



South Coast Air Quality Management District

21865 Copley Drive, Diamond Bar, CA 91765-4178
(909) 396-2000 • www.aqmd.gov

TECHNOLOGY COMMITTEE MEETING

Committee Members

Council Member Joe Buscaino, Chair
Supervisor Lisa Bartlett
Board Member Gideon Kracov
Mayor Larry McCallon
Council Member Judith Mitchell
Council Member Carlos Rodriguez

October 16, 2020 ♦ 12:00 p.m.

Pursuant to Governor Newsom's Executive Orders N-25-20 (March 12, 2020) and N-29-20 (March 17, 2020), the South Coast AQMD Technology Committee meeting will only be conducted via video conferencing and by telephone. Please follow the instructions below to join the meeting remotely.

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Audience will be allowed to provide public comment through telephone or Zoom connection.

PUBLIC COMMENT WILL STILL BE TAKEN

AGENDA

Members of the public may address this body concerning any agenda item before or during consideration of that item (Gov't. Code Section 54954.3(a)). If you wish to speak, raise your hand on Zoom or press Star 9 if participating by telephone. All agendas for regular meetings are posted at South Coast AQMD Headquarters, 21865 Copley Drive, Diamond Bar, California, at least 72 hours in advance of the regular meeting. Speakers may be limited to three (3) minutes each.

CALL TO ORDER

ACTION ITEMS (1-3):

1. Recognize Revenue, Issue Program Announcement, Execute Contracts, and Redistribute Funds for Heavy-Duty Truck Projects Meeting the Proposition 1B – Goods Movement Program Requirements
(Motion Requested)

Tom Lee
Program Supervisor

South Coast AQMD is currently administering and implementing the final funding cycle for the Proposition 1B – Goods Movement Program. Due to cancellation of some projects, new Proposition 1B funding granted by CARB, and availability of Community Air Protection Program incentives, a new solicitation is needed to receive applications for additional heavy-duty truck projects and infrastructure meeting the criteria of the Proposition 1B – Goods Movement Program. These actions are to: 1) recognize revenue from CARB up to \$6,406,088 into the Proposition 1B – Goods Movement Fund (81); 2) reimburse the General Fund up to \$305,052 for administrative costs; 3) issue a Program Announcement for heavy-duty truck and infrastructure projects; 4) execute contracts (or modify existing contracts) for eligible truck projects; and 5) redistribute funds, as needed, for the timely liquidation of incentive programs funds.

2. Reimburse CEC and Return Interest
(Motion Requested)

Patricia Kwon
Program Supervisor

In February 2020, CEC issued a final audit report of CEC-funded projects, concluding that the majority of claimed agreement expenditures were in compliance with grant agreement requirements. However, the report questioned certain reimbursed subcontractor costs and requested that interest earned be returned to CEC. These actions are to: 1) reimburse CEC for unsupported costs with funds provided by two contractors in an amount not to exceed \$214,719 from the Clean Fuels Fund (31); 2) reimburse CEC for unsupported costs in an amount not to exceed \$70,631 from the Clean Fuels Fund (31); and 3) return to CEC interest earned on CEC funds in an amount not to exceed \$202,723 and future residual interest earned from the Hydrogen Fueling Infrastructure Network Fund (63).

3. Amend Contract to Install Solar Panels for Volvo LIGHTS Project
(Motion Requested)

Patricia Kwon
Program Supervisor

In November 2018, the Board approved execution of contracts for the Volvo Low Impact Green Heavy Transport Solutions (LIGHTS) project. In order to complete installation of solar panels at freight handling facilities participating in the Volvo LIGHTS project, CARB approved reallocating up to \$600,000 of administrative funding to project costs. This action is to amend a contract with Volvo Group North America, LLC in an amount not to exceed \$600,000 from the GHG Reduction Projects Special Revenue Fund (67) for the installation of solar panels.

INFORMATIONAL ITEMS (4-5):

4. Report on Electric Vehicle Battery Reuse and Recycling
(No Motion Requested)

Caroline Godkin
Deputy Secretary
(Cal EPA)

Rapid growth in the market for zero emission battery electric vehicles is a significant part of the overall strategy to improve air quality in the South Coast Air Basin. Although reuse of batteries is a desirable option in the near-term, the longer-term challenge of a growing number of batteries present a potential environmental waste issue. The Lithium-ion Car Battery Recycling Advisory Group led by Cal EPA was created to advise the Legislature on policies pertaining to the recovery and recycling of lithium-ion vehicle batteries. Staff from Lithium-ion Car Battery Recycling Advisory Group will present the current range of approaches to electric-vehicle lithium-ion battery reuse and recycling and highlight future pathways to address the potential environmental impacts of used batteries.

5. Clean Fuels Program Draft 2021 Plan Update
(No Motion Requested)

Joseph Impullitti
Planning and Rules
Manager

Every fall, staff has brought the Clean Fuels Program Draft Plan Update to the Technology Committee to solicit input on the proposed distribution of potential project funds for the upcoming year before requesting final approval for the Plan Update each year in early spring. Staff proposes continued support for a wide portfolio of technologies, but with particular emphasis on heavy-duty truck technologies with zero and near-zero emissions for goods movement applications to create a pathway towards achieving 2023 attainment as well as a continued focus on preparing for hydrogen vehicle deployments and EV charging infrastructure.

OTHER MATTERS:

6. Other Business

Any member of the Committee, or its staff, on his or her own initiative or in response to questions posed by the public, may ask a question for clarification, may make a brief announcement or report on his or her own activities, provide a reference to staff regarding factual information, request staff to report back at a subsequent meeting concerning any matter, or may take action to direct staff to place a matter of business on a future agenda. (Gov't. Code Section 54954.2)

7. Public Comment Period

At the end of the regular meeting agenda, an opportunity is provided for the public to speak on any subject within the Committee's authority that is not on the agenda. Speakers may be limited to three (3) minutes each.

ADJOURNMENT

Document Availability

All documents (i) constituting non-exempt public records, (ii) relating to an item on an agenda for a regular meeting, and (iii) having been distributed to at least a majority of the Committee after the agenda is posted, are available by contacting Alejandra Vega at (909) 396-2264, or send the request to avega@aqmd.gov.

Americans with Disabilities Act and Language Accessibility

Disability and language-related accommodations can be requested to allow participation in the Technology Committee meeting. The agenda will be made available, upon request, in appropriate alternative formats to assist persons with a disability (Gov't Code Section 54954.2(a)). In addition, other documents may be requested in alternative formats and languages. Any disability or language-related accommodation must be requested as soon as practicable. Requests will be accommodated unless providing the accommodation would result in a fundamental alteration or undue burden to South Coast AQMD. Please contact Alejandra Vega at 909.396.2264 from 7:30 a.m. to 6:00 p.m., Tuesday through Friday, or send the request to avega@aqmd.gov.

INSTRUCTIONS FOR ELECTRONIC PARTICIPATION

Instructions for Participating in a Virtual Meeting as an Attendee

As an attendee, you will have the opportunity to virtually raise your hand and provide public comment.

Before joining the call, please silence your other communication devices such as your cell or desk phone. This will prevent any feedback or interruptions during the meeting.

Please note: During the meeting, all participants will be placed on Mute by the host. You will not be able to mute or unmute your lines manually.

After each agenda item, the Chairman will announce public comment.

A countdown timer will be displayed on the screen for each public comment.

If interpretation is needed, more time will be allotted.

Once you raise your hand to provide public comment, your name will be added to the speaker list. Your name will be called when it is your turn to comment. The host will then unmute your line.

Directions for Video ZOOM on a DESKTOP/LAPTOP:

- If you would like to make a public comment, please click on the “**Raise Hand**” button on the bottom of the screen.
- This will signal to the host that you would like to provide a public comment and you will be added to the list.

Directions for Video Zoom on a SMARTPHONE:

- If you would like to make a public comment, please click on the “**Raise Hand**” button on the bottom of your screen.
- This will signal to the host that you would like to provide a public comment and you will be added to the list.

Directions for TELEPHONE line only:

- If you would like to make public comment, please **dial *9** on your keypad to signal that you would like to comment.

Technology Committee Agenda #1

BOARD MEETING DATE: November 6, 2020

AGENDA NO.

PROPOSAL: Recognize Revenue, Issue Program Announcement, Execute Contracts, and Redistribute Funds for Heavy-Duty Truck Projects Meeting the Proposition 1B – Goods Movement Program Requirements

SYNOPSIS: South Coast AQMD is currently administering and implementing the final funding cycle for the Proposition 1B – Goods Movement Program. Due to cancellation of some projects, new Proposition 1B funding granted by CARB, and availability of Community Air Protection Program incentives, a new solicitation is needed to receive applications for additional heavy-duty truck projects and infrastructure meeting the criteria of the Proposition 1B – Goods Movement Program. These actions are to: 1) recognize revenue from CARB up to \$6,406,088 into the Proposition 1B – Goods Movement Fund (81); 2) reimburse the General Fund up to \$305,052 for administrative costs; 3) issue a Program Announcement for heavy-duty truck and infrastructure projects; 4) execute contracts (or modify existing contracts) for eligible truck projects; and 5) redistribute funds, as needed, for the timely liquidation of incentive programs funds.

COMMITTEE: Technology, October 16, 2020; Recommended for Approval

RECOMMENDED ACTIONS:

1. Recognize, upon receipt, up to \$6,406,088 from CARB (Grant # GMB19-01) into the Proposition 1B – Goods Movement Fund (81);
2. Reimburse the General Fund up to \$305,052 from the Proposition 1B – Goods Movement Fund (81) for administrative costs associated with Grant #GMB19-01 to implement the Proposition 1B – Goods Movement program;
3. Issue Program Announcement #PA2021-03 for heavy-duty truck and infrastructure projects under the Proposition 1B – Goods Movement Program;
4. Authorize the Executive Officer to execute contracts (or modify existing contracts) for eligible truck projects, including infrastructure, from the Community Air Protection Fund (77) or Proposition 1B – Goods Movement Program Fund (81); and

5. Authorize the Executive Officer to redistribute the source of funds within and/or between the Proposition 1B – Goods Movement Fund (81) and the Community Air Protection Fund (77) prior to payments made on a new contract or modification, as needed, for timely liquidation of funds in accordance with applicable guidelines, requirements, and direction from CARB.

Wayne Nastri
Executive Officer

MMM:NB:VAW:TL

Background

To date, CARB has granted approximately \$458 million in Proposition 1B – Goods Movement Program funds to the South Coast AQMD to reduce emissions from the goods movement sector, including the replacement of heavy-duty diesel trucks, transportation refrigeration units (TRUs) and locomotives with cleaner technologies, as well as installation of shore power for ships at berth. The vast majority of these vehicles/equipment are currently operational, providing significant emission reduction benefits to the region.

In October 2019, the Board issued Proposition 1B – Goods Movement Program Announcement (PA) #PA2021-03 to solicit additional projects to utilize turnback funds. The solicitation was closed on March 31, 2020. Due to the cancellation of some projects, new Proposition 1B funding granted by CARB, and the availability of Community Air Protection Program incentives, a new solicitation is now needed to receive applications for additional heavy-duty truck projects and infrastructure meeting the criteria of the Proposition 1B – Goods Movement Program. The amount of funding available is estimated to be up to \$50 million from both Proposition 1B and Community Air Protection funds. Pursuant to the Community Air Protection incentive grants, these incentive funds may be used for clean truck projects eligible under the Proposition 1B – Goods Movement Program, with the majority of these funds benefiting disadvantaged and/or low-income communities.

On August 4, 2020, CARB granted unused funds totaling \$6,406,088 from the Loan Assistance and Diesel Particulate Filter (DPF) Substrate Programs to the South Coast AQMD to fund additional truck and infrastructure projects received through the Proposition 1B Program.

Proposal

This action is to recognize up to \$6,406,088 from a new CARB grant (Grant

#GMB19-01) into the Proposition 1B – Goods Movement Fund (81) and reimburse the General Fund up to \$305,052, or up to five percent, from the Proposition 1B – Goods Movement Fund (81) for administrative costs necessary to implement the additional funds granted to this program.

This action is also to issue PA #PA2021-03 to solicit new heavy-duty truck and infrastructure projects and authorize the Executive Officer to execute contracts (or modify existing contracts) for eligible projects from this PA using funds from Community Air Protection Program Fund (77) or Proposition 1B – Goods Movement Fund(81).

In addition, staff also proposes to authorize the Executive Officer to redistribute the source of funding within and/or between the Proposition 1B – Goods Movement Fund (81) and the Community Air Protection Fund (77) prior to payments made on a new contract or modification, as needed, to facilitate timely liquidation of funds to the extent the redistribution would not be in conflict with any applicable guidelines, requirements or direction from CARB.

Benefits to South Coast AQMD

The projects funded will reduce NO_x and PM emissions that are surplus to existing regulations and will occur throughout the life of the projects resulting in long-term emissions reduction benefits, including implementing specific measures included in AB 617 Community Emission Reduction Plans. Additionally, these projects will reduce exposure to toxic diesel exhaust emissions, especially in disadvantaged and low-income communities that are identified in the Community Air Protection incentives grants.

Resource Impacts

The revenue of \$6,406,088 will be recognized into the Proposition 1B – Goods Movement Fund (81). Reimbursement of the General Fund for administrative costs will not exceed \$305,052 (or up to five percent of the grant amount).

The action of redistributing funding sources will not affect the Board-approved award amount for each project; therefore, no resource impacts are anticipated.

Attachment

Program Announcement #PA2021-03



**South Coast AQMD Program Announcement
For
Heavy-Duty Diesel Trucks
Under the Proposition 1B - Goods Movement Emission Reduction Program**

The South Coast Air Quality Management District (South Coast AQMD) is pleased to announce the availability of funds from the Proposition 1B - Goods Movement Emission Reduction Program (hereafter “Program”). The Program is administered by a partnership between the California Air Resources Board (CARB) and local air agencies to reduce air pollution emissions and health risk from freight movement along California’s trade corridors. Projects funded under this Program must achieve early or extra emission reductions not otherwise required by law or regulation. Program funding will be available until a sufficient number of eligible and complete applications have been received, and all Program funds are fully committed through executed contracts.

This Program Announcement is seeking applications for heavy-duty diesel truck projects, including the six project options identified below. Please note funding is also available for electric charging stations, hydrogen fueling units, and truck stop electrification infrastructure. About \$50 million in funding is available for this solicitation.

WHO: The following may apply for funding through this solicitation:

1. Owner of an on-road, heavy-duty diesel truck with a manufacturer’s gross vehicle weight rating (GVWR) of 16,001 lbs. or greater (Class 5, 6, 7 or 8 truck) used to move goods as part of a sales transaction for a majority of the time,
2. Any entity who plans to own and operate the Program-funded electrification infrastructure at a truck stop, rail yard or other freight facility, with agreement from the site owner, including any entity who plans to own and operate an electric charging station or hydrogen fueling unit.

WHAT: There are six project options available as part of this solicitation.

1. Truck Replacement
2. Truck Engine Repower (Small Fleet Only)
3. Three-Way Truck Transaction
4. Two-for-One Truck Replacement
5. Electrification Infrastructure at a Truck Stop, Rail Yard or Other Facility
6. Electric Charging Stations or Hydrogen Fueling Units

Equipment specifications for each of these project options can be found in Appendix A of the 2015 Program Guidelines at: <https://ww2.arb.ca.gov/our-work/programs/proposition-1b-goods-movement-emission-reduction-program>

HOW: The application forms with instructions are attached to this Program Announcement (PA). For guidance on which application forms are required for your project type, please see Section VII of this PA. A copy of the application forms can be found at: <http://www.aqmd.gov/Prop1B>

WHERE: Three (3) copies of a **completed application (with all required supporting documents and signatures)** must be submitted via mail delivery, or in person to:



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Heavy-Duty Diesel Trucks
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PA2021-03**

**South Coast Air Quality Management District
21865 Copley Dr., Diamond Bar, CA 91765
Attn: Procurement**

NOTE: Facsimile or email submittals will not be accepted.

WHEN: This solicitation will open on November 6, 2020 and will close on April 30, 2021 at 1pm.

Schedule:

Solicitation Opens	November 6, 2020 (and will close on April 30, 2021, at 1 pm)
Anticipated:	
South Coast AQMD Evaluation Period	November 2020 to June 2021
South Coast AQMD to Issue Contracts	February 2021 to June 2021
Operational Deadline	Please refer to the Proposition 1B: Goods Movement Emission Reduction Program Operational Deadlines for Year 5 Truck Projects, posted at: http://www.aqmd.gov/Prop1B

For general information or questions about the South Coast AQMD Proposition 1B – Goods Movement Emission Reduction Program, please contact:
Fan Xu, Air Quality Specialist • (909) 396-2347



**South Coast AQMD Program Announcement
For
Heavy-Duty Diesel Trucks
Under the Proposition 1B - Goods Movement Emission Reduction Program
PA2021-03**

I. SUMMARY

The purpose of this Program Announcement (PA) is to solicit applications for the replacement of heavy-duty truck projects under the State’s Proposition 1B – Goods Movement Emission Reduction Program. This PA will include projects of the following equipment types:

- ✓ Heavy-duty diesel trucks (replacement or repower with alternative fuel or advanced technologies identified in Tables 1 and 2)
- ✓ Truck stop electrification infrastructure
- ✓ Electric charging stations
- ✓ Hydrogen fueling infrastructure

II. BACKGROUND

The diesel engines in trucks, locomotives, ships, harbor craft, and cargo handling equipment are major contributors to the State’s air pollution challenges. These sources account for nearly half of the statewide particulate matter (PM) emissions. Diesel PM is both a toxic air contaminant and a contributor to black carbon, a powerful short-lived climate pollutant. Near-source exposure to emissions of this particulate matter is associated with health risks, especially near distribution centers, railyards, and seaports, many of which impact disadvantaged communities. Emissions from freight transport also account for over one-third of the statewide nitrogen oxides (NOx) that forms fine particles.

