quickly reduce air pollution emissions and health risk from freight movement along California's trade corridors. Over the course of six years, the program has upgraded ships at-berth, cargo handling equipment, locomotives, TRUs, and harbor craft.

### **C.I.D. Conclusions**

In conclusion, CARB has implemented the most comprehensive mobile source emissions control program in the nation. CARB's mobile source control program is robust and targets all sources of emissions through a four-pronged approach. First, increasingly stringent emissions standards drive the use of the cleanest available engines and equipment and minimize emissions from new vehicles and equipment. Second, to speed the turnover of older, dirtier engines and equipment to cleaner new equipment, in-use programs target emissions from the existing fleet by requiring vehicle and fleet owners to transition legacy fleets and vehicles to the cleanest vehicles and emissions control

technologies. Third, incentive programs help fleet owners to replace older, dirtier vehicles and equipment with the cleanest technologies, while also facilitating the development of the next generation of clean technologies that are needed to meet future air quality targets. Finally, cleaner fuels minimize emissions from all combustion engines being used across the State.

This multi-faceted approach has not only spurred the development and use of increasingly cleaner technologies and fuels, it has also provided significant emission reductions across all mobile source sectors that go far beyond national programs or programs in other states.

## C.II. Current local stationary and area sources control measures

The SFNA air districts have been regulating air pollution sources since the 1970s. Current rules and their emission benefits have helped and will continue to help make progress toward achieving the nonattainment area's clean air goals.

### C.II.A. Existing Local VOC Control Measures

Table C-1 lists the current air districts' rules for different VOC emissions reduction categories. The numbers in parentheses are the year which the rule was initially adopted. The following sections provide a brief description of the control measures.

Table C-1 Current VOC Rules by SFNA Air District.

	Sac Metro AQMD	El Dorado AQMD	Feather River AQMD	Placer County APCD	Yolo-Solano AQMD
VOC Rule Category					
<b>Adhesives</b>	Rule 460 Adhesive and Sealants (1997)	Rule 236 Adhesives (1995)		Rule 235 Adhesives (1995)	Rule 2.33 Adhesive Operations (1994)
<b>Aerospace Coatings</b>	Rule 456 Aerospace Assembly and Component Coating Operations (1993)				
<b>Architectural Coatings</b>	Rule 442 Architectural Coating (1982)	Rule 215 Architectural Coatings (1994)	Rule 3.15 Architectural Coatings (1991)	Rule 218 Architectural Coatings (1979)	Rule 2.14 Architectural Coatings (1979)
<b>Asphalt Paving Material</b>	Rule 453 Cutback and Emulsified Asphalt Paving Materials (1981)	Rule 224 Cutback and Emulsified Asphalt Paving Materials (1991)		Rule 217 Cutback and Emulsified Asphalt Paving Materials (1979)	Rule 2.28 Cutback and Emulsified Asphalts (1994)
<b>Auto Refinishing</b>	Rule 459 Automotive, Truck and Heavy Equipment Refinishing Operations (1996)	Rule 230 Automotive Refinishing Operations (1994)	Rule 3.19 Motor Vehicle and Mobile Equipment Coating Operations (1998)	Rule 234 Automotive Refinishing Operations (1995)	Rule 2.26 Motor Vehicle and Mobile Equipment Coating Operations (1994)
<b>Bakeries</b>	Rule 458 Large Commercial Bread Bakeries (1994)				
<b>Bulk Terminal</b>	Rule 446 Storage of Petroleum Products () Rule 447 Organic Liquid Loading (1974)	Rule 244 Organic Liquid and Transport Vessels (2001)	Rule 3.9 Organic Liquid and Transfer (1991)	Rule 212 Storage of Organic Liquids (1977) Rule 213 Gasoline Transfer into Stationary Storage Containers (1979)	Rule 2.21 Organic Liquid Storage and Transfer (1994)

	Sac Metro AQMD	El Dorado AQMD	Feather River AQMD	Placer County APCD	Yolo-Solano AQMD
VOC Rule Category					
Can & Coil Coatings				Rule 223 Metal Container Coating (1981)	
Confined Animal Facility	Rule 410 Reduction of Animal Matter (1972); Rule 496 Large Confined Animal Facilities (2006)	Rule 221 Reduction of Animal Matter (Unknown)		Rule 222 Reduction of Animal Matter (1979)	Rule 11.2 Confined Animal Facilities Permit Program (2006)
Dry Cleaning	Rule 444 Petroleum Solvent Dry Cleaning (1981)	Rule 218 Perchloroethylene Dry Cleaning Operations (1980)			Rule 9.7 Perchloroethylene Dry Cleaning Operation (1994)
Fugitive Emissions	<i>Rule 443 Leaks from Synthetic Organic Chemical and Polymer Manufacturing (1979)</i>	<i>Rule 245 Valves and Flanges (2001)</i>			Rule 2.23 - Fugitive Hydrocarbon Emissions (1997)
GDF	Rule 449 Gasoline Transfer into Stationary Storage Containers (1975)	Rule 238 Gasoline Transfer and Dispensing (2001)	Rule 3.8 Gasoline Dispensing Facilities (1991)	Rule 214 Transfer of Gasoline into Vehicle Fuel Tanks (1979); Rule 215 Transfer of Gasoline into Tank Trucks, Trailers and Railroad Tank Cars at Loading Facilities (1979)	Rule 2.22 Gasoline Dispensing Facilities (1974)
Graphic Arts	Rule 450 Graphics Art Operations (1981)	Rule 231 Graphics Arts Operations (1994)		Rule 239 Graphic Arts Operations (1994)	Rule 2.29 Graphics Arts Printing Operations (1994)
Landfill Gas	Rule 485 Municipal Landfill Gas (1997)		Rule 3.18 Standards for Municipal Solid Waste Landfills (1997)		Rule 2.38 Standards for Municipal Solid Waste Landfills (1997)
Misc. Metal Parts & Products Coatings	Rule 451 Surface Coating of Miscellaneous Metal Parts and Products (1979) Rule 468 Surface Coating of Plastic Parts and Products (2018)			Rule 245 Surface Coating of Metal Parts and Products (2008)	Rule 2.25 Metal Parts and Products Coating Operations (1980)



	Sac Metro AQMD	El Dorado AQMD	Feather River AQMD	Placer County APCD	Yolo-Solano AQMD
VOC Rule Category					
<b>Plastics Coating</b>	Rule 468 Surface Coating of Plastic Parts and Products (2018)			Rule 249 Surface Coating of Plastic Parts and Products (2013)	
<b>Polyester Resin Operations</b>	Rule 465 Polyester Resin Operations (1997)	Rule 240 Polyester Resin Operations (2000)		Rule 243 Polyester Resin Operations (2003)	Rule 2.30 Polyester Resin Operations (1993)
<b>Semiconductor Manufacturing</b>				Rule 244 Semiconductor Manufacturing Operations (1995)	
<b>Surface Preparation/ Cleanup</b>	Rule 451 Surface Coating of Miscellaneous Metal Parts and Products (1979); Rule 454 Degreasing Operations (1979) Rule 466 Solvent Cleaning (2002)	Rule 225 Solvent Cleaning and Degreasing Operations (1994) Rule 235 Surface Preparation and Cleanup (1995)	Rule 3.14 Surface Preparation and Clean-up (1991)	Rule 216 Organic Solvent Cleaning and Degreasing Operations (1979) Rule 240 Surface Preparation and Cleanup (1995)	Rule 2.31 Solvent Cleaning and Degreasing (1994) Rule 2.35 Pharmaceutical Manufacturing Operations (1994)
<b>Synthetic Organics Chemical Manufacturing Industry</b>	Rule 464 Organic Chemical Manufacturing Operations (1998)				Rule 2.41 Expandable Polystyrene Manufacturing Operations (2008)
<b>Wood Coatings</b>	Rule 463 Wood Products Coatings (1996)	Rule 237 Wood Products Coatings (1995)	Rule 3.20 Wood Products Coating Operations (2005)	Rule 236 Wood Products Coating Operations (1994) Rule 238 Factory Coating of Flat Wood Paneling (1994)	Rule 2.39 Wood Products Appliances (2004)

#### C.II.A.1. Adhesives and Sealants

Adhesives are used to bond one surface to another by attachment. A variety of adhesives are available for applications including, but not limited to, architectural applications such as carpet, flooring, and roofing, as well as adhesives for plastic, tires, traffic marking tape, metal, fiberglass, and marine applications. Contact adhesives, for example, provide a quick bond between two surfaces by applying pressure without requiring fastening. Large quantities of adhesives are used in manufacturing furniture, the automotive industry, and in the construction industry. Sealants have adhesive properties and are generally used to fill, seal, waterproof, or weatherproof gaps or joints between two surfaces. They are used heavily in the construction industry. This control measure reduces emissions by limiting the VOC content in these materials.