Proposition 1B (Prop. 1B), which was approved by the voters in 2006, authorizes \$1 billion in bond funding to CARB to cut freight emissions in four priority trade corridors, including the Los Angeles/Inland Empire trade corridor in the South Coast Air Basin. To date, CARB has granted close to \$938 million to local agencies for various goods movement projects. The project categories include heavy-duty diesel trucks, freight locomotives, ships at berth, commercial harbor craft, cargo handling equipment, transport refrigeration units (TRU), and infrastructure for electrification of truck stops, distribution centers and other places where trucks congregate.

The Program supplements existing regulations and may be combined with other funding programs to cut diesel emissions by funding projects “not otherwise required by law or regulation.” The Program funds provide an incentive to equipment owners to upgrade to cleaner equipment and achieve early or extra emission reductions beyond those required by applicable rules, regulations or enforceable agreements.

III. DEFINITIONS

a) Air Quality Improvement Program (AQIP)

AQIP is a voluntary incentive program administered by CARB to fund clean vehicle and equipment projects, research of biofuels production and air quality impacts of alternative fuels, and workforce training. AQIP was created in 2007 by Assembly Bill (AB) 118, the California Alternative and Renewable Fuel, Vehicle Technology, Clean Air, and Carbon Reduction Act of 2007 (Núñez, Chapter 750, Statutes of 2007). AB 8 (Perea, Chapter 401, Statutes of 2013) reauthorized the fees that support AQIP through 2023.



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CARB has focused AQIP investments on technology-advancing projects that support California's long-term air quality and climate change goals in addition to providing immediate emission benefits. AQIP investments have concentrated on three main categories: commercial deployment of clean vehicles, pre-commercial advanced technology demonstrations, and finance assistance to small trucking fleets. For the latest information on the AQIP, please visit:

<http://www.arb.ca.gov/msprog/aqip/aqip.htm>

b) Class 5 Truck (Weight Classification)

A heavy duty truck with a Gross Vehicle Weight Rating of 16,001 to 19,500 pounds, equipped with a medium-heavy duty engine.

c) Class 6 Truck (Weight Classification)

A heavy duty truck with a Gross Vehicle Weight Rating of 19,501 to 26,000 pounds, equipped with a medium-heavy duty engine.

d) Class 7 Truck (Weight Classification)

A heavy duty truck with a Gross Vehicle Weight Rating of 26,001 to 33,000 pounds, equipped with either a medium-heavy duty engine or a heavy-heavy duty engine.

e) Class 8 Truck (Weight Classification)

A heavy duty truck with a Gross Vehicle Weight Rating of 33,001 pounds or greater, equipped with a heavy-heavy duty engine.

f) Drayage Truck

Drayage trucks are defined in the California Code of Regulations (CCR) by Section C.15 of the Drayage Truck Regulation (13 CCR §2027) as any in-use on-road vehicle with a gross vehicle weight rating (GVWR) greater than 26,000 pounds that is used for transporting cargo, such as containerized, bulk, or break-bulk goods, that operates:

- A. On or transgresses through port or intermodal rail yard property for the purpose of loading, unloading or transporting cargo, including transporting empty containers and chassis; or
- B. Off port or intermodal rail yard property transporting cargo or empty containers or chassis that originated from or is destined to a port or intermodal rail yard property.

g) Freight Facility

Distribution centers, warehouses, retail and wholesale outlets, and agricultural processing centers, and other places where trucks congregate (other than truck stops).

h) "Goods"

Defined as having the same meaning in California Code, Commercial Code section 2105, which essentially requires that:

- A. The goods must be movable.
- B. The goods being moved must be part of a transaction that involves a contract for the sale of the goods.
- C. Rental equipment does not qualify as "Goods."



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PA2021-03**

i) Hybrid Truck

Vehicle with an electric drive system powered by an on-board generator and approved for funding by CARB's AQIP.

j) Hybrid Zero Emission Mile Truck

Hybrid vehicle capable of zero emission miles.

k) Middle-Aged Truck

A truck with a model year MY2007-2009 engine and an original equipment manufacturer (OEM) filter or a PM filter. (Note: these trucks may be selected for a reuse program)

This is commonly referred to as "Truck A" in a Three-Way Truck Transaction. In this type of transaction, this middle-aged truck is replaced with a new truck. The middle-aged truck can then be reused by another truck fleet that has a truck with a 2006 MY or older engine that will be scrapped.

Note that this Truck A may not be used to expand another business or entity's fleet size.

l) New Truck

Truck with a model year 2019 or newer engine that has not been previously owned.

m) Optional Low-NOx Truck

Truck that utilizes a new Optional Reduced Emission Standard Heavy-Duty Engine that is certified/verified (as applicable) by CARB. The Optional Reduced Emission Standard is one of five separate but related regulatory actions that together will reduce GHG & NOx air emissions from medium- and heavy-duty vehicles and engines; harmonize State requirements with Federal requirements; establish new, optional provisions; and enhance enforcement and implementation of existing regulations.

Specifically, the optional low oxides of nitrogen (NOx) standards for heavy-duty vehicle engines provide a mechanism to allow heavy-duty engine manufacturers to optionally certify engines to standards more stringent than the 2010 standards. Trucks equipped with new engines that are certified by the CARB to the optional low-NOx standard of 0.02 g/bhp-hr NOx or lower will be considered for funding through this Program Announcement.

n) Repower

To replace a higher-emitting diesel engine in a truck with a new or remanufactured, diesel engine that meets a more stringent emission standard (pollutes less). In a repower, the truck chassis remains the same. For example, replacing a 2007 engine, in an MY2008 model year truck, with a 2015 engine. The emissions from the new engine are verified with the CARB Executive Order for that engine family.



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PA2021-03**

o) Small Fleets

Fleets with one to three on-road, diesel trucks and buses or vehicles with a gross vehicle weight rating (GVWR) greater than 14,000 lbs., as long as the vehicles are under common ownership and or control even if they are part of different companies, subsidiaries, divisions, or other organizational structures of a company or agency, regardless of whether the vehicles operate in California.

p) Three-Way Truck Transaction

The act of replacing a middle-aged truck with a new truck with an original equipment manufacturer (OEM) filter or a PM retrofit; using the middle-aged truck to replace an old truck; and scrapping the old truck.

q) Zero Emission Truck

Vehicle that emits no criteria pollutant, toxic or greenhouse gas emissions at the tailpipe.

IV. OWNERSHIP REQUIREMENTS

Applications shall be signed and submitted by the current legal owner of the existing equipment that will be upgraded or replaced. For infrastructure projects, if there is no existing equipment, the application must be signed and submitted by the future owner of the Program-funded equipment.

Non-owner applications are not eligible for funding.

Individuals or companies that operate the existing equipment under a lease agreement with the equipment owner are prohibited from applying for bond funding.

Third-party applications are not allowed.

V. FUNDING TABLES

For the funding tables below, please also reference the Definitions in Section III above for descriptions of each project type and/or replacement engine type.



South Coast AQMD Program Announcement For Heavy-Duty Diesel Trucks Under the Proposition 1B - Goods Movement Emission Reduction Program PA2021-03

Table 1: Heavy-Duty Trucks – All Fleet Sizes

Project Type ¹	Truck Class	Old Truck Engine Model Year	Replacement Engine Model Year	Maximum Funding Amounts
Replacement (2-for-1 also available)	Class 8	2005-2009	New MY2019+ engine zero emission truck ^{2,3}	\$200,000
			New MY2019+ engine hybrid zero emission mile truck ^{2,3}	\$150,000
			New MY2019+ engine optional low-NOx truck (0.02 g/bhp-hr NOx or less) ^{2,3}	\$100,000
			New MY2019+ engine hybrid truck ^{2,3}	\$80,000
			New MY 2019+ engine natural gas truck ^{2,3,4}	\$65,000
	Class 7	2005-2009	New MY2019+ engine zero emission truck ^{2,3}	\$200,000
			New MY2019+ engine hybrid zero emission mile truck ^{2,3}	\$150,000
			New MY2019+ engine optional low-NOx truck (0.02 g/bhp-hr NOx or less) ^{2,3}	\$100,000
			New MY2019+ engine hybrid truck ^{2,3}	\$80,000
			New MY 2019+ engine natural gas truck ^{2,3,4}	\$65,000
	Class 6 (No filter installed) & 1998 - 2007 (if filter installed) ⁹	2007 – 2009	New MY2019+ engine zero emission truck ^{2,3}	\$100,000
			New MY2019+ engine hybrid zero emission mile truck ^{2,3}	\$65,000
			New MY2019+ engine optional low-NOx truck (0.02 g/bhp-hr NOx or less) ^{2,3}	\$50,000
			New MY2019+ engine hybrid truck ^{2,3,8}	\$45,000
			New MY 2019+ engine natural gas truck ^{2,3,4,8}	\$40,000
Class 5 (No filter installed) & 1998 - 2007 (if filter installed) ⁹	2007 – 2009	New MY2019+ engine zero emission truck ^{2,3}	\$80,000	
		New MY2019+ engine hybrid zero emission mile truck ^{2,3}	\$50,000	
		New MY2019+ engine optional low-NOx truck (0.02 g/bhp-hr NOx or less) ^{2,3}	\$40,000	
		New MY2019+ engine hybrid truck ^{2,3,8}	\$35,000	
		New MY 2019+ engine natural gas truck ^{2,3,4,8}	\$25,000	
Three-way Truck Transaction	Class 5/6/7/8	<i>Truck A:</i> MY2007-2009 engine truck ^{5,6,7} <i>Truck B:</i> Truck with MY2006 or older engine <i>Truck C:</i> New MY 2019+ engine truck as described above	-Replace Truck A with Truck C ^{2,3} -Scrap Truck B and replace with Truck A (reuse) -Truck A and B may be owned/operated by a different owner.	<i>Contact South Coast AQMD</i>

Table 1 Notes:

1. Project life for replacement and repowered truck is five years.
2. Projects may be co-funded with CARB’s Air Quality Improvement Program, Low Carbon Transportation Program, or the California Energy Commission’s (CEC’s) Alternative Renewable Fuel Vehicle Technology Program funds as applicable.
3. Co-funded projects can only utilize one additional source of State funding and the combined funding may not exceed 90% of the total eligible project cost or any other funding restrictions of each respective program. Projects must meet the requirements of each program providing funding.
4. Engines must meet the 2010 emission level of 0.20 g/bhp-hr or less NOx (FEL and CERT values – engine EO’s that do not have both FEL and CERT values can show eligibility by using CERT values) and 0.01 g/bhp-hr or less PM (CERT value). All engines must be approved by CARB to be sold in California.



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PA2021-03**

5. Truck A must have an original equipment manufacturer (OEM) filter or Level 3 PM retrofit.
6. Owner of Truck A does not need to specify the business or entity that will accept this truck in the Three-Way Transaction at the time of application.
7. Truck A may not be used to expand another business or entity's fleet size.
8. This option is not available for the existing Class 5 and 6 trucks that have an engine of MY1999.
9. Filter must have been installed by prior to Jan. 1, 2014 and reported prior to Jan. 31, 2014.

Table 2: Heavy-Duty Trucks – Small Fleets Only¹

Project Type	Truck Class	Old Truck Engine Model Year	Replacement Engine Model Year	Maximum Funding Amounts
Repower	Class 8	2005 - 2009	Repower with new MY2019+ engine ¹	\$20,000
	Class 7	2005 - 2009	Repower with new MY2019+ engine ¹	\$20,000
	Class 6	2005 - 2009	Repower with new MY2019+ engine ¹	\$10,000

Table 2 Notes:

¹ The replacement engine must be either zero emission or meeting the option low-NOx standard.

Table 3: Truck Stop Electrification Infrastructure

Project Type	Project Description	Maximum Funding Amounts	Project Life (years)
Truck Stop Electrification	Landside electrification infrastructure at a truck stop, rail yard, or other freight facility.	50% of eligible costs or the calculated funding amount at 0.10 lbs/State \$, whichever is lower	10
Electric Charging Station(s) or Hydrogen Fueling Unit(s)	Infrastructure for an electric charging station or hydrogen fueling units for heavy-duty trucks. (Requires the purchase of at least one vehicle through the Program.)	50% of eligible costs or \$30,000, whichever is lower	5

IMPORTANT NOTES:

- Clear all outstanding CARB violations for vehicle and/or fleet, and maintain compliance with CARB's Truck and Bus Regulation and all other CARB regulations.
- If you do not have copies of registration records, visit your local DMV office and request a Vehicle Registration Information Record (form INF 1125) for each truck in your application. To find your local DMV office, please visit <http://www.dmv.ca.gov>. You may also obtain and pay for the DMV printout online at: <http://www.dmv.ca.gov/online/vrr.htm>.
- Gather at least 2 records showing valid odometer readings at least 6 months apart for each truck in your application.
- Determine the manufacturer's Gross Vehicle Weight Rating (GVWR) as identified on a sticker/label most commonly found on the truck door jamb or on the inside of the door. If this tag is missing or not readable/legible, please check with your local dealer.
- Maintain current registration for the old truck; keep it in legal operating condition until delivered to dismantler. Truck must continue to move goods for sale a majority of the time. Planned Non-Operation (PNO) is not allowed at any time.
- Applicants may request reduced funding amounts to improve cost-effectiveness and competitiveness of the project.
- Projects committing to 90% operation in California may be less competitive due to decreased emission reductions achieved within California
- Clear all old truck titles of any lien holders. A copy of the clean title for each old truck will be required for replacement projects before the grant payment can be made.
- Make sure your truck has a readable/legible VIN tag on the truck and engine tag on the engine prior to any inspection (project pre-inspection and post-inspection).



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For complete Program requirements, please refer to the 2015 Update to the Program Guidelines and related supplemental materials listed on the CARB Program website at <https://ww2.arb.ca.gov/our-work/programs/proposition-1b-goods-movement-emission-reduction-program> or call Fan Xu at the South Coast Air Quality Management District for guidance at (909) 396- 2347.

VI. ELIGIBILITY

Project eligibility will be based on the Program Guidelines which can be found at: <https://ww2.arb.ca.gov/our-work/programs/proposition-1b-goods-movement-emission-reduction-program>. Class 5, 6, 7, and 8 trucks are the only projects that can be funded under this solicitation.

In order to be eligible for funding, the equipment owner must demonstrate:

- ✓ Existing truck has been used to move goods a majority of time for the past 2 years
- ✓ Fleet compliance with the Statewide Truck and Bus Rule
- ✓ California Operation:
 - At least 75% operation within California each year for the past 24 months.
 - Annual vehicle miles traveled (VMT) in California each year for the past 2 years:
 - At least 20,000 miles for each Class 7 or 8 truck.
 - At least 10,000 miles for each Class 5 or 6 truck.
- ✓ California Registration:
 - Current registration in California (California base-plated or California International Registration Plan (IRP), or dual-plated registration (California based-plated/California IRP and Mexico only) for trucks carrying goods across the California-Mexico border, as they are required to be dual-plated, AND
 - Registration for the past 2 years:
 - California DMV registration cards verifying registration for the past 2 years, or
 - California DMV Vehicle Registration Information Record (DMV printout) showing:
 - 1) Registration in both the current and prior year with a minimum of 6 months of total registration, or
 - 2) If the DMV printout only shows registration of 8 months in the current year and no registration in the prior year, then alternative documentation (insurance certificate or 90-day BIT inspection form) will be required to verify registration in the prior year.

Ineligible Equipment

- ✓ Vehicles subject to CARB's Public and Utility Fleet Rule.
- ✓ Vehicles subject to CARB's Solid Waste Collection Vehicle Rule.
- ✓ Vehicles subject to CARB's Diesel Cargo Handling Equipment Rule.
- ✓ Trucks not in compliance with the Statewide Truck and Bus Rule and the Drayage Truck Regulation including Dray-Off.
- ✓ Trucks registered outside the State of California, including dual-plated registration, except for trucks that carry goods across the California-Mexico border, as they are required to be dual-plated, as described above.



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- ✓ Trucks which are a salvage vehicle (see Chapter I, Table I.4) for which a minimum of 24 months of ownership and operation cannot be verified.
- ✓ Trucks constructed from a glider kit, unless allowed by the local agency for an old, existing truck to be replaced. Glider kit trucks may not be repowered or utilized as a replacement truck.
- ✓ Repowered trucks when used as a replacement truck.