### C.II.A.2. Architectural Coatings

This control measure regulates the VOC content of coatings applied to stationary structures and their appurtenances. These coatings include general use flat and non-flat coatings as well as specialty coatings, such as industrial maintenance coatings, lacquers, floor coatings, roof coatings, and stains. This control measure regulates the VOC content of architectural coatings that are manufactured, sold, and used in the nonattainment area.

### C.II.A.3. Asphalt Paving Material

Cutback asphalt is a blend of asphalt cement and solvent. The solvent ranges in volatility depending upon the need for rapid cure (uses highly volatile gasoline or naphtha), medium cure (uses less volatile kerosene), or slow cure (uses low volatility oils). The VOCs evaporate when the cutback asphalt cures, and can range from 20% to 50% by volume, averaging 35%. This control measure regulates VOC emissions from the use of cutback and emulsified asphalt in paving materials, paving and maintenance operations. It also prohibits the sale and use of the asphalt materials that do not meet the requirements specified in the measure.

### C.II.A.4. Bakeries

Bakeries emit VOC emissions from their baking process. This control measures regulate the VOC emissions from large commercial bakeries, which produce more than or equal to 100 pounds per operating day of VOC emissions during the baking process. A facility must install technologically feasible and cost-effective control devices, such as thermal regeneration and catalytic incineration.

### C.II.A.5. Bulk Terminal

Bulk terminal is an organic liquid distribution facility which receives organic liquid from the refinery by means other than truck. This control measure regulates VOC emissions from loading of organic liquids. This control measure also applies to loading of organic liquids to any tank truck, trailer, or railroad tank car from a bulk plant or a bulk terminal.

### C.II.A.6. Confined Animal Facility

Confined animal facilities are commercial agricultural operations that are used for the raising of animals, including cattle, calves, chickens, ducks, goats, horses, sheep, swine, rabbits, and turkeys. The animals are corralled, penned, or otherwise confined in restricted areas and fed by a means other than grazing. VOCs are emitted from manure and feed as well as directly from the animals. This control measure reduces emissions from a variety of emission points, including feed, silage, milking parlors, free stalls, corrals, solid waste, and liquid waste. Facility operators may choose from a list of mitigation measures that best suits their individual operations.

#### C.II.A.7. Dry Cleaning

Dry cleaning operations use different types of cleaning solvents in its operations. The control measure limits VOC emissions from petroleum solvents used in dry cleaning. Dry cleaning operations that use solvents other than petroleum solvents are exempt.

#### C.II.A.8. Fugitive Emissions

Fugitive emissions are the release of hydrocarbons from leaking components at oil and gas production and processing facilities, refineries, chemical plants, gasoline terminals, and pipeline transfer stations. This control measure limits fugitive VOC emissions from components such as valves and flanges, fittings, pumps, compressors, pressure relief devices, diaphragms, hatches, sightglasses, and meters.

#### C.II.A.9. Gasoline Dispensing Facility

Gasoline dispensing facilities release VOC emission of gasoline vapor into the atmosphere during the transfer of gasoline from any stationary storage tank or delivery vessel into any motor vehicle fuel tank. This control measure required CARB-certified equipment used in the transfer process, which reduces the VOC emission of gasoline vapor into the atmosphere.

#### C.II.A.10. Graphic Arts

Graphic arts operations use different types of materials, such as coatings, adhesives, inks, e.g., printing ink, metallic ink, ultraviolet ink, fountain solutions, thinners, reducers, catalysts, colorants, to make graphics. This control measure applies to graphic arts operations, including screen printing operations, at any stationary source regardless of the substrate. This control measure limits the VOC content of materials used in graphic arts operations, including the solvents used for cleaning.

#### C.II.A.11. Landfill Gas

Municipal Solid Waste (MSW) landfills are used to dispose of residential refuse. After the waste is buried and compacted, anaerobic decomposition of the organic material generates large amounts of gas, which contains methane and VOCs. This control measure sets standards for gas collection and control systems, monitoring, reporting and recordkeeping requirements. Landfill gas emissions are reduced using a network of collection wells and blowers, which capture the landfill gas and deliver it to a combustion device, such as a flare, engine, boiler, or turbine.