General Requirements for Equipment Owners (Applicable to All Project Options)

Selected applicants must sign a contract with South Coast AQMD including project milestone and completion deadlines and commit to the following:

- ✓ Certify that there are no outstanding CARB violations or non-compliance with CARB regulations associated with the equipment or the owner and provide a copy of the CARB compliance certificate from The Truck Regulation Upload, Compliance, and Reporting System (TRUCRS).
- ✓ Maintain fleet compliance with the Statewide Truck and Bus Rule without utilizing Program-funded equipment until the specified timeframe. CARB will post and update information on the Program website describing operational deadlines and when the Program-funded vehicle will become eligible to be included in the equipment owner's fleet compliance strategy for the applicable project option.
- ✓ Vehicle inspections by the South Coast AQMD at designated time & location.
- ✓ Destruction of the old truck (replacements) and/or engine (repowers & replacements) at a South Coast AQMD-approved Prop. 1B Program dismantling facility (the old truck must be kept in operating condition and registered as operational until it is delivered to the dismantler and must be able to be driven to the dismantler under its own power).
- ✓ Maintaining old truck eligibility for Program funds. This includes maintaining registration, keeping equipment in legal operating condition, correcting any air pollution citations, and reporting, repairing, or replacing equipment that has been damaged, destroyed, or stolen.
- ✓ Commit to the project life (contract term) specified with the applicable Program-funded equipment project option.
- ✓ Adhere to all Program requirements during the project life.
- ✓ Commit to move goods a majority of the time.
- ✓ Commit Program-funded equipment to 100% California operation (or 90% California operation as selected by the equipment owner) and California base-plated registration or California IRP. **Out-of-state registrations, including out-of-state IRP, are prohibited.** Dual plates are only allowed for trucks that carry goods across the California/Mexico border and are required to be dual plated (California/Mexico - only for 90% California operation projects).
- ✓ Commit Program-funded equipment to at least 50% travel within the four trade corridors for the duration of the project life.
- ✓ Maintain current California DMV registration for Program-funded equipment at all times during the project life.
- ✓ Ownership of the old truck shall not change from the time an equipment project application is submitted to invoice payment.



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- ✓ Agree to accept an on-board electronic monitoring unit on program-funded equipment at any time during the project life.
- ✓ Comply with record-keeping, reporting, and audit requirements.
- ✓ Properly maintain Program-funded equipment in good operating condition and according to manufacturer's recommendations.
- ✓ Maintain collision/comprehensive insurance on the Program-funded truck for replacement projects.
- ✓ Demonstrate proof of equipment warranty (a minimum of 1 year or 100,000 mile major component engine warranty for the program-funded equipment) that covers parts and labor to include the diesel particulate filter (if the equipment is no longer under warranty or has less than 1 year of warranty).
- ✓ Correct outstanding CARB equipment violations associated with the owner's **entire fleet of vehicles**.
- ✓ Program-funded projects must be purchased and operational prior to the CARB's Truck and Bus Regulation applicable compliance deadlines.
- ✓ Agree and acknowledge that the South Coast AQMD may release the information the application contains to third parties if required by state and federal public records laws;
- ✓ Program funding shall only be used to pay down the capital cost of the new equipment.
- ✓ Any tax obligation associated with the funding award is the responsibility of the equipment owner (grantee). Equipment owners receiving funding may be issued a 1099-G form by the South Coast AQMD for the awarded amount if required.
- ✓ Any other Program provisions and requirements described in the Program Guidelines and the executed contract with the South Coast AQMD.
- ✓ The applicant must be the legal owner of the old truck at the time of application.
- ✓ **COMPLIANCE WITH LABOR LAWS:** If an application is deemed eligible, the applicant will be required to provide information on any and all labor violations that have occurred within the last three years to be further considered for an award. If awarded, the contractor will be required to notify SCAQMD in writing if they have been found by a court or federal or state agency to have violated labor laws. The contractor will complete a yearly certification in which they will either state that they have not been found by a court or federal or state agency to have violated labor laws or, if such violations have been found, the contractor will give SCAQMD details about those violations in the certification. If the contractor has previously provided that information to the SCAQMD, they will be required to reattach that previous notification to the certification and provide any additional details about those violations that have not previously been provided. The contractor's yearly certification will be due at the same time as the annual progress reports. SCAQMD reserves the right to terminate the contract with a contractor that has been found to have violated labor laws, and the contractor may be required to return any and all contract funds, as determined by SCAQMD. The contractor will also ensure that these requirements are included in all subcontracts.

Program Requirements for Engine Repower/Replacement Projects:

- ✓ Engines eligible for funding must be certified/verified (as applicable) by a CARB Executive Order for on-road use with the following:

South Coast Air Quality Management District
21865 Copley Dr.
Diamond Bar, CA 91765



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- Alternative fuel engines must meet the 2010 emissions level of 0.20 grams per brake-horsepower hour (g/bhp-hr) or less NO_x (FEL and CERT values - engine EO's that do not have both FEL and CERT values can show eligibility by using CERT values) and 0.01 g/bhp-hr or less PM (CERT value).
- Hybrid and zero emission engines must be 2019 or newer and certified/verified (as applicable) by CARB.
- Low NO_x engines must meet the optional low NO_x standard of 0.02 g/bhp-hr or less NO_x and be certified/verified (as applicable) by CARB.
- Class 8 truck - intended service of Heavy Heavy Duty (HHD) for diesel engines or Heavy Duty Otto (HDO) for applicable alternative fuel vehicles.
- Class 7 truck - intended service of Medium Heavy Duty (MHD) or HHD for diesel engines or HDO for applicable alternative fuel vehicles.
- Class 5 and 6 truck - intended service of LHD (Class 5 trucks only) or MHD for diesel engines or HDO for applicable alternative fuel vehicles.
- Class 5-8 trucks - all heavy duty hybrid or electric vehicles shall follow CARB's Heavy Duty Hybrid Electric Vehicle Certification Procedure.

Program Requirements for Truck Replacement Projects:

- ✓ All replacement trucks must have a manufacturer's GVWR of:
 - 16,001 lbs – 19,500 lbs (Class 5)
 - 19,501 lbs – 26,000 lbs (Class 6)
 - 26,001 lbs – 33,000 lbs (Class 7)
 - 33,001 lbs or greater (Class 8)
- ✓ The existing truck must have a MHD or HHD engine (service class), except Class 5 trucks which may have LHD engines.
- ✓ The replacement truck must have the same weight classification range (Class 5, 6, 7, or 8) and service class (HHD or MHD) as the existing truck, except for the following conditions (funding levels for trucks in different weight classification ranges are specified in Table 5 below):
 - The equipment owner chooses to replace 2 eligible trucks for 1 replacement truck (Two-for-One option). For 2 for 1 replacement projects, the funding amount is based on the highest weight classification of the two existing trucks, or the weight classification of the replacement truck, whichever is less.
 - Replacement required by the equipment owner in order to meet a vocational need, as approved by the South Coast AQMD.
 - Replacement of a Class 7 truck with a Class 8 truck or Class 8 with a Class 7 truck, as long as both trucks have a HHD engine. Please note that the funding amount would be at a Class 7 level for both scenarios.
- ✓ Original equipment manufacturer engine installed in a chassis of the same model year, make, and configuration as was originally provided from the truck manufacturer when the chassis and engine were both new.



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**Table 4: Heavy-Duty Trucks – Funding Examples for Weight Class Modifications
(Based on GVWR)**

Project Type	Old Truck	Replacement Truck	Funding Level
Replacement (1 for 1)	Class 7	Class 8	Class 7
Replacement (1 for 1)	Class 8	Class 7	Class 7
Replacement (1 for 1)	Class 6	Class 5	Class 5
Replacement (2 for 1)	Class 7 and Class 8	Class 8	Class 8
Replacement (2 for 1)	Class 8 and Class 8	Class 7	Class 7
Replacement (2 for 1)	Class 6 and Class 6	Class 7	Class 6
Replacement (2 for 1)	Class 6 and Class 8	Class 7	Class 7
Replacement (2 for 1)	Class 6 and Class 5	Class 7	Class 6

- Additional requirements specific to certain truck project options can be found in Appendix A of the Proposition 1B: Goods Movement Emission Reduction Program-Final 2015 Staff Report and Guidelines for Implementation available at: <https://ww2.arb.ca.gov/our-work/programs/proposition-1b-goods-movement-emission-reduction-program>.

Modifying an Application

Equipment owners are limited in what they can change after the application is submitted, as changes will affect a project’s competitive ranking. Equipment owners are encouraged to select the option that best suits their company as changes may not be possible at a later date. For Program-funded projects, equipment owners are able to select any make/model vehicle or engine as long as it meets the required emission levels and is in the same vehicle class as the existing truck (with limited exceptions), and meets all other program requirements. Please note that your funding amount may change if you modify your application. **Under no circumstances will an engine that is dirtier than the 2010 emission levels (0.20 grams/bhp-hr NOx and 0.01 grams/bhp-hr PM) be eligible for funding.**

Equipment owners may change the project option after the solicitation period has closed subject to the following requirements:

- The change must result in a funding amount equal to or less than the amount that was requested in the original application.
- The change must result in calculated project cost-effectiveness equal to or greater than the project listed in the original application.
- The change must result in the project remaining above the funding line on the ranked list.

Equipment owners **cannot** substitute a different vehicle or change the ownership of the existing truck identified on the application after the solicitation period has closed.

If a truck identified as a certain weight class in the application is later determined to be in a different weight class, the South Coast AQMD will reduce the amount of funding requested to the amount associated with the appropriate weight class or as specified above in Table 2.



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VII. APPLICATION SUBMITTAL REQUIREMENTS

An equipment owner **is not allowed to** submit a Proposition 1B application for the same vehicle to multiple local agencies. However, equipment owners may apply for co-funds from other funding programs up to 90% of the total project cost with the limitation that no more than one additional source of State funding is used. Please note that the other funding programs may have restrictions limiting opportunities to co-fund the same project. Equipment owners who are found to have submitted multiple Prop. 1B applications for the same equipment project and not disclosed any other requested or received financial incentive, may be disqualified from funding for that engine or piece of equipment under this Program.

The following documentation must be completed, signed and submitted to South Coast AQMD by the due date:

Project Type	Require application forms, and attachments
Truck Replacement	Form A1, Form B1 for each truck included in the application, including all supplemental information, and Attachments 1 through 5.
Two-for-One Truck Replacement	Form A1, Form B1, and Form B2 for each two-for-one truck transaction, included in the application, including all supplemental information, and Attachments 1 through 5.
Truck Engine Repower	Form A1, Form B3 for each truck included in the application, including all supplemental information, and Attachments 1 through 5.
Three-Way Truck Transaction	Form A1, Form B4 for each 3-way truck transaction in the application, including all supplemental information, and Attachments 1 through 5.
Electrification Infrastructure at a Truck Stop, Rail Yard or Other Freight Facility	Form C1 for each project in the application, including all supplemental information, and Attachments 1 through 5.
Electric Charging Stations or Hydrogen Fueling Units	Form C2 for each project in the application, including all supplemental information, and Attachments 1 through 5.

Below is a list of all application forms and attachments for the Prop 1B Program. Please refer to the above table for the specific application forms required for your project type.

- ✓ Form A1 – Application Information (this form is required for all applicants)
- ✓ Form B1 – Heavy-Duty Diesel Truck Replacement
- ✓ Form B2 – Second Truck in Two-for-One Truck Replacement
- ✓ Form B3 – Heavy-Duty Truck Engine Repower
- ✓ Form B4 – Three-Way Truck Transaction
- ✓ Form C1 – Truck Stop Electrification Infrastructure
- ✓ Form C2 – Electric Charging Stations or Hydrogen Fueling Units
- ✓ Attachment 1 – Business Information Request
- ✓ Attachment 2 – Disadvantaged Business Certification
- ✓ Attachment 3 – W-9 - Request for Taxpayer Identification Number and Certification
- ✓ Attachment 4 – Withholding Exemption Certificate
- ✓ Attachment 5 – Campaign Contribution Disclosure



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- ✓ Attachment 7 – Direct Deposit Authorization

Note: Each Attachment (#s 1-5) should be completed and submitted with each set of projects. If your application is approved, an updated Attachment 5 may be requested by your assigned Project Officer at a later date.

VIII. EQUIPMENT PROJECT PURCHASE RESTRICTIONS

An equipment owner **may not** purchase, receive, install, pay for, or place into operation any engines, equipment, or vehicles, nor may work begin on a repower project or a project to install electrical infrastructure, until the project contract is fully executed. An equipment owner may pre-order prior to contract execution at the equipment owner's risk. The South Coast AQMD **will not** reimburse grantees for orders or any payments on a new engine, piece of equipment, or vehicle that takes place prior to South Coast AQMD approval of the project through contract execution.

Dealers ordering engines, equipment, or vehicles prior to contract execution assume all financial risk, and are in no way assured grant funds.

If the new equipment is commercially available at the time of contract execution, the applicant must complete the project and submit the required invoice documentation within 18 months after contract execution, or no later than the operational deadline specified by CARB.

If the new equipment is not commercially available at the contract execution, the applicant must complete the project and submit the required invoice documentation by no later than the operational deadline specified by CARB.

For truck stop electrification infrastructure projects, the applicant must complete the project, obtain at least 1 year of data on actual use, and submit the required invoice documentation by the date specified in the contract.

IX. PAYMENT PROCESS

The South Coast AQMD shall expend Program funds through invoice payments upon submittal of a complete invoice and after the satisfactory completion of a post-inspection by South Coast AQMD. Invoice payments provide Program funding to equipment owners on a reimbursement basis or to the vendor (or dealership) through a direct payment option provided the South Coast AQMD receives written instructions and approval from the grantee. For the direct payment option, an authorized representative of the dealership must have signed a Memorandum of Understanding agreement with the South Coast AQMD certifying their understanding of the Program requirements. Grant funds shall only be used toward the capital cost of the equipment.

Invoice Payments

Payment of the grant funds will only be made after the replacement truck has passed a post-inspection by the South Coast AQMD and the South Coast AQMD has received and approved a valid invoice package for the new engine, vehicle, or piece of equipment. The South Coast AQMD may issue the grant payment to the equipment owner upon submission of a valid invoice once the following requirements have been met:



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- ✓ Equipment owner or dealer must deliver the old truck/engine to a South Coast AQMD-approved, DMV-licensed dismantler within 30 calendar days after the new equipment is placed into operation.
- ✓ The equipment owner shall submit proof of a minimum 1-year or 100,000 mile major component engine warranty covering parts and labor for the new replacement vehicle or repowered engine (if the truck is no longer under warranty or has less than 1 year of warranty).
- ✓ Equipment owner must submit proof of insurance on the replacement or repowered truck.
- ✓ Equipment owner must demonstrate compliance with applicable regulations. For CARB's Truck and Bus Regulation, this includes a valid compliance certificate for the current year with the Truck Regulation Upload, Compliance, and Reporting System (TRUCRS)¹ ID that matches the information on the application. **Equipment owners cannot use the old truck or new replacement/ repowered truck for demonstrating compliance with the regulation.**
- ✓ For the reimbursement option, the equipment owner must submit proof of payment and a copy of the original invoice from the vendor or dealership. Additional information may be required by the South Coast AQMD.
- ✓ For the reimbursement option, the South Coast AQMD will require verification from the dismantler that the old equipment has been delivered to the dismantling site and is in custody of the dismantler.
- ✓ The payment of grant funds will not exceed the amount directly paid by the equipment owner.

X. PROJECT EVALUATION

Complete applications will be evaluated by the South Coast AQMD in the order in which they are received. For truck projects, only complete and eligible projects will be posted on the South Coast AQMD website, once approved by CARB. Awards will be made to complete, and eligible projects until Program funds are fully committed. For complete information regarding project evaluation refer to Chapter IV of the Final 2015 Staff Report and Guidelines for Implementation found on the CARB Program website at <https://ww2.arb.ca.gov/our-work/programs/proposition-1b-goods-movement-emission-reduction-program>.

XI. ANNUAL REPORTING REQUIREMENTS

Heavy-Duty Diesel Truck Projects

Equipment owners that are awarded funding will be responsible for annual reporting to the South Coast AQMD. The equipment owner shall submit annual reports for the project life. The equipment owner's annual reports shall include, but is not limited to:

- ✓ Contact information (owner name, address, phone number, etc.).
- ✓ Proof of California DMV registration.
- ✓ Fleet size.
- ✓ Current odometer reading, including the date read (estimate total vehicle mileage if odometer is missing or broken).
- ✓ Annual VMT in California since last report.

CARB online reporting system for heavy-duty diesel trucks. https://ssl.arb.ca.gov/ssltrucr/stb/trucrs_reporting/reporting.php



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- ✓ Certification of the required 90% or 100% California-only operation.
- ✓ Certification of at least 50% of travel within the four trade corridors as well as provide the percentage of annual vehicle miles of travel in:
 - Bay Area Trade Corridor
 - Central Valley Trade Corridor
 - Los Angeles/Inland Empire Trade Corridor
 - San Diego/Border Trade Corridor
- ✓ Proof of insurance coverage.
- ✓ Certification that the bond-funded project was operated in accordance with the signed contract, and that all information submitted to the South Coast AQMD is true and accurate.
- ✓ Other information as requested by the South Coast AQMD.

Truck Stop Electrification

Equipment owners that are awarded funding will be responsible for annual reporting to the South Coast AQMD for the project life. The equipment owner annual reports shall include, but is not limited to:

- ✓ Contact information (owner name, company, address, phone number).
- ✓ Project completion date.
- ✓ Actual number of truck connections to equipment per unit (parking space) each month in the reporting period.
- ✓ Actual number of hours the equipment was used per unit (parking space) each month in the reporting period. Include only equipment hours that enabled usage of heating and cooling to the cab or electrical power to TRUs or auxiliary power systems.
- ✓ Actual electrical usage by trucks or equipment documented by electric utility billing statements, electric meter readings, equipment monitoring data or other approved method in the reporting period. Include only electrical power that enabled usage of heating and cooling to the cab or electrical power to TRUs or auxiliary power systems.
- ✓ Date, duration, and general description of any equipment failure or other event that prevented trucks from using the system for more than 1 week.
- ✓ Certification of insurance.
- ✓ Signed certification statement that the bond-funded project was installed and is operating as it was approved in the post-inspection and that all information submitted to the local agency is true and accurate.
- ✓ Other information as requested by the South Coast AQMD.

Electric Charging Stations/Hydrogen Fueling Units

Equipment owners that are awarded funding will be responsible for annual reporting to the South Coast AQMD for the project life. The equipment owner annual reports shall include, but is not limited to:

- ✓ Contact information (owner name, address, phone number, etc.).
- ✓ Actual number of truck connections to equipment per charging station/fueling unit each month in the reporting period.



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- ✓ Actual number of hours the equipment was used per charging station/fueling unit each month in the reporting period.
- ✓ For electrical charging stations, actual electrical usage per charging station documented by electric utility billing statements, electric meter readings, equipment monitoring data or other approved method in the reporting period.
- ✓ For hydrogen fueling units, actual usage per unit documented by billing statements, meter readings, equipment monitoring data or other approved method in the reporting period.
- ✓ Description of any equipment failure or other event that prevented trucks from using the charging/fueling units more than one week.
- ✓ Proof of equipment warranty coverage.
- ✓ Certification that the bond-funded project was operated in accordance with the signed contract, and that all information submitted to the South Coast AQMD is true and accurate.
- ✓ Other information as requested by the South Coast AQMD.

XII. INFORMATION ON TRUCK EFFICIENCY UPGRADES

The Program does not provide funding for technologies that improve fuel efficiency for trucks, which may include devices that reduce aerodynamic drag and rolling resistance. Aerodynamic drag may be reduced by using devices such as cab roof fairings, cab side gap fairings, and cab side skirts. On the trailer side, aerodynamic drag may be reduced by using trailer side skirts, gap fairings, and trailer tails. Rolling resistance may be reduced by using single wide tires or low-rolling resistance tires and automatic tire inflation systems on both the tractor and the trailer. These upgrades offer the potential to cut emissions of greenhouse gases and criteria pollutants, with a two- to three-year payback period through lower fuel costs. The benefits are variable based on the type of truck operations.

On December 11, 2008, CARB adopted a *Regulation to Reduce Greenhouse Gas Emissions from Heavy-Duty Vehicles (CCR, title 17, section 95300)*. This regulation applies primarily to owners of 53-foot or longer box-type trailers requiring their trucks and trailers to become more fuel efficient. Truck owners may be responsible for replacing or retrofitting their affected vehicles with efficiency upgrades that fit their operating profile. While the Program does not provide funding for the efficiency upgrades, other incentive programs may help offset the purchase cost or help finance the purchase of the upgrades, including CARB's Providing Loan Assistance for California Equipment (PLACE) Program (<http://www.arb.ca.gov/ba/loan/on-road/on-road.htm>).

XIII. USEFUL RESOURCES

- ✓ CARB Goods Movement Emission Reduction Program: <https://ww2.arb.ca.gov/our-work/programs/proposition-1b-goods-movement-emission-reduction-program>
- ✓ CARB Truck Stop website: <http://www.arb.ca.gov/msprog/truckstop/truckstop.htm>
- ✓ CARB TRUCRS: https://ssl.arb.ca.gov/ssltrucrsto/trucrs_reporting/reporting.php
- ✓ South Coast AQMD Prop. 1B Website (where a copy of the solicitation and application forms can be found) <http://www.aqmd.gov/prop1b>

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PROPOSITION 1B - GOODS MOVEMENT EMISSION REDUCTION PROGRAM APPLICATION

FORM A1: Applicant Information *(Complete one form per company)*

I. APPLICANT INFORMATION(Required Information)

Applicant Name/Registered Owner (Equipment Owner):		
Business Name (if any):	TRUCRS ID #:	
Primary Contact Full Name:	Email:	
Mailing Address:	Phone Number:	
City:	State:	Zip Code:
Fleet Size: _____	<i>"Fleet Size" means the number of diesel-fueled vehicles traveling in California that are registered to be driven on public highways and have a manufacturer's gross vehicle weight rating of 14,001 pounds or greater that are under common ownership or control [as defined in CCR section 2025 in title 13, article 4.5, Chapter 1] by a person, business, or government agency.</i>	

II. PROJECT INFORMATION

What type of project are you applying for?		
Project Type	Total Number of trucks included	Additional forms to complete
Truck Replacement	Number of trucks being replaced: _____	Form B1 for each truck included in the application
Two-for-One Truck Replacement	Number of trucks being replaced: _____	Form B1 and B2 for each two-for-one truck replacement included in the application
Truck Engine Repower	Number of trucks being repowered: _____	Form B3 for each truck included in the application
Three-Way Truck Transaction	Total trucks included: _____	Form B4 for each 3-way truck transaction in the application
Truck Stop Electrification Infrastructure	Not Applicable	Form C1
Electric Charging Stations or Hydrogen Fueling Units	Not Applicable	Form C2

III. SUPPLEMENTAL INFORMATION- PLEASE ATTACH THE FOLLOWING DOCUMENTS TO COMPLETE YOUR APPLICATION

<input type="checkbox"/>	Attach one or more of the following forms to Form A1 , as required: Form B1- Truck Replacement Form B2- Two-for-One Truck Replacement Form B3- Truck Engine Repower Form B4- Three-Way Truck Transaction Form C1- Truck Stop Electrification Infrastructure Form C2- Electric Charging Stations or Hydrogen
<input type="checkbox"/>	Attach a copy of the "Certificate of Compliance" from CARB's TRUCRS database, this certificate must show that your fleet is in compliance with CARB Truck and Bus Regulation at the time of application submittal. The TRUCRS website can be accessed at: https://ssl.arb.ca.gov/ssltru-crstb/trucrs_reporting/reporting.php .

Submit the original completed application (with all required supporting documents and signatures) along with **two (2) copies** of **the entire application package** via mail delivery, or in person to:

South Coast Air Quality Management District
21865 Copley Dr., Diamond Bar, CA 91765
 Attn: **Procurement**

Application Deadline: Solicitation will close on April 30, 2021 at 1pm

NOTE: Facsimile or email submittals **will not be accepted**. You must submit total of 3 copies including the original application.



I am the owner of the existing vehicle(s), have the legal authority to apply for incentive funding for the entity described in this application, and agree to the following statement by signing below:

- I (equipment owner) have reviewed the information provided in this application, including all supporting documentation, and certify the application information is true and correct, and meet the minimum requirement of the proposition 1B –Good Movement Emission Reduction Program;
- I agree to follow all requirements of the Proposition 1B - Goods Movement Emission Reduction Program- Final 2015 Staff Report and Guidelines for Implementation;
- The program-funded equipment shall be placed into operation and post-inspected prior to the applicable operational deadline to remain eligible for funding;
- I understand that the Program-funded equipment may not be used by the equipment owner to comply with any applicable CARB regulations for the specified timeframe;
- Neither the owner nor equipment identified in the application has any outstanding violations or non-compliance with CARB regulations;
- The purchase of this low-emission vehicle is NOT required by any local, state, and/or federal rule or regulation, including, but not limited to, the Drayage Truck Regulation (13 CCR §2027), Truck and Bus Regulation (13 CCR §2025), and/or Solid Waste Collection Vehicle Regulation (13 CCR §2021);
- I have not and will not apply for additional grant funds from any other agency or program for the vehicle(s) included in this application, except the funding programs allowed by the Guideline.
- I will disclose any other source(s) of funding that has been applied for and will be used for the same project, including the source of funds, amount, and the purpose for funding;
- I will disclose the value of any existing financial incentive that directly reduces the project cost, including tax credits or deductions, grants, or other public financial assistance for the same equipment;
- Grant funds shall only be used to offset the capital cost of the equipment and/or shall reduce the principal owed to purchase the equipment;
- New equipment must **not** be purchased, received, installed, paid for, or placed into operation prior to contract execution unless specified by the Program Guidelines, and if allowed, equipment owner shall assume all financial risk and is in no way assured program funds;
- New equipment purchased outside of California may be subject to California sales and/or use tax;
- I have all the information needed to understand what must be done to maintain eligibility for Program funds. This includes maintaining registration and ownership; keeping equipment in legal operating condition within California; correcting any air pollution citations; complying with all CARB regulations; and reporting, repairing, or replacing equipment that has been damaged, destroyed, or stolen;
- I understand that an incomplete or illegible application, including applications that are missing required information, may be rejected by the South Coast AQMD at their discretion;
- I acknowledge that the South Coast AQMD may release the information the application contains to third parties if required by state and federal public records laws;
- I understand that the Program-funded equipment will be required to operate at least 90% or 100% of its operating time within California for the project life;
- Program funds were not used to previously upgrade the equipment identified in the equipment project application (except for funds that may have been received to retrofit a truck with a diesel PM filter);
- Any additional non-Program funding needed to complete the equipment project according to the proposed timeframe is reasonably available; and
- I understand as an applicant that incentive programs have limited funds and shall terminate upon depletion of program funding.

Printed Name of Owner: _____

Title: _____

Signature of Owner: _____

Date: _____



PROPOSITION 1B - GOODS MOVEMENT EMISSION REDUCTION PROGRAM APPLICATION

FORM B1: Equipment Information – Heavy-Duty Diesel Truck Replacement
(Complete one form per truck)

I. Required Truck Information

Equipment Registered Owner:		Equipment Fuel Type:
Vehicle Identification Number (VIN):		License Plate Number:
Truck Model Year:	Engine Model Year:	Engine Serial No.:
Annual Vehicle Miles Traveled in California:	Current Odometer Reading:	Date Recorded:
Power Take-off (PTO) Usage <i>(if applicable)</i> :		Current PTO hour meter reading: _____ Date Recorded: _____
Does PTO operate while the main truck engine is operating? <input type="checkbox"/> Yes <input type="checkbox"/> No		
Manufacturer Gross Vehicle Weight Rating (GVWR): _____ lbs <i>(Refer to the label found in the door jamb of your truck for the correct GVWR. Please attach a photograph of this label. NOTE: This is NOT the number registered with the DMV)</i>		
Port Trucks? <input type="checkbox"/> Yes <input type="checkbox"/> No		DPF installed? <input type="checkbox"/> Yes <input type="checkbox"/> No
Vocation <i>(Types of goods typically transported – Choose 1 box only)</i> "Goods" are defined as having the same meaning in Commercial Code section 2105, which essentially requires that: 1) The goods must be movable, and 2) the goods being moved must be part of a transaction that involves a contract for the sale of the goods. <input type="checkbox"/> Agricultural <input type="checkbox"/> Concrete Mixer <input type="checkbox"/> Dry Bulk Blower <input type="checkbox"/> Vacuum Pneumatic Trailer <input type="checkbox"/> Aggregates <input type="checkbox"/> Container <input type="checkbox"/> Hazardous Materials <input type="checkbox"/> Wood/Paper Products <input type="checkbox"/> Bulk or Break Bulk <input type="checkbox"/> Dairy Heavy Equipment/Metals Restaurant/Grocery <input type="checkbox"/> Building/Construction <input type="checkbox"/> Dump Truck <input type="checkbox"/> Poultry <input type="checkbox"/> Other _____		
Estimated Percentage of Annual Vehicle Miles Traveled (VMT) in CA Trade Corridors <i>(Total percentage cannot be over 100%)</i> _____% Bay Area _____% Central Valley _____% LA/Inland Empire _____% San Diego/Border _____% Other in CA _____% Outside CA		
Proposed future operation within CA during the contract term <i>(choose one)</i> : At least <input type="checkbox"/> 90% <input type="checkbox"/> 100%		

Proposed New Equipment and Funding Requested: All Fleets

Existing Truck	Replacement Engine Emission Level <small>(Please check only 1 Box Below)</small>				
	New MY2019+ engine natural gas truck ^{1,2,3}	New MY2019+ engine Hybrid truck ^{1,2,4}	New MY2019+ Engine optional Low-NOx truck (0.02 only) ^{1,2}	New MY2019+ engine hybrid zero emission mile truck ^{1,2,5}	New MY2019+ engine zero emission truck ^{1,2,6}
Class 8 <i>(33,001 lbs or greater GVWR, HHD engine)</i>	<input type="checkbox"/> \$65,000	<input type="checkbox"/> \$80,000	<input type="checkbox"/> \$100,000	<input type="checkbox"/> \$150,000	<input type="checkbox"/> \$200,000
Class 7 <i>(26,001 – 33,000 lbs GVWR, MHD or HHD engine)</i>	<input type="checkbox"/> \$65,000	<input type="checkbox"/> \$80,000	<input type="checkbox"/> \$100,000	<input type="checkbox"/> \$150,000	<input type="checkbox"/> \$200,000
Class 6 <i>(19,501 – 26,000 lbs GVWR, MHD engine)</i>	<input type="checkbox"/> \$40,000	<input type="checkbox"/> \$45,000	<input type="checkbox"/> \$50,000	<input type="checkbox"/> \$65,000	<input type="checkbox"/> \$100,000
Class 5 <i>(16,001 – 19,500 lbs GVWR, <HD engine)</i>	<input type="checkbox"/> \$25,000	<input type="checkbox"/> \$35,000	<input type="checkbox"/> \$40,000	<input type="checkbox"/> \$50,000	<input type="checkbox"/> \$80,000

1. Projects may be co-funded with CARB's Air Quality Improvement Program, Low Carbon Transportation Program, or the California Energy Commission's (CEC's) Alternative Renewable Fuel Vehicle Technology Program funds as applicable.
2. Co-funded projects can only utilize one additional source of State funding and the combined funding may not exceed 90% of the total eligible project cost or any other funding restrictions of each respective program. Projects must meet the requirements of each program providing funding.
3. Engines must meet the 2010 emission level of 0.20 g/bhp-hr or less NOx (FEL and CERT values - engine EO's that do not have both FEL and CERT values can show eligibility by using CERT values) and 0.01 g/bhp-hr or less PM (CERT value). All engines must be approved by CARB to be sold in California.
4. Hybrid truck is defined as a vehicle with an electric drive system powered by an on-board generator and approved for funding by AQIP.
5. Hybrid zero emission mile truck is defined as a hybrid vehicle capable of zero emission miles.
6. Zero emission truck is defined as a vehicle that emits no criteria pollutant, toxic or greenhouse gas emissions at the tailpipe.



II. **Supplemental Information- Please Attach the following Documents to Complete Your Application**

- Proof of Current and Prior Year Registration in CA:**
Acceptable records may include: CA based-plated registration, CA International Registration Plan (IRP), or dual-plated registration (CA based-plated/CA IRP and Mexico only) for trucks carrying goods across the CA-Mexico border.

Please provide registration documents to verify the following:
 - 1) Current registration, AND
 - 2) Registration for the past 2 years: Must show proof of registration in the current year (1-12 months prior to application date) and prior year (13-24 months prior to application date).
Two options:
 - 1) CA DMV registration cards for the past 2 years, OR
 - 2) CA DMV Vehicle Registration Information Record (DMV printout)
 - o The DMV printout must show registration in both the current year and prior year with a minimum of 6 months of total registration.
 - o If the DMV printout shows no registration in the prior year, then alternative documentation (insurance certificate or BIT inspection) must be used to verify operation in the prior year.

Note: The DMV printout may be obtained by submitting a Request for Driver Record Information form (INF 1125) to the DMV. To find your local DMV office, please visit <http://www.dmv.ca.gov>. You may also obtain and pay for the DMV printout online at: <http://www.dmv.ca.gov/online/vrr.htm>
- Copy of Existing Vehicle Title**
(Note: Title may show a lienholder at the time of application however the title must be cleared of all liens prior to payment of any grant funds by South Coast AQMD.)
- Vehicle Miles Traveled (VMT) in CA for the past 24 Months:**
Acceptable documentation includes, but is not limited to: maintenance records, Biennial Inspection of Terminals (BIT inspection), International Fuel Tax Agreement (IFTA) records, daily logs, etc.) Documentation must clearly identify the truck by ID number, license plate, or VIN.
Two (2) mileage records showing odometer readings

- If applicable, provide Power Take Off (PTO) activity for the past 24 months:**

Acceptable documentation is subject to approval by the South Coast AQMD, but must clearly identify the truck by ID number, license plate, or VIN.

Two (2) PTO records showing hour meter
- Proof of insurance for the past 24 months**
- Copy of Certificate of Compliance from CARB’s TRUCRS database**

- Photograph of the manufacturer’s labels found in the door jamb of the truck showing VIN and GVWR**

III. **IMPORTANT NOTES**

- ✓ **SUBMIT** completed Forms A1, B1, and all required supplemental Information listed above to the South Coast AQMD by the requested due date.