#### C.II.A.12. Polyester Resin Operations

This control measure regulates VOC emissions during the curing of the resin. Emissions must be reduced by complying with limits on the monomer content of the resin, using vapor suppressants, using closed-mold systems, or using an emissions capture and control system. The control measure applies to all polyester resin (composite) operations, which include, but are not limited to, manufacture of: bathware products, vanity installations, recreational and commercial watercraft hulls, recreational vehicle bodies,

building panels and appliances, automotive, aerospace and aircraft components, and structural components for chemical process equipment and storage tanks.

#### C.II.A.13. Semiconductor Manufacturing

This control measure regulates the VOC emissions from semiconductor manufacturing operations. The control measure applies only to the manufacture of semiconductor and other related integrated circuits.

#### C.II.A.14. Surface Coating Operations

This control measure regulated the coating operation for different types of products and/or substrates. VOC emissions from the surface coating operations result from the evaporation of the organic solvents. These emissions occur in several places during the operation, including surface preparation and cleanup, application of the coating, drying of the parts, and cleanup of the application equipment. This control measure is subcategorized based on products and/or substrate, including the following:

- Aerospace Coating
- Automotive Refinishing
- Can and Coil Coating
- Miscellaneous Metal Parts and Products
- Plastic Parts and Products
- Wood coating

#### C.II.A.15. Surface Preparation/Cleanup

Surface preparation and cleanup control measure limits VOC emissions from solvents used in cleaning operations during the production, repair, maintenance or servicing of parts, products, tools, machinery, or equipment, or in general work areas. Degreasing is a cleanup process, which is widely used by automotive repair and maintenance facilities and by other types of commercial and manufacturing facilities. Organics solvents are also used in coating operations for cleaning of coating application equipment, such as spray guns, brushes, etc.

#### C.II.A.16. Synthetic Organics Chemical Manufacturing Industry

The synthetic organics chemical manufacturing industry control measure regulates VOC emissions from organic chemical manufacturing operations, including pharmaceutical and cosmetic manufacturing operations. The control measure only applies to pharmaceutical and cosmetic manufacturing plants, which includes lowering the applicability thresholds for the entire facility and for individual process equipment and increasing the combined system efficiency for control equipment.

#### C.II.B. Existing Local NO<sub>x</sub> Control Measures

Table C-2 lists the current air districts' rules for different NO<sub>x</sub> emissions reduction categories, and the following sections provide a brief description of the control measures. The numbers in parentheses are the year which the rule was initially adopted.

Table C-2 Current NO<sub>x</sub> Rules by SFNA Air District

	SMAQMD	El Dorado AQMD	Feather River AQMD	Placer County APCD	Yolo-Solano AQMD
<b>NO<sub>x</sub> Rule Category</b>					
<b>Boilers &amp; Steam Generators</b>	Rule 411 NO <sub>x</sub> from Boilers, Process Heaters, and Steam Generators (1995)	Rule 209 Fossil Fuel-Steam Generator Facility (Unknown) Rule 229 Industrial, Institutional, And Commercial Boilers, Steam Generators, And Process Heaters (Unknown) Rule 232 Biomass Boiler (1994)	Rule 3.21 Industrial, Institutional, and Commercial Boilers, Steam Generators, and Process Heaters (2006)	Rule 209 Fossil Fuel-Steam Facility Rule 231 Industrial, Institutional, And Commercial Boilers, Steam Generators and Process Heaters (1994) Rule 233 Biomass Boilers (1994)	Rule 2.16 Fuel Burning Heat or Power Generators Rule 2.27 Large Boiler (1993) Rule 2.43 Biomass Boilers (2010) Rule 2.45 Boilers (2019)
<b>Gas Turbines</b>	Rule 413 Stationary Gas Turbines (1995)			Rule 250 Stationary Gas Turbines (1994)	Rule 2.34 Stationary Gas Turbines (1994)
<b>Internal Combustion Engines</b>	Rule 412 Stationary IC Engines Located at Major Stationary Sources of NO <sub>x</sub> (1995)	Rule 233 Stationary Internal Combustion Boilers (1994)	Rule 3.22 Stationary Internal Combustion Engines (2009)	Rule 242 Stationary Internal Combustion Engines (2003)	Rule 2.32 -- Stationary Internal Combustion Engines (2001)
<b>Residential &amp; Small Water Heaters</b>	Rule 414 Water Heaters, Boilers and Process Heaters Rated Less Than 1,000,000 BTU Per Hour (1996)	Rule 239 Natural Gas-Fired Residential Water Heaters (Unknown)	Rule 3.23 Natural Gas-Fired Water Heaters, Small Boilers, and Process Heaters (2016)	Rule 246 Natural Gas-Fired Water Heaters (1997) Rule 247 Natural Gas-Fired Water Heaters, Small Boilers And Process Heaters (2013)	Rule 2.37 Natural Gas-Fired Water Heaters and Small Boilers (1994)
<b>Central Furnace/Miscellaneous Combustion Unit</b>	Rule 419 NO <sub>x</sub> from Miscellaneous Combustion Units (2018)				Rule 2.44 Central Furnaces (2009)