- ✓ **DO NOT PURCHASE NEW EQUIPMENT!** New equipment funded by this program can only be purchased once the contract is signed between the equipment owner and the South Coast AQMD. An equipment owner may pre-order new equipment prior to contract execution and after posting of CARB's approved rank list at the equipment owner's risk.
- ✓ **KEEP EXISTING OLD TRUCK REGISTERED AND IN OPERATION!** Existing equipment must maintain continuous DMV registration and be in operation moving goods at a similar activity level to that listed in the application until the equipment has been relinquished to a South Coast AQMD-approved dismantler.
- ✓ **STAY COMPLIANT!** Applicants must maintain compliance with all applicable CARB regulations throughout the Proposition 1B Program process and the life of the contract. The Program-Funded equipment may not be used by the equipment owner to comply with any applicable CARB regulations.



PROPOSITION 1B - GOODS MOVEMENT EMISSION REDUCTION PROGRAM APPLICATION

FORM B2: Two-for-One Truck Replacement – For Second Truck Only

(Complete this form for the second truck in the Two-for-One Truck Replacement)

I. Second Truck Information

Equipment Registered Owner: Equipment Fuel Type:
Vehicle Identification Number (VIN): License Plate Number:
Truck Model Year: Engine Model Year: Engine Serial No.:
Annual Vehicle Miles Traveled in California: Current Odometer Reading: Date Recorded:
Power Take-off (PTO) Usage (if applicable): Current PTO hour meter reading: Date Recorded:
Does PTO operate while the main truck engine is operating? Yes No
Manufacturer Gross Vehicle Weight Rating (GVWR): lbs
(Refer to the label found in the door jamb of your truck for the correct GVWR. Please attach a photograph of this label. NOTE: This is NOT the number registered with the DMV)
Port Truck? Yes No DPF Installed? Yes No
Vocation (Types of goods typically transported – Choose 1 box only)
“Goods” are defined as having the same meaning in Commercial Code section 2105, which essentially requires that:
1) The goods must be movable, and 2) the goods being moved must be part of a transaction that involves a contract for the sale of the goods.
Agricultural Concrete Mixer Dry Bulk Blower Vacuum Pneumatic Trailer
Aggregates Container Hazardous Materials Wood/Paper Products
Bulk or Break Bulk Dairy Heavy Equipment/Metals Restaurant/Grocery
Building/Construction Dump Truck Poultry Other
Estimated Percentage of Annual Vehicle Miles Traveled (VMT) in CA Trade Corridors (Total percentage cannot be over 100%)
% Bay Area % Central Valley % LA/Inland Empire % San Diego/Border % Other in CA % Outside CA
Proposed future operation within CA during the contract term (choose one): At least 90% 100%

II. Supplemental Information – Please Attach the Following Documents to Complete Your Application

Proof of Current and Prior Year Registration in CA:
Acceptable records may include: CA based-plated registration, CA International Registration Plan (IRP), or dual-plated registration (CA based-plated/CA IRP and Mexico only) for trucks carrying goods across the CA-Mexico border.
Please provide registration documents to verify the following:
1) Current registration, AND
2) Registration for the past 2 years: Must show proof of registration in the current year (1-12 months prior to application date) and prior year (13-24 months prior to application date).
Two options:
1) CA DMV registration cards for the past 2 years, OR
2) CA DMV Vehicle Registration Information Record (DMV printout)
o The DMV printout must show registration in both the current year and prior year with a minimum of 6 months of total registration.
o If the DMV printout shows no registration in the prior year, then alternative documentation (insurance certificate or BIT inspection) must be used to verify operation in the prior year.
Note: The DMV printout may be obtained by submitting a Request for Driver Record Information form (INF 1125) to the DMV. To find your local DMV office, please visit http://www.dmv.ca.gov. You may also obtain and pay for the DMV printout online at: http://www.dmv.ca.gov/online/vrr.htm



- Copy of Existing Vehicle Title**
(Note: Title may show a lienholder at the time of application however the title must be cleared of all liens prior to the payment of any grant funds by South Coast AQMD.)

- Vehicle miles traveled (VMT) in California for the past 24 Months:**
Acceptable documentation includes, but is not limited to: maintenance records, Biennial Inspection of Terminals (BIT inspection), International Fuel Tax Agreement (IFTA) records, daily logs, etc.) Documentation Two (2) mileage records that show odometer readings.

- If applicable, provide Power Take Off (PTO) activity for the past 24 months:**
Acceptable documentation is subject to approval by the South Coast AQMD, but must clearly identify the truck by ID number, license plate, or VIN.
Two (2) PTO records showing hour meter readings.

- Proof of insurance for the past 24 months**

- Copy of Certificate of Compliance from CARB’s TRUCRS database**

- Photograph of the manufacturer’s label found in the door jamb of the truck showing VIN and GVWR**
(Legibly printed photos only)

III. IMPORTANT NOTES

- ✓ **SUBMIT** completed Forms A1, B1, B2 and all required supplemental Information listed above to the South Coast AQMD by the requested due date.
- ✓ **DO NOT PURCHASE NEW EQUIPMENT!** New equipment funded by this program can only be purchased once the contract is signed between the equipment owner and the South Coast AQMD. An equipment owner may pre-order new equipment prior to contract execution and after posting of CARB’s approved rank list at the equipment owner’s risk.
- ✓ **KEEP EXISTING OLD TRUCK REGISTERED AND IN OPERATION!** Existing equipment must maintain continuous DMV registration and be in operation moving goods at a similar activity level to that listed in the application until the equipment has been relinquished to a South Coast AQMD-approved dismantler.
- ✓ **STAY COMPLIANT!** Applicants must maintain compliance with all applicable CARB regulations throughout the Proposition 1B Program process and the life of the contract. The Program-Funded equipment may not be used by the equipment owner to comply with any applicable CARB regulations.



PROPOSITION 1B - GOODS MOVEMENT EMISSION REDUCTION PROGRAM APPLICATION

FORM B3: Heavy-Duty Diesel Truck Engine Repower (Small Fleet Only)

(Complete one form per truck)

I. Required Truck Information

Equipment Registered Owner:		Equipment Fuel Type:
Vehicle Identification Number (VIN):		License Plate Number:
Truck Model Year:	Engine Model Year:	Engine Serial No.:
Annual Vehicle Miles Traveled in California:	Current Odometer Reading:	Date Recorded:
Power Take-off (PTO) Usage (if applicable):		Current PTO hour meter reading: _____ Date Recorded: _____
Does PTO operate while the main truck engine is operating? <input type="checkbox"/> Yes <input type="checkbox"/> No		
Manufacturer Gross Vehicle Weight Rating (GVWR): _____ lbs <i>(Refer to the label found in the door jamb of your truck for the correct GVWR. Please attach a photograph of this label. NOTE: This is NOT the number registered with the DMV)</i>		
Port Truck? <input type="checkbox"/> Yes <input type="checkbox"/> No		DPF Installed? <input type="checkbox"/> Yes <input type="checkbox"/> No
Vocation (Types of goods typically transported – Choose 1 box only) “Goods” are defined as having the same meaning in Commercial Code section 2105, which essentially requires that: 2) The goods must be movable, and 2) the goods being moved must be part of a transaction that involves a contract for the sale of the goods. <input type="checkbox"/> Agricultural <input type="checkbox"/> Concrete Mixer <input type="checkbox"/> Dry Bulk Blower <input type="checkbox"/> Vacuum Pneumatic Trailer <input type="checkbox"/> Aggregates <input type="checkbox"/> Container <input type="checkbox"/> Hazardous Materials <input type="checkbox"/> Wood/Paper Products <input type="checkbox"/> Bulk or Break Bulk <input type="checkbox"/> Dairy <input type="checkbox"/> Heavy Equipment/Metals <input type="checkbox"/> Restaurant/Grocery <input type="checkbox"/> Building/Construction <input type="checkbox"/> Dump Truck <input type="checkbox"/> Poultry <input type="checkbox"/> Other _____		
Estimated Percentage of Annual Vehicle Miles Traveled (VMT) in CA Trade Corridors (Total percentage cannot be over 100%) _____% Bay Area _____% Central Valley _____% LA/Inland Empire _____% San Diego/Border _____% Other in CA _____% Outside CA Proposed future operation within CA during the contract term (choose one): <input type="checkbox"/> At least 90% <input type="checkbox"/> 100%		

Proposed New Equipment and Funding Requested:

Existing Truck	Replacement Engine Repower diesel engine with a new MY2019+ engine that meets 2010 emission levels
Class 8 <i>(33,001 lbs or greater, HHD engine)</i> (MY 2005-2009 Engine)	<input type="checkbox"/> \$20,000
Class 7 <i>(26,001 – 33,000 lbs, MHD or HHD)</i> (MY 2005 -2009 Engine)	<input type="checkbox"/> \$20,000
Class 6 <i>(19,501 – 26,000 lbs, MHD engine)</i> <i>(MHDengine)</i> (MY 2007-2009 Engine (no filter installed) and 1998 – 2007 if filter installed)	<input type="checkbox"/> \$10,000



II. Supplemental Information – Please Attach the Following Documents to Complete Your Application

Proof of Current and Prior Year Registration in CA:

Acceptable records may include: CA based-plated registration, CA International Registration Plan (IRP), or dual-plated registration (CA based-plated/CA IRP and Mexico only) for trucks carrying goods across the CA-Mexico border.

Please provide registration documents to verify the following:

- 1) Current registration, AND
- 2) Registration for the past 2 years: Must show proof of registration in the current year (1-12 months prior to application date) and prior year (13-24 months prior to application date).

Two options:

- 1) CA DMV registration cards for the past 2 years, OR
- 2) CA DMV Vehicle Registration Information Record (DMV printout)
 - o The DMV printout must show registration in both the current year and prior year with a minimum of 6 months of total registration.
 - o If the DMV printout shows no registration in the prior year, then alternative documentation (insurance certificate or BIT inspection) must be used to verify operation in the prior year.

Note: The DMV printout may be obtained by submitting a Request for Driver Record Information form (INF 1125) to the DMV. To find your local DMV office, please visit <http://www.dmv.ca.gov>. You may also obtain and pay for the DMV printout online at: <http://www.dmv.ca.gov/online/vrr.htm>

Copy of Existing Vehicle Title

(Note: Title may show a lienholder at the time of application however the title must be cleared of all liens prior to payment of any grant funds by South Coast AQMD.)

Vehicle miles traveled (VMT) in California for the past 24 Months:

Acceptable documentation includes, but is not limited to: maintenance records, Biennial Inspection of Terminals (BIT inspection), International Fuel Tax Agreement (IFTA) records, daily logs, etc.) Documentation Two (2) mileage records that show odometer readings.

If applicable, provide Power Take Off (PTO) activity for the past 24 months:

Acceptable documentation is subject to approval by the South Coast AQMD, but must clearly identify the truck by ID number, license plate, or VIN.
Two (2) PTO records showing hour meter readings.

Proof of insurance for the past 24 months

Copy of Certificate of Compliance from CARB’s TRUCRS database

Photograph of the manufacturer’s label found in the door jamb of the truck showing VIN and GVWR
(Legibly printed photos only)



III. IMPORTANT NOTES

- ✓ **SUBMIT** completed Forms A1, B1, and all required supplemental Information listed above to the South Coast AQMD by the requested due date.
- ✓ **DO NOT PURCHASE NEW EQUIPMENT!** New equipment funded by this program can only be purchased once the contract is signed between the equipment owner and the South Coast AQMD. An equipment owner may pre-order new equipment prior to contract execution and after posting of CARB's approved rank list at the equipment owner's risk.
- ✓ **KEEP EXISTING OLD TRUCK REGISTERED AND IN OPERATION!** Existing equipment must maintain continuous DMV registration and be in operation moving goods at a similar activity level to that listed in the application until the equipment has been relinquished to a South Coast AQMD-approved dismantler.
- ✓ **STAY COMPLIANT!** Applicants must maintain compliance with all applicable CARB regulations throughout the Proposition 1B Program process and the life of the contract. The Program-Funded equipment may not be used by the equipment owner to comply with any applicable CARB regulations.



PROPOSITION 1B - GOODS MOVEMENT EMISSION REDUCTION PROGRAM APPLICATION

FORM B4: Three-Way Truck Transaction

I. Truck A Information (Engine Model Year 2007-2009 with a OEM or Level 3 PM Filter Installed)

Equipment Registered Owner:		Equipment Fuel Type:
Vehicle Identification Number (VIN):		License Plate Number:
Truck Model Year:	Engine Model Year:	Engine Serial No.:
Annual Vehicle Miles Traveled:	Current Odometer Reading:	Date Recorded:
Power Take-off (PTO) Usage (if applicable):		Current PTO hour meter reading: _____ Date Recorded: _____
Does PTO operate while the main truck engine is operating?		Yes No
Manufacturer Gross Vehicle Weight Rating (GVWR): _____ lbs <i>(Refer to the label found in the door jamb of your truck for the correct GVWR. Please attach a photograph of this label. NOTE: This is NOT the number registered with the DMV)</i>		
Vocation (Types of goods typically transported – Choose 1 box only) “Goods” are defined as having the same meaning in Commercial Code section 2105, which essentially requires that: 1) The goods must be movable, and 2) the goods being moved must be part of a transaction that involves a contract for the sale of the goods.		
<input type="checkbox"/> Agricultural	<input type="checkbox"/> Concrete Mixer	<input type="checkbox"/> Dry Bulk Blower
<input type="checkbox"/> gates	<input type="checkbox"/> Container	<input type="checkbox"/> Hazardous Materials
<input type="checkbox"/> Bulk or Break Bulk	<input type="checkbox"/> Dairy	<input type="checkbox"/> Heavy Equipment/Metals
<input type="checkbox"/> Building/Construction	<input type="checkbox"/> Dump Truck	<input type="checkbox"/> Poultry
<input type="checkbox"/> Vacuum Pneumatic Trailer	<input type="checkbox"/> Aggre-	<input type="checkbox"/> Wood/Paper Products
<input type="checkbox"/> Restaurant/Grocery	<input type="checkbox"/> Other _____	
Estimated Percentage of Annual Vehicle Miles Traveled (VMT) in CA Trade Corridors (Total percentage cannot be over 100%) _____ % Bay Area _____ % Central Valley _____ % LA/Inland Empire _____ % San Diego/Border _____ % Other in CA _____ % Outside CA		
Proposed future operation within CA during the contract term (choose one): <input type="checkbox"/> At least 90% <input type="checkbox"/> 100%		

II. Truck B Information (Engine Model Year 2006 or Older that has demonstrated compliance with the Statewide Truck and Bus Rule)

Equipment Registered Owner:		Equipment Fuel Type:
Vehicle Identification Number (VIN):		License Plate Number:
Truck Model Year:	Engine Model Year:	Engine Serial No.:
Annual Vehicle Miles Traveled:	Current Odometer Reading:	Date Recorded:
Power Take-off (PTO) Usage (if applicable):		Current PTO hour meter reading: _____ Date Recorded: _____
Does PTO operate while the main truck engine is operating?		Yes No
Manufacturer Gross Vehicle Weight Rating (GVWR): _____ lbs <i>(Refer to the label found in the door jamb of your truck for the correct GVWR. Please attach a photograph of this label. NOTE: This is NOT the number registered with the DMV)</i>		
Vocation (Types of goods typically transported – Choose 1 box only) “Goods” are defined as having the same meaning in Commercial Code section 2105, which essentially requires that: 1) The goods must be movable, and 2) the goods being moved must be part of a transaction that involves a contract for the sale of the goods.		
<input type="checkbox"/> Agricultural	<input type="checkbox"/> Concrete Mixer	<input type="checkbox"/> Dry Bulk Blower
<input type="checkbox"/> gates	<input type="checkbox"/> Container	<input type="checkbox"/> Hazardous Materials
<input type="checkbox"/> Bulk or Break Bulk	<input type="checkbox"/> Dairy	<input type="checkbox"/> Heavy Equipment/Metals
<input type="checkbox"/> Building/Construction	<input type="checkbox"/> Dump Truck	<input type="checkbox"/> Poultry
<input type="checkbox"/> Vacuum Pneumatic Trailer	<input type="checkbox"/> Aggre-	<input type="checkbox"/> Wood/Paper Products
<input type="checkbox"/> Restaurant/Grocery	<input type="checkbox"/> Other _____	
Estimated Percentage of Annual Vehicle Miles Traveled (VMT) in CA Trade Corridors (Total percentage cannot be over 100%) _____ % Bay Area _____ % Central Valley _____ % LA/Inland Empire _____ % San Diego/Border _____ % Other in CA _____ % Outside CA		
Proposed future operation within CA during the contract term (choose one): <input type="checkbox"/> At least 90% <input type="checkbox"/> 100%		

Note: If owner of Truck B is different than owner of Truck A and has not yet been identified, Table II may be left blank. Ranking may be increased if Truck B information is provided at the time of application submittal.



III. Truck C Information – New Equipment And Funding Request for All Fleet (Must be the same vehicle class as Truck A)

Existing Truck	Replacement Engine Emission Level (Please check only 1 Box Below)				
	New MY2019+ engine natural gas truck ^{1,2,3}	New MY2019+ engine Hybrid truck ^{1,2,4}	New MY2019+ Engine optional Low-NOx truck (0.02 only) ^{1,2}	New MY2019+ engine hybrid zero emission mile truck ^{1,2,5}	New MY2019+ engine zero emission truck ^{1,2,6}
Class 8 (33,001 lbs or greater GVWR, HHD engine)	<input type="checkbox"/> \$65,000	<input type="checkbox"/> \$80,000	<input type="checkbox"/> \$100,000	<input type="checkbox"/> \$150,000	<input type="checkbox"/> \$200,000
Class 7 (26,001 – 33,000 lbs GVWR, MHD or HHD engine)	<input type="checkbox"/> \$65,000	<input type="checkbox"/> \$80,000	<input type="checkbox"/> \$100,000	<input type="checkbox"/> \$150,000	<input type="checkbox"/> \$200,000
Class 6 (19,501 – 26,000 lbs GVWR, MHD engine)	<input type="checkbox"/> \$40,000	<input type="checkbox"/> \$45,000	<input type="checkbox"/> \$50,000	<input type="checkbox"/> \$65,000	<input type="checkbox"/> \$100,000
Class 5 (16,001 - 19,501 lbs GVWR, LHD or MHD engine)	<input type="checkbox"/> \$25,000	<input type="checkbox"/> \$35,000	<input type="checkbox"/> \$40,000	<input type="checkbox"/> \$50,000	<input type="checkbox"/> \$80,000

1. Projects may be co-funded with CARB’s Air Quality Improvement Program, Low Carbon Transportation Program, or the California Energy Commission’s (CEC’s) Alternative Renewable Fuel Vehicle Technology Program funds as applicable.
2. Co-funded projects can only utilize one additional source of State funding and the combined funding may not exceed 90% of the total eligible project cost or any other funding restrictions of each respective program. Projects must meet the requirements of each program providing funding.
3. Engines must meet the 2010 emission level of 0.20 g/bhp-hr or less NOx (FEL and CERT values - engine EO’s that do not have both FEL and CERT values can show eligibility by using CERT values) and 0.01 g/bhp-hr or less PM (CERT value). All engines must be approved by CARB to be sold in California.
4. Hybrid truck is defined as a vehicle with an electric drive system powered by an on-board generator and approved for funding by AQIP.
5. Hybrid zero emission mile truck is defined as a hybrid vehicle capable of zero emission miles.
6. Zero emission truck is defined as a vehicle that emits no criteria pollutant, toxic or greenhouse gas emissions at the tailpipe.



iv. Supplemental Information – Please Attach the Following Documents to Complete Your Application

Proof of Current and Prior Year Registration in CA:

Acceptable records may include: CA based-plated registration, CA International Registration Plan (IRP), or dual-plated registration (CA based-plated/CA IRP and Mexico only) for trucks carrying goods across the CA-Mexico border.

Please provide registration documents to verify the following:

Current registration, AND

Registration for the past 2 years: Must show proof of registration in the current year (1-12 months prior to application date) and prior year (13-24 months prior to application date).

Two options:

CA DMV registration cards for the past 2 years, OR

CA DMV Vehicle Registration Information Record (DMV printout)

The DMV printout must show registration in both the current year and prior year with a minimum of 6 months of total registration.

If the DMV printout shows no registration in the prior year, then alternative documentation (insurance certificate or BIT inspection) must be used to verify operation in the prior year.

Note: The DMV printout may be obtained by submitting a Request for Driver Record Information form (INF 1125) to the DMV. To find your local DMV office, please visit <http://www.dmv.ca.gov>. You may also obtain and pay for the DMV printout online at: <http://www.dmv.ca.gov/online/vrr.htm>

Copy of Existing Vehicle Title

(Note: Title may show a lienholder at the time of application however the title must be cleared of all liens prior to payment of any grant funds by South Coast AQMD.)

Vehicle Miles Traveled (VMT) in CA for the past 24 Months:

Acceptable documentation includes, but is not limited to: maintenance records, Biennial Inspection of Terminals (BIT inspection), International Fuel Tax Agreement (IFTA) records, daily logs, etc.) Documentation must clearly identify the truck by ID number, license plate, or VIN.

Two (2) mileage records that show odometer readings.

If applicable, provide Power Take Off (PTO) activity for the past 24 months:

Acceptable documentation is subject to approval by the South Coast AQMD, but must clearly identify the truck by ID number, license plate, or VIN.

Two (2) PTO records showing hour meter

Proof of insurance for the past 24 months

Copy of Certificate of Compliance from CARB's TRUCRS database

Photograph of the manufacturer's labels found in the door jamb of the truck showing VIN and GVWR (Legibly printed photos only)

V. IMPORTANT NOTES

- ✓ **SUBMIT** completed Forms A1, B1, and all required supplemental Information listed above to the South Coast AQMD by the requested due date.
- ✓ **DO NOT PURCHASE NEW EQUIPMENT!** New equipment funded by this program can only be purchased once the contract is signed between the equipment owner and the South Coast AQMD. An equipment owner may pre-order new equipment prior to contract execution and after posting of CARB's approved rank list at the equipment owner's risk.
- ✓ **KEEP EXISTING OLD TRUCK REGISTERED AND IN OPERATION!** Existing equipment must maintain continuous DMV registration and be in operation moving goods at a similar activity level to that listed in the application until the equipment has been relinquished to a South Coast AQMD-approved dismantler.
- ✓ **STAY COMPLIANT!** Applicants must maintain compliance with all applicable CARB regulations throughout the Proposition 1B Program process and the life of the contract. The Program-Funded equipment may not be used by the equipment owner to comply with any applicable CARB regulations.



PROPOSITION 1B - GOODS MOVEMENT EMISSION REDUCTION PROGRAM APPLICATION

FORM C1: Truck Stop Electrification Infrastructure

I. APPLICANT INFORMATION

Name :		
Business Name (if any):		
Primary Contact Name:		Email: Phone Number:
Mailing Address:		
City:	State:	Zip Code:
Person with contract signing authority (if different than above):		Title:
Have you applied for any other grant programs for this project? <input type="checkbox"/> Yes <input type="checkbox"/> No If yes, specify the grant program(s) that you applied to: _____		

II. LOCATION INFORMATION

Facility Name:
Location/Project Site Address:
Type of Project: <input type="checkbox"/> Truck Stop - Number of Existing Parking Spaces : _____ <input type="checkbox"/> Intermodal Facility – Number of Existing Spaces: _____ Dis- <input type="checkbox"/> tribution Center - Number of Existing Docks: _____ <input type="checkbox"/> Other (please specify): _____
How many heavy-duty diesel trucks are currently operated at this facility annually? _____ Average daily time a refrigeration units (TRUs) operates while parked? _____ hr.

III. PROJECT INFORMATION – PROJECTED ACTIVITIES WITH NEW EQUIPMENT AND EMISSIONS BENEFITS DATA*

Brief Description of Project (please include the detailed design plan with application):		
Number of electrification units to be installed: _____	Individual power required: _____	Total power required: _____
Annual estimated of number of trucks connect to electric power : _____	Average connection time per truck: _____ hrs.	
Annual estimated of number of TRU connect to electric power : _____	Average connection time per TRU: _____ hrs.	



PROPOSITION 1B - GOODS MOVEMENT EMISSION REDUCTION PROGRAM APPLICATION

FORM C1: Truck Stop Electrification Infrastructure

Projected annual usage in hours (expected percent occupancy):

Year 1 : _____% Year 2 : _____% Year 3 : _____% Year 4 : _____% Year 5 : _____%

Year 6 : _____% Year 7 : _____% Year 8 : _____% Year 9 : _____% Year 10 : _____%

Projected power usage for TRU (expected percent occupancy):

Year 1 : _____% Year 2 : _____% Year 3 : _____% Year 4 : _____% Year 5 : _____%

Year 6 : _____% Year 7 : _____% Year 8 : _____% Year 9 : _____% Year 10 : _____%

Baseline emission (without project) for the first 10-year of operation: NOx _____ lb. and PM _____ lb.

Emission from the project during the first 10-year of operation: NOx _____ lb. and PM _____ lb.

Emission reduction for the first 10-year of project operation: NOx _____ lb. and PM _____ lb.

Cost Effectiveness : _____ lb./State dollars

Note: Cost-effectiveness should be equal to or greater than 0.10 lb./State dollars invested

* Applicant must use CARB's 2015 Emissions Benefits Calculator to estimate the baseline and future emissions, the amount of emissions reduced, and the cost-effectiveness of the project together with the annual usage in hours. The calculator will be posted on CARB's website. Applicant must provide an electronic copy and a hardcopy of the completed calculator with the application.

IV. EQUIPMENT VENDOR INFORMATION

Vendor Name:

Contact person:

Email:

Phone Number:

V. EQUIPMENT PROJECT FUNDING REQUEST

Total project cost (\$):

Program dollar requested (\$):

Source of funds to pay for the balance of the project:

Private (cash/loan) Local Other state Federal Other(please specify): _____



VI. ATTACHMENTS-PLEASE ATTACH THE FOLLOWING DOCUMENTS TO COMPLETE YOUR APPLICATION

- Completed Form C1.
- Complete ARB’s 2015 Emission Benefit Calculator. The calculator can be accessed at: <https://ww2.arb.ca.gov/our-work/programs/proposition-1b-goods-movement-emission-reduction-program>
- Truck electrification infrastructure detailed design plan.
- Itemized cost information by phase (design, environmental, construction).
- Written project acknowledgement form from the site owner (if applicant does not own the site where the equipment will be installed) which acknowledge/agrees to the following, at a minimum, for the duration of the project life:
 - The equipment owner will be allowed to install and operate the Program-funded equipment at the site address.
 - Program-funded equipment will be the property of the applicant listed in the equipment project application.
 - The local agency, ARB, or their designees will be allowed to access the site, equipment, and associated records for inspection, Program reviews, or fiscal audits.

VII. Applicant Statement

I have the legal authority to apply for incentive funding for the entity described in this application, and agree to the following statements by signing below:

- I (applicant) have reviewed the information provided in this application, including all supporting documentation, and certify the application information is true and correct, and meets the minimum requirements of the Proposition 1B - Goods Movement Emission Reduction Program;
- I agree to follow all requirements of the 2015 Proposition 1B - Goods Movement Emission Reduction Program Guidelines;
- The program-funded equipment shall be placed into operation and post-inspected prior to the applicable operational deadline to remain eligible for funding;
- I understand that the Program-funded equipment may not be used by the equipment owner to comply with any applicable CARB regulations for the specified timeframe;
- I have not and will not apply for additional grant funds from any other agency or program for this proposed project, except the funding programs allowed by the Guideline.
- I will disclose any other source(s) of funding that has been applied for and will be used for the same project, including the source of funds, amount, and the purpose for funding;
- I will disclose the value of any existing financial incentive that directly reduces the project cost, including tax credits or deductions, grants, or other public financial assistance for the same equipment;
- Grant funds shall only be used to offset the capital cost of the equipment and/or shall reduce the principal owed to purchase the equipment;
- New equipment must **not** be purchased, received, installed, paid for, or placed into operation prior to contract execution;
- New equipment purchased outside of California may be subject to California sales and/or use tax;
- I agree to properly maintain program funded equipment in good operating condition and according to manufacturer’s recommendation during the project life;
- I understand that an incomplete or illegible application, including applications that are missing required documentation, may be rejected by the South Coast AQMD at their discretion;
- I acknowledge that the South Coast AQMD may release the information the application contains to third parties if required by state and federal public records laws; and
- I understand that landside electrification infrastructure to reduce diesel engine idling and use of diesel-fueled internal combustion auxiliary power systems may be funded at the lower of 50% of eligible project costs or a level commensurate with a cost-effectiveness of 0.10 pounds of weighted emissions reduced per State dollars invested.
- I understand that truck stop/distribution center electrification infrastructure projects shall be eligible to compete for funding



PROPOSITION 1B - GOODS MOVEMENT EMISSION REDUCTION PROGRAM APPLICATION

FORM C1: Truck Stop Electrification Infrastructure

only if the cost-effectiveness is equal to or greater than 0.10 pounds of weighted emissions reduced per State dollars invested.

- I understand that eligible costs for the project include purchase and installation of electrical infrastructure to: enable heating, cooling, and the use of cab power for parked trucks at truck stops, intermodal facilities, and other places where trucks congregate. Reimbursement for the eligible costs shall be based on demonstrated use over the first year of operation. Ineligible costs include on-board auxiliary power units and other equipment installed on trucks.
- I understand that the reimbursement for the eligible cost will be based on demonstrated use over the first year of operation.
- Equipment project match funding is reasonably available to complete the equipment project according to the proposed timeframe.

Printed Name of Owner: _____ **Title:** _____

Signature of Owner: _____ **Date:** _____



PROPOSITION 1B - GOODS MOVEMENT EMISSION REDUCTION PROGRAM APPLICATION

FORM C2: Electric Charging Stations or Hydrogen Fueling Units

This funding option is only available if the equipment owner replaces a minimum of one vehicle through the Program (Form B1)

I. APPLICANT INFORMATION

Name :		
Business Name (if any):		
Primary Contact Name:		Email: Phone Number:
Mailing Address:		
City:	State:	Zip Code:
Person with contract signing authority (if different than above):		Title:
Have you applied for any other grant programs for this project? <input type="checkbox"/> Yes <input type="checkbox"/> No If yes, specify the grant program(s) that you applied to:		

II. CHARGING/FUELING EQUIPMENT INFORMATION

Equipment/ Construction Location:
Project type? <input type="checkbox"/> Electric charging station <input type="checkbox"/> Hydrogen Fueling Unit
Equipment Manufacturer:
Equipment Power Rating for Electric Charger Only (Voltage, Amperage, Wattage, Efficiency):
Equipment Serial Number:
Equipment Recharge Rate (Electric Charger Only):
Anticipated Cost of Eligible Equipment:
Description of Usage Monitoring System
Estimated Annual Truck connections: _____ Trucks. Estimated connection time/Truck: _____ hours.

III. EQUIPMENT PROJECT FUNDING REQUEST

Estimated Cost of Charging Stations/Fueling Units :\$ _____
Program Dollars Requested:\$ _____ (Partial funding of up to the lower of 50% or \$30,000 for 1 charging or fueling units)
Equipment Power Rating for Electric Charger Only (Voltage, Amperage, Wattage, Efficiency):
Equipment Serial Number:
Equipment Recharge Rate (Electric Charger Only):

Attachment 1



South Coast Air Quality Management District

21865 Copley Drive, Diamond Bar, CA 91765-4178 (909)
396-2000 • www.aqmd.gov

BUSINESS INFORMATION REQUEST

Business Name	
Division of	
Subsidiary of	
Website Address	
Type of Business <i>Check One:</i>	<input type="checkbox"/> Individual <input type="checkbox"/> DBA, Name _____, County Filed in _____ <input type="checkbox"/> Corporation, ID No. _____ <input type="checkbox"/> LLC/LLP, ID No. _____ <input type="checkbox"/> Other _____

REMITTING ADDRESS INFORMATION

Address			
City/Town			
State/Province		Zip	
Phone	() - Ext	Fax	() -
Contact		Title	
E-mail Address			
Payment Name if Different			

All invoices must reference the corresponding Purchase Order Number(s)/Contract Number(s) if applicable and mailed to:

**Attention: Accounts Payable, Accounting Department South
Coast Air Quality Management District
21865 Copley Drive
Diamond Bar, CA 91765-4178**

Attachment 2

BUSINESS STATUS CERTIFICATIONS

Federal guidance for utilization of disadvantaged business enterprises allows a vendor to be deemed a small business enterprise (SBE), minority business enterprise (MBE) or women business enterprise (WBE) if it meets the criteria below.

- is certified by the Small Business Administration or
- is certified by a state or federal agency or
- is an independent MBE(s) or WBE(s) business concern which is at least 51 percent owned and controlled by minority group member(s) who are citizens of the United States.

Statements of certification:

As a prime contractor to South Coast AQMD, _____ (name of business) will engage in good faith efforts to achieve the fair share in accordance with 40 CFR Section 33.301, and will follow the six affirmative steps listed below **for contracts or purchase orders funded in whole or in part by federal grants and contracts.**

1. Place qualified SBEs, MBEs, and WBEs on solicitation lists.
2. Assure that SBEs, MBEs, and WBEs are solicited whenever possible.
3. When economically feasible, divide total requirements into small tasks or quantities to permit greater participation by SBEs, MBEs, and WBEs.
4. Establish delivery schedules, if possible, to encourage participation by SBEs, MBEs, and WBEs.
5. Use services of Small Business Administration, Minority Business Development Agency of the Department of Commerce, and/or any agency authorized as a clearinghouse for SBEs, MBEs, and WBEs.
6. If subcontracts are to be let, take the above affirmative steps.

Self-Certification Verification: Also for use in awarding additional points, as applicable, in accordance with South Coast AQMD Procurement Policy and Procedure:

Check all that apply:

- | | |
|---|--|
| <input type="checkbox"/> Small Business Enterprise/Small Business Joint Venture | <input type="checkbox"/> Women-owned Business Enterprise |
| <input type="checkbox"/> Local business | <input type="checkbox"/> Disabled Veteran-owned Business Enterprise/DVBE Joint Venture |
| <input type="checkbox"/> Minority-owned Business Enterprise | <input type="checkbox"/> Most Favored Customer Pricing Certification |

Percent of ownership: _____ %

Name of Qualifying Owner(s): _____

State of California Public Works Contractor Registration No. _____ . MUST BE INCLUDED IF BID PROPOSAL IS FOR PUBLIC WORKS PROJECT.

I, the undersigned, hereby declare that to the best of my knowledge the above information is accurate. Upon penalty of perjury, I certify information submitted is factual.

NAME

TITLE

TELEPHONE NUMBER

DATE

Definitions

Disabled Veteran-Owned Business Enterprise means a business that meets all of the following criteria:

- is a sole proprietorship or partnership of which is at least 51 percent owned by one or more disabled veterans, or in the case of any business whose stock is publicly held, at least 51 percent of the stock is owned by one or more disabled veterans; a subsidiary which is wholly owned by a parent corporation but only if at least 51 percent of the voting stock of the parent corporation is owned by one or more disabled veterans; or a joint venture in which at least 51 percent of the joint venture's management and control and earnings are held by one or more disabled veterans.
- the management and control of the daily business operations are by one or more disabled veterans. The disabled veterans who exercise management and control are not required to be the same disabled veterans as the owners of the business.
- is a sole proprietorship, corporation, partnership, or joint venture with its primary headquarters office located in the United States and which is not a branch or subsidiary of a foreign corporation, firm, or other foreign-based business.

Joint Venture means that one party to the joint venture is a DVBE and owns at least 51 percent of the joint venture. In the case of a joint venture formed for a single project this means that DVBE will receive at least 51 percent of the project dollars.

Local Business means a business that meets all of the following criteria:

- has an ongoing business within the boundary of South Coast AQMD at the time of bid application.
- performs 90 percent of the work within South Coast AQMD's jurisdiction.

Minority-Owned Business Enterprise means a business that meets all of the following criteria:

- is at least 51 percent owned by one or more minority persons or in the case of any business whose stock is publicly held, at least 51 percent of the stock is owned by one or more minority persons.
- is a business whose management and daily business operations are controlled or owned by one or more minority person.
- is a business which is a sole proprietorship, corporation, partnership, joint venture, an association, or a cooperative with its primary headquarters office located in the United States, which is not a branch or subsidiary of a foreign corporation, foreign firm, or other foreign business.

“Minority” person means a Black American, Hispanic American, Native American (including American Indian, Eskimo, Aleut, and Native Hawaiian), Asian-Indian American (including a person whose origins are from India, Pakistan, or Bangladesh), Asian-Pacific American (including a person whose origins are from Japan, China, the Philippines, Vietnam, Korea, Samoa, Guam, the United States Trust Territories of the Pacific, Northern Marianas, Laos, Cambodia, or Taiwan).

Small Business Enterprise means a business that meets the following criteria:

- a. 1) an independently owned and operated business; 2) not dominant in its field of operation; 3) together with affiliates is either:
 - **A service, construction, or non-manufacturer with 100 or fewer employees, and average annual gross receipts of ten million dollars (\$10,000,000) or less over the previous three years, or**
 - A manufacturer with 100 or fewer employees.
- b. Manufacturer means a business that is both of the following:
 - 1) Primarily engaged in the chemical or mechanical transformation of raw materials or processed substances into new products.
 - 2) Classified between Codes 311000 to 339000, inclusive, of the North American Industrial Classification System (NAICS) Manual published by the United States Office of Management and Budget, 2007 edition.

Small Business Joint Venture means that one party to the joint venture is a Small Business and owns at least 51 percent of the joint venture. In the case of a joint venture formed for a single project this means that the Small Business will receive at least 51 percent of the project dollars.

Women-Owned Business Enterprise means a business that meets all of the following criteria:

- is at least 51 percent owned by one or more women or in the case of any business whose stock is publicly held, at least 51 percent of the stock is owned by one or more women.
- is a business whose management and daily business operations are controlled or owned by one or more women.
- is a business which is a sole proprietorship, corporation, partnership, or a joint venture, with its primary headquarters office located in the United States, which is not a branch or subsidiary of a foreign corporation, foreign firm, or other foreign business.

Most Favored Customer as used in this policy means that the South Coast AQMD will receive at least as favorable pricing, warranties, conditions, benefits and terms as other customers or clients making similar purchases or receiving similar services.

The payee completes this form and submits it to the withholding agent. The withholding agent keeps this form with their records.

Withholding Agent Information

Name _____

Payee Information

Name _____

SSN or ITIN FEIN CA Corp. no. CA SOS file no.

Address (apt./suite, room, PO box, or PMB no.) _____

City (If you have a foreign address, see instructions.) _____

State _____ ZIP code _____

Exemption Reason

Check only one box.

By checking the appropriate box below, the payee certifies the reason for the exemption from the California income tax withholding requirements on payment(s) made to the entity or individual.

- Individuals — Certification of Residency:**
I am a resident of California and I reside at the address shown above. If I become a nonresident at any time, I will promptly notify the withholding agent. See instructions for General Information D, Definitions.
- Corporations:**
The corporation has a permanent place of business in California at the address shown above or is qualified through the California Secretary of State (SOS) to do business in California. The corporation will file a California tax return. If this corporation ceases to have a permanent place of business in California or ceases to do any of the above, I will promptly notify the withholding agent. See instructions for General Information D, Definitions.
- Partnerships or Limited Liability Companies (LLCs):**
The partnership or LLC has a permanent place of business in California at the address shown above or is registered with the California SOS, and is subject to the laws of California. The partnership or LLC will file a California tax return. If the partnership or LLC ceases to do any of the above, I will promptly inform the withholding agent. For withholding purposes, a limited liability partnership (LLP) is treated like any other partnership.
- Tax-Exempt Entities:**
The entity is exempt from tax under California Revenue and Taxation Code (R&TC) Section 23701 _____ (insert letter) or Internal Revenue Code Section 501(c) _____ (insert number). If this entity ceases to be exempt from tax, I will promptly notify the withholding agent. Individuals cannot be tax-exempt entities.
- Insurance Companies, Individual Retirement Arrangements (IRAs), or Qualified Pension/Profit-Sharing Plans:**
The entity is an insurance company, IRA, or a federally qualified pension or profit-sharing plan.
- California Trusts:**
At least one trustee and one noncontingent beneficiary of the above-named trust is a California resident. The trust will file a California fiduciary tax return. If the trustee or noncontingent beneficiary becomes a nonresident at any time, I will promptly notify the withholding agent.
- Estates — Certification of Residency of Deceased Person:**
I am the executor of the above-named person's estate or trust. The decedent was a California resident at the time of death. The estate will file a California fiduciary tax return.
- Nonmilitary Spouse of a Military Servicemember:**
I am a nonmilitary spouse of a military servicemember and I meet the Military Spouse Residency Relief Act (MSRRA) requirements. See instructions for General Information E, MSRRA.

CERTIFICATE OF PAYEE: Payee must complete and sign below.

To learn about your privacy rights, how we may use your information, and the consequences for not providing the requested information, go to ftb.ca.gov/forms and search for **1131**. To request this notice by mail, call 800.852.6711.

Under penalties of perjury, I declare that I have examined the information on this form, including accompanying schedules and statements, and to the best of my knowledge and belief, it is true, correct, and complete. I further declare under penalties of perjury that if the facts upon which this form are based change, I will promptly notify the withholding agent.

Type or print payee's name and title _____ Telephone (____) _____

Payee's signature ► _____ Date _____



CAMPAIGN CONTRIBUTIONS DISCLOSURE

In accordance with California law, bidders and contracting parties are required to disclose, at the time the application is filed, information relating to any campaign contributions made to South Coast Air Quality Management District (South Coast AQMD) Board Members or members/alternates of the MSRC, including: the name of the party making the contribution (which includes any parent, subsidiary or otherwise related business entity, as defined below), the amount of the contribution, and the date the contribution was made. 2 C.C.R. §18438.8(b).

California law prohibits a party, or an agent, from making campaign contributions to South Coast AQMD Governing Board Members or members/alternates of the Mobile Source Air Pollution Reduction Review Committee (MSRC) of more than \$250 while their contract or permit is pending before South Coast AQMD; and further prohibits a campaign contribution from being made for three (3) months following the date of the final decision by the Governing Board or the MSRC on a donor’s contract or permit. Gov’t Code §84308(d). For purposes of reaching the \$250 limit, the campaign contributions of the bidder or contractor plus contributions by its parents, affiliates, and related companies of the contractor or bidder are added together. 2 C.C.R. §18438.5.

In addition, South Coast AQMD Board Members or members/alternates of the MSRC must abstain from voting on a contract or permit if they have received a campaign contribution from a party or participant to the proceeding, or agent, totaling more than \$250 in the 12-month period prior to the consideration of the item by the Governing Board or the MSRC. Gov’t Code §84308(c).

The list of current South Coast AQMD Governing Board Members can be found at South Coast AQMD website (www.aqmd.gov). The list of current MSRC members/alternates can be found at the MSRC website (<http://www.cleantransportationfunding.org>).

SECTION I.

Contractor (Legal Name): _____

DBA, Name _____, County Filed in _____ Corporation, ID No. _____ LLC/LLP, ID No. _____
--

List any parent, subsidiaries, or otherwise affiliated business entities of Contractor:
(See definition below).

SECTION II.

Has Contractor and/or any parent, subsidiary, or affiliated company, or agent thereof, made a campaign contribution(s) totaling \$250 or more in the aggregate to a current member of the South Coast Air Quality Management Governing Board or member/alternate of the MSRC in the 12 months preceding the date of execution of this disclosure?

Yes No **If YES, complete Section II below and then sign and date the form. If NO, sign and date below. Include this form with your submittal.**

Campaign Contributions Disclosure, continued:

Name of Contributor _____

Governing Board Member or MSRC Member/Alternate	Amount of Contribution	Date of Contribution
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Name of Contributor _____

Governing Board Member or MSRC Member/Alternate	Amount of Contribution	Date of Contribution
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Name of Contributor _____

Governing Board Member or MSRC Member/Alternate	Amount of Contribution	Date of Contribution
---	------------------------	----------------------

Name of Contributor _____

Governing Board Member or MSRC Member/Alternate	Amount of Contribution	Date of Contribution
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I declare the foregoing disclosures to be true and correct.

By: _____

Title: _____

Date: _____

DEFINITIONS

Parent, Subsidiary, or Otherwise Related Business Entity (2 Cal. Code of Regs., §18703.1(d).)

- (1) Parent subsidiary. A parent subsidiary relationship exists when one corporation directly or indirectly owns shares possessing more than 50 percent of the voting power of another corporation.
- (2) Otherwise related business entity. Business entities, including corporations, partnerships, joint ventures and any other organizations and enterprises operated for profit, which do not have a parent subsidiary relationship are otherwise related if any one of the following three tests is met:
 - (A) One business entity has a controlling ownership interest in the other business entity.
 - (B) There is shared management and control between the entities. In determining whether there is shared management and control, consideration should be given to the following factors:
 - (i) The same person or substantially the same person owns and manages the two entities;
 - (ii) There are common or commingled funds or assets;
 - (iii) The business entities share the use of the same offices or employees, or otherwise share activities, resources or personnel on a regular basis;
 - (iv) There is otherwise a regular and close working relationship between the entities; or
 - (C) A controlling owner (50% or greater interest as a shareholder or as a general partner) in one entity also is a controlling owner in the other entity.

Agenda Item #1

Tom Lee

Recognize Revenue, Issue Program Announcement, Execute Contracts, and Redistribute Funds for Heavy-Duty Truck Projects Meeting the Proposition 1B – Goods Movement Program Requirements

Background

- Administering and implementing the final funding cycle of the Prop 1B-Goods Movement Program on-going
- Incentive funds – Newly available
 - New Prop 1B - \$6.4 million
 - AB 617 – CAPP
 - Cancelled projects previously funded
- Staff estimates up to \$50 million
- Clean truck and infrastructure projects meeting the Prop 1B Program requirements, with a focus on port operations



Proposal

- Recognize \$6.4 million in new Prop 1B funding from CARB for trucks and supporting infrastructure
- Issue Program Announcement to solicit additional truck projects
- Execute contracts (or modify existing contracts) for Prop. 1B - eligible truck projects using Community Air Protection Program incentives or Prop 1B funds
- Redistribute funding sources between Prop 1B and CAPP incentives, as needed, for timely liquidation



Recommended Actions

- Recognize revenue up to \$6,406,088 from CARB for heavy-duty truck projects submitted under the Prop 1B Program
- Reimburse General Fund up to \$305,052 for administrative costs
- Issue Program Announcement #PA2021-03
- Execute contracts (or modify existing contracts) for eligible truck projects using CAPP incentives or Prop 1B funds
- Redistribute funding sources between Prop 1B Fund (81) and Community Air Protection Fund (77) as needed for timely liquidation

Technology Committee Agenda #2

BOARD MEETING DATE: November 6, 2020

AGENDA NO.

PROPOSAL: Reimburse CEC and Return Interest

SYNOPSIS: In February 2020, CEC issued a final audit report of CEC-funded projects, concluding that the majority of claimed agreement expenditures were in compliance with grant agreement requirements. However, the report questioned certain reimbursed subcontractor costs and requested that interest earned be returned to CEC. These actions are to: 1) reimburse CEC for unsupported costs with funds provided by two contractors in an amount not to exceed \$214,719 from the Clean Fuels Fund (31); 2) reimburse CEC for unsupported costs in an amount not to exceed \$70,631 from the Clean Fuels Fund (31); and 3) return to CEC interest earned on CEC funds in an amount not to exceed \$202,723 and future residual interest earned from the Hydrogen Fueling Infrastructure Network Fund (63).

COMMITTEE: Technology, October 16, 2020; Recommended for Approval

RECOMMENDED ACTIONS:

1. Reimburse CEC for unsupported costs with funds provided by Clean Fuel Connection, Inc. and Cummins Westport Inc. in an amount not to exceed \$214,719 from the Clean Fuels Fund (31);
2. Reimburse CEC for unsupported costs on behalf of H2 Frontier in an amount not to exceed \$70,631 from the Clean Fuels Fund (31); and
3. Return to CEC interest earned on CEC funds in an amount not to exceed \$202,723 and residual interest earned from the Hydrogen Fueling Infrastructure Network Fund (63).

Wayne Nastri
Executive Officer

Background

The CEC conducted an audit on five funding agreements, with aggregated project funds of \$12.6 million, and issued a final audit report on February 4, 2020. These grants were leveraged with other funds, including more than \$3.5 million from South Coast AQMD as well as significant private investments and were successfully implemented within CEC budgeted amounts. Collectively, these projects have resulted in or paved the way for significant reduction in criteria pollutants, greenhouse gases and petroleum usage, furthering the goals of both agencies, especially the projects that commercialized heavy-duty natural gas engines that are 90 percent cleaner than the existing standard and are currently being deployed throughout the Basin.

Existing processes and controls on invoices and supporting information are sound, however, research, development and demonstration projects, such as those included in the subject audit, often experience delays, and contractor/subcontractor reports need additional scrutiny to ensure completion of tasks. In line with existing controls, invoices and other documentation were thoroughly reviewed for accuracy prior to any payments and relied on contractors to provide true and accurate information for expenditures, especially indirect labor rates.

The final audit report concluded that the majority of claimed agreement expenditures were in compliance with grant agreement requirements. However, the final audit report contained two observations. The report questioned payments made to three contractors for unsupported labor, fringe benefits and indirect costs, totaling \$285,350. CEC also requested that South Coast AQMD return \$178,345 in interest earned on CEC funds. These funds were provided to South Coast AQMD as an advance payment on one of the agreements that was about to expire to prevent these funds from reverting to the state and enable the completion of three projects. Interest on the advance payment of funds was tracked in accordance with established protocols, and the interest income was always planned to be returned to CEC. Additional interest has been earned since the audit report, with a current interest balance of \$202,723. There is also residual interest which will continue to accrue and will also be returned to CEC.

Proposal

Two contractors agreed to reimburse South Coast AQMD. One contractor has paid \$9,622 to South Coast AQMD. The final invoice for the second contractor will be adjusted by \$205,097. However, one contractor is in financial hardship and is not able to reimburse South Coast AQMD for \$70,631 in unsupported costs, which is the only out-of-pocket cost South Coast AQMD will incur due to the CEC audit. The total amount that would be returned to CEC for unsupported costs is \$285,350.

Staff is proposing the following actions: 1) reimburse CEC for unsupported costs with funds provided by Clean Fuel Connection, Inc. and Cummins Westport, Inc. in an amount not to exceed \$214,719 from the Clean Fuels Fund (31); 2) reimburse CEC for

unsupported costs on behalf of H2 Frontier in an amount not to exceed \$70,631 from the Clean Fuels Fund (31); and 3) return to CEC interest earned on CEC funds in an amount not to exceed \$202,723 and return any future residual interest earned from the Hydrogen Fueling Infrastructure Network Fund (63).

Resource Impacts

The \$70,631 for unsupported costs for the contractor in financial hardship will be funded from the Clean Fuels Fund (31) which has sufficient funds available.

Agenda Item #2

Patricia Kwon

Reimburse CEC and Return Interest

Background

- May 2019 — CEC audited several funding agreements on demonstration projects with \$12.6M in project funds
 - Significant private investments and successfully implemented within budget
 - Resulted or paved way for significant criteria pollutant, GHG, petroleum usage reductions
 - Projects commercialized HD natural gas engines 90% cleaner than existing standard, currently deployed throughout Basin
 - Existing processes/controls on invoices sound but additional scrutiny needed for supporting information on indirect costs
- February 2020 — CEC issued Final Audit Report
- September 2020 — CEC issued Resolution of Audit Findings

Background (continued)

- CEC requested reimbursement for unsupported subcontractor costs and return interest earned on CEC funds
- CEC Final Audit Report included two observations
- Observation #1: Unsupported but reimbursed subcontractor costs for labor, fringe benefits, and indirect costs



Background (Continued)

- Observation #2: South Coast AQMD earned interest as well as residual interest from holding CEC funds
 - CEC agreed to advance payment prior to completion of work since funds expiring, to prevent funds reverting to state
 - South Coast AQMD would pay subcontractors upon satisfactory completion of work
 - Once work completed, interest would be returned to CEC



Proposal

- CFCI and CWI agreed to reimburse for unsupported costs
 - CFCI provided check to South Coast AQMD
 - CWI agreed to reduce amount on pending invoice which had received payment from CEC
- H2 Frontier is in financial hardship - unable to reimburse
- South Coast AQMD agreed to pay interest earned from CEC funds
- Strengthened financial and project controls already implemented



Proposed CEC Reimbursement

Contractor	Agreement	Amount
CFCI	ARV-13-026	\$9,622
CWI	500-16-002, 600-13-008	\$205,097
H2 Frontier	600-12-018	\$70,631
Interest	600-12-018	\$202,723
TOTAL		\$488,073

Recommended Actions

- Reimburse CEC for unsupported costs provided by CFCI and CWI in an amount not to exceed \$214,719 from Clean Fuels Fund (31)
- Reimburse CEC for unsupported costs on behalf of H2 Frontier in an amount not to exceed \$70,631 from the Clean Fuels Fund (31)
- Return to CEC interest on CEC funds in an amount not to exceed \$202,723 and residual interest earned from Hydrogen Fueling Infrastructure Network Fund (63)

Technology Committee Agenda #3

BOARD MEETING DATE: November 6, 2020

AGENDA NO.

PROPOSAL: Amend Contract to Install Solar Panels for Volvo LIGHTS Project

SYNOPSIS: In November 2018, the Board approved execution of contracts for the Volvo Low Impact Green Heavy Transport Solutions (LIGHTS) project. In order to complete installation of solar panels at freight handling facilities participating in the Volvo LIGHTS project, CARB approved reallocating up to \$600,000 of administrative funding to project costs. This action is to amend a contract with Volvo Group North America, LLC in an amount not to exceed \$600,000 from the GHG Reduction Projects Special Revenue Fund (67) for the installation of solar panels.

COMMITTEE: Technology, October 16, 2020; Recommend for Approval

RECOMMENDED ACTION:

Authorize the Chairman to amend a contract with Volvo Group North America, LLC, in an amount not to exceed \$600,000 from the GHG Reduction Projects Special Revenue Fund (67) to install solar panels at freight handling facilities.

Wayne Nastri
Executive Officer

MMM:NB:JI:PSK

Background

In November 2018, the Board approved an award of \$44,839,686 for the Volvo Low Impact Green Heavy Transport Solutions (LIGHTS) project to develop and demonstrate Class 8 battery electric trucks, freight handling equipment, infrastructure and solar panels under CARB's Low Carbon Transportation GHG Reduction Fund Investments. South Coast AQMD received \$2,151,436 or 5 percent of the total grant for

administrative funding towards project management including reporting, contracting, invoicing, and other administrative tasks.

Since the grant agreement with CARB was executed in 2019, tariffs on solar panels and inverters and construction challenges to comply with COVID-19 requirements have increased the cost of installing solar and construction projects in general. The grant agreement with CARB also had a significant solar production requirement of 1.8 million kWh annually. To achieve this target, over 1 MW of solar panels will be installed at up to two freight handling facilities in Chino and Ontario participating in the Volvo LIGHTS project. Solar panels will also increase resiliency for these fleets and their ability to charge their trucks, yard tractors, forklifts, and support EVs and pave the way for future development of a microgrid at these sites to enable these fleets to deploy larger numbers of battery electric trucks and off-road equipment to transition their entire fleets to zero emission.

Proposal

In order to complete installation of solar panels at freight handling facilities in the Volvo LIGHTS project, South Coast AQMD staff recommends reallocating up to \$600,000 of its administrative funding to project costs, which CARB has approved. This action is to amend a contract with Volvo Group North America, LLC (Volvo) to add up to \$600,000 in CARB funding for the Volvo LIGHTS project. There is no net change in grant funds from CARB as a result of this action.

Sole Source Justification

Section VIII.B.2. of the Procurement Policy and Procedure identifies four major provisions under which a sole source award may be justified. The request for sole source awards for the Volvo contract is made under the provisions B.2.c.(1): The unique experience and capabilities of the proposed contractor or contractor team; B.2.c.(2): The project involves the use of proprietary technology; and B.2.d.(1): Projects involving cost-sharing by multiple sponsors. Volvo has extensive knowledge and experience in advanced EV technologies and solar technologies to successfully complete this project. This project will be cost-shared by Volvo and other project partners as discussed in the Resource Impacts section.

Benefits to South Coast AQMD

Projects to support development and demonstration of various electric container and freight transport technologies and infrastructure, as well as to demonstrate solar and energy storage technologies to enable development and demonstration of microgrids with fleets charging heavy-duty trucks, yard tractors, and forklifts are included in the *Technology Advancement Office Clean Fuels Program 2020 Plan Update* under the categories of “Develop and Demonstrate Electric and Hybrid Vehicles,” “Develop and Demonstrate Electric Container Transport Technologies,” “Develop and Demonstrate Electric Charging Infrastructure,” and “Develop and Demonstrate Microgrids with

Photovoltaic/Fuel Cell/Battery Storage/EV Chargers and Energy Management.” This project is to develop and demonstrate zero emissions heavy-duty trucks, freight handling equipment, infrastructure and solar panels. Successful demonstrations of such projects will contribute to the attainment of national ambient air quality standards in the South Coast Air Basin by eliminating PM and NOx emissions from replaced diesel heavy-duty trucks and off-road freight handling equipment. The project also includes installation of infrastructure powered by solar panels and energy storage.

Resource Impacts

The amended contract with Volvo will not exceed \$46,691,592 from the GHG Reduction Projects Special Revenue Fund (67). This will not exceed the total CARB funding of \$42,191,592, \$4,000,000 in South Coast AQMD cost share from the Clean Fuels Fund (31), and \$500,000 from the U.S. EPA Clean Air Technology Initiative (CATI) program. CARB funding of \$41,591,592 from project funding was previously recognized by the Board in November 2018, and up to \$600,000 is being reallocated from South Coast AQMD administrative funding to project funding from this grant. The funding sources and amounts for the project are in the following table:

Proposed Volvo Project Costs

Source	Amount	Percent
CARB <i>(recognized Nov 2018)</i>	\$41,591,592	45%
CARB <i>(reallocation from admin to project funds)</i>	\$600,000	.65%
Volvo and partners <i>(cash & in-kind)</i>	\$45,855,308	50%
South Coast AQMD <i>(approved Nov 2018)</i>	\$4,000,000	4%
U.S. EPA (CATI) <i>(approved Sept 2020)</i>	\$500,000	.55%
Total	\$92,546,900	100%

Sufficient funds will be available in GHG Reduction Projects Special Revenue Fund (67) to amend the Volvo contract from the CARB funding for the Volvo LIGHTS project.

Agenda Item #3

Patricia Kwon

Amend Contract to Install Solar
Panels for Volvo LIGHTS Project

Background

- In November 2018, Board approved \$44.8M award for Volvo LIGHTS - develop and demonstrate Class 8 battery electric trucks
- Five percent of grant for administrative funding (\$2,151,436)
- Tariffs on solar panels/inverters and construction challenges to comply with COVID-19 requirements have increased costs
- CARB grant required 1.8M kWh annual production



Background (cont.)

- Solar panels will increase resiliency for fleets
- Greater flexibility in charging trucks, freight handling equipment
- Pave way for future development of microgrid at fleets to enable larger deployments



Volvo battery electric trucks at DHE in Ontario

Proposal

Reallocate up to \$600,000 from administrative to project funding for solar panels/inverters



Proposed Project Costs – Volvo LIGHTS

Funding Source	Amount	Percent
CARB (recognized Nov 2018)	\$41,591,592	45
CARB <i>(requested reallocation admin to project)</i>	\$600,000	0.65
Volvo and partners	\$45,855,308	50
South Coast AQMD (approved Nov 2018)	\$ 4,000,000	4
U.S. EPA CATI (recognized Nov 2018)	\$ 500,000	.55
Total	\$92,546,900	100%

Recommended Action

Amend contract with Volvo Group North America, LLC, to install solar panels at freight handling facilities, adding up to \$600,000 from the GHG Reduction Projects Special Revenue Fund (67)

Clean Fuels Program Draft 2021 Plan Update

Every fall, staff has brought the Clean Fuels Program Draft Plan Update to the Technology Committee to solicit input on the proposed distribution of potential project funds for the upcoming year before requesting final approval for the Plan Update each year in early spring. Staff proposes continued support for a wide portfolio of technologies, but with emphasis on heavy-duty truck technologies with zero and near-zero emissions for goods movement applications to create a pathway towards achieving 2023 attainment as well as a continued focus on preparing for hydrogen vehicle deployments and EV charging infrastructure.

Each calendar year, as required by legislation, the Clean Fuels Program Plan Update is revised to reflect technical priorities and proposed project areas for the upcoming year. As part of this process, every fall the Board considers the Clean Fuels Program Draft Plan Update to provide input on the proposed allocation of potential project funds before requesting final approval each year in early spring. This has provided an opportunity for the Board to provide initial input, incorporate Board feedback as well as input from advisory groups, technical experts and other stakeholders before Board approval of the final Plan Update (concurrent with approval of the Clean Fuels Annual Report).

For Calendar Year 2021, staff has prepared a Clean Fuels Program Draft 2021 Plan Update which proposes continued support for a wide portfolio of technologies. This Draft Update continues to emphasize heavy-duty truck technologies with zero and near-zero emissions for goods movement applications, as well as a continued focus on preparing for hydrogen vehicle deployments and EV charging infrastructure, to create a pathway towards achieving 2023 attainment. This aligns well with the South Coast AQMD's FY 2020-21 Goals and Priority Objectives, which includes supporting development of cleaner advanced technologies, and assists in achieving goals outlined in the 2016 AQMP, which calls for a significant reduction in NOx emissions by 2023 and 2031. The portfolio is also designed to leverage funds from other state and federal programs such as the Greenhouse Gas Reduction Fund and the Diesel Emissions Reduction Program.

The attached Clean Fuels Program Draft Plan Update identifies potential projects to be considered for funding during 2021. The proposed projects reflect promising low, near-zero and zero emission technologies and applications that are emerging in different source categories. This update includes a number of proposed projects, not all of which are expected to be funded in the current fiscal year given the available budget. Some of the proposed projects for 2021 include but are not limited to: 1) Heavy-duty zero emission battery electric and fuel cell trucks and infrastructure; 2) Onboard sensor development for emissions monitoring and improved efficiency; 3) Microgrid demonstrations to support zero emission infrastructure; 4) Battery, fuel cell electric

transit and school buses charging/fueling infrastructure, including vehicle to grid capability; 5) Heavy-duty diesel truck replacements with near-zero emissions natural gas trucks; and 6) Fuel and emissions studies: measurements and analysis of NOx emissions, emissions impacts of hydrogen-natural gas fuel blends on near-zero natural gas engines. Projects not funded in 2021 may be considered for funding in subsequent years.

In addition to identifying proposed projects to be considered for funding, this Draft Plan Update confirms nine key technical areas of highest priority to the South Coast AQMD. These high priority areas are listed below based on the proposed funding distribution shown in Figure 1:

- Focus priorities on large demonstrations of zero emissions drayage trucks to test and validate OEM readiness and infrastructure viability
- Defining technology pathways via special projects - the Ultra-Low Emissions Engine Program with renewable fuels
- Near-zero emission (gaseous and liquid fuel) engine systems, especially high HP uses
- Expand focus on local renewable fuel production and use
- Leverage OEM partnerships to focus on continued deployment of hybrid, plug-in, electric-drive technologies and infrastructure
- Onsite hydrogen production and dispensing and mobile refueling

These priorities represent the areas where South Coast AQMD funding will have the greatest impact. In keeping with the diverse and flexible technology portfolio approach, these priorities may shift during the year to: 1) capture opportunities such as cost-sharing by the state government, the federal government or other entities; or 2) address specific technology issues which affect residents within the South Coast AQMD's jurisdiction.

Figure 1 graphically depicts the potential distribution of South Coast AQMD Clean Fuels funds, based on projected program costs of \$17.9 million for the nine project areas discussed previously. The expected actual project expenditures for 2021 will be less than the total projected program cost since not all projects will materialize. The target allocations are based on balancing technology priorities, technical challenges and opportunities discussed previously, and near-term versus long-term benefits with the constraints on available South Coast AQMD funding. Specific contract awards throughout 2021 will be based on this proposed allocation, the quality of proposals received and evaluation of projects against standardized criteria, and ultimately, the Board's approval. At that time, additional details will be provided about the technology, its application, the specific scope of work, the project team capabilities, and the project cost-sharing.

These technical priorities will necessarily be balanced by funding availability and the availability of qualified projects. Revenues from several sources support the South Coast

AQMD’s Technology Advancement program. The principal revenue source is the Clean Fuels Program, which under H&SC Section 40448.5 and Vehicle Code Section 9250.11 establishes mechanisms to collect revenues from mobile and stationary sources to support the program’s objectives, albeit with constraints on the use of the funds. Grants and cost-sharing revenue contracts from various government agencies, such as CARB, CEC, National Renewable Energy Laboratory, U.S. EPA and DOE, also support technology advancement efforts and may be approached for cost-sharing.

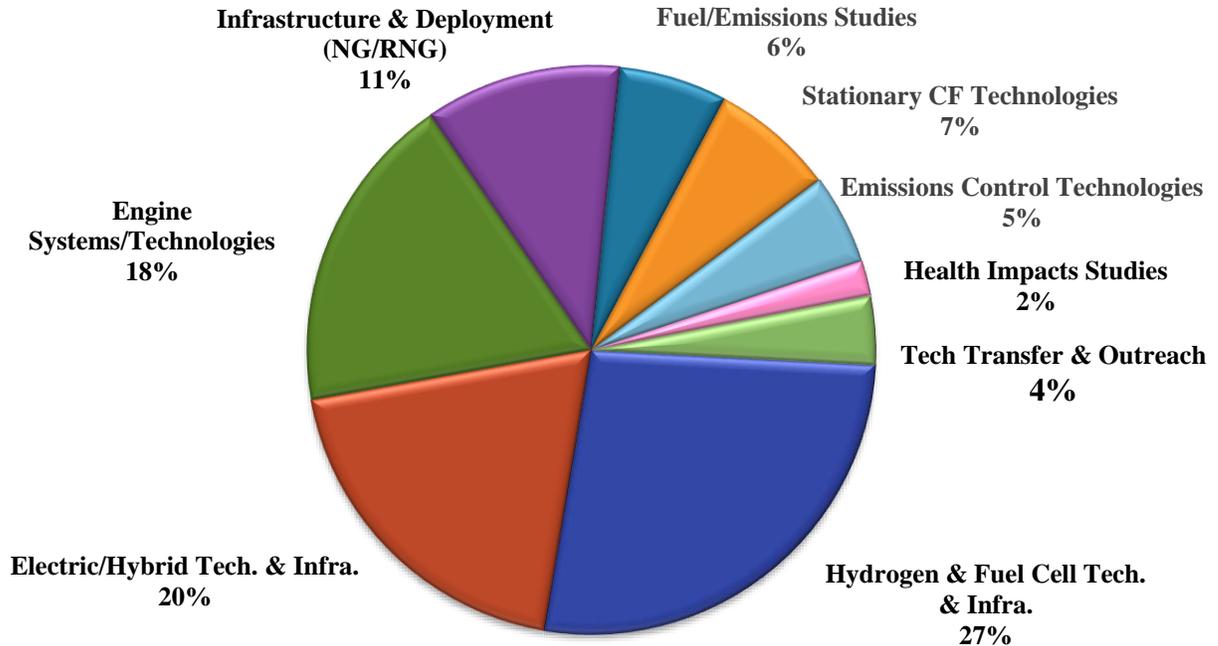


Figure 1: Projected Funding Distribution for Potential Projects in 2021 (\$17.9M)

The proposed update is the result of a historical as well as current comprehensive planning and review process, which will continue over the next few months as the Draft Update is further refined before the Board considers adoption in early spring. This process includes consideration of the 2016 AQMP, the Clean Air Action Plan, California Sustainable Freight Strategy, CARB’s 2019-2021 Funding Plan and proposed rules, such as the Heavy-Duty On-Road “Omnibus” Low NOx Regulation and the Advanced Clean Truck Regulation. The proposed update also incorporates coordination activities involving outside organizations including consideration of federal, state and local activities and proposed integrated solutions ranging from the Governor’s Executive Orders and goals for medium- and heavy-duty vehicles for 2021 and beyond, to CARB’s climate strategies. Also, the Governor issued an executive order for 100% in-state sales of zero emission cars. CARB will develop a regulation that achieves the goal by 2035 which will result in GHG reductions of 35% and NOx reduction of 80% from cars in the

state. Additionally, the 100 Percent Clean Energy Act of 2019, which requires California to be carbon neutral by 2045, and CARB's proposed Advanced Clean Truck Regulation are other examples that will impact air quality