### C.II.B.1. Boilers, Process Heaters, and Steam Generators

Boilers and process heaters are used to provide hot water and steam for a variety of industrial and commercial applications, including space heating, food processing, garment laundering, and equipment sterilization. Manufacturing operations use process

heaters to heat materials or equipment during the manufacturing process. The equipment burners can be fired on solid, liquid, or gaseous fuels. NO<sub>x</sub> emissions are generated from the combustion of the fuel. This control measure regulates NO<sub>x</sub> emission from units fired on gaseous or nongaseous fuels with a rate heat input capacity to as low as 1 million British Thermal Unit (BTU) per hour.

#### C.II.B.2. Gas Turbines

Gas turbines use exhaust gasses from the combustion of gaseous or liquid fuels to spin the turbine blades, driving a shaft and producing mechanical power. In most stationary applications, the shaft is coupled to an electrical generator, which converts the mechanical power into electricity. Gas turbines systems are classified as either simple cycle or combined cycle. In a simple cycle system, heat from the hot exhaust gases is not recovered. In a combined cycle system, heat from the exhaust gases is used to produce steam, which passes through a steam turbine, producing additional power. Gas turbines control measure regulates NO<sub>x</sub> emissions from the operation of stationary gas turbines. The control measure applies to all stationary gas turbines with output ratings equal to or greater than 0.3 megawatt (MW), or input of 3 million BTU per hour and operated on gaseous and/or liquid fuel.

#### C.II.B.3. Internal Combustion Engines

Internal combustion (IC) engines are used in a wide variety of applications, including electrical power generation, liquid pumping, gas compression, mobile equipment, and vehicles. NO<sub>x</sub> is generated in IC engines from both the oxidation of nitrogen in the air (thermal NO<sub>x</sub>) and from the oxidation of fuel-bound nitrogen (fuel NO<sub>x</sub>). Emissions of NO<sub>x</sub> can be reduced using combustion controls, which modify the combustion characteristics, or using post-combustion controls, such as nonselective catalytic reduction (NSCR) and selective catalytic reduction (SCR). Internal Combustion Engines control measure regulates NO<sub>x</sub>, CO, and non-methane hydrocarbons emissions from the operation of stationary internal combustion engines located at a major stationary source of NO<sub>x</sub>. It applies to any stationary internal combustion engine rated at more than 50 brake horsepower.

#### C.II.B.4. Residential & Small Water Heaters

Water heaters and small boilers predominantly burn natural gas and are used to heat water and generate steam. These units are used in a variety of applications, including in homes, restaurants, retail stores, schools, hotels, and office buildings. Residential & Small Water Heaters control measure regulates NO<sub>x</sub> emissions from water heaters, boilers, and process heaters. The control measure applies to any person who manufactures, distributes, offers for sale, sells, or installs any type of water heater fired with gaseous or nongaseous fuels for use in SFNA.

#### C.II.B.5. Furnace

Residential heating accounts for a large fraction of residential energy consumption. Most residential furnaces use natural gas as fuel, which produces NO<sub>x</sub> during the combustion process. Furnaces control measure limits NO<sub>x</sub> emissions from natural gas-fired, fan-type central furnaces, which is no more than 40 nanogram (ng) of NO<sub>x</sub> per Joule of heat output. Only certified furnaces can be sold or installed in the air districts adopted the control measure.

#### C.II.B.6. Miscellaneous Combustion Sources

There are other types of combustion equipment not subject to those control measures, such as dryers, dehydrators, heaters, kilns, furnaces, crematories, incinerators, heated pots, cookers, roasters, heated tanks, evaporators, distillation units, afterburners, degassing units, vapor incinerators, catalytic or thermal oxidizers, and remediation units. This control measure would limit NO<sub>x</sub> emissions from combustion equipment that requires a permit but is not subject to the other NO<sub>x</sub> emissions control measures. The NO<sub>x</sub> emission limits are based on the type of device and the process temperature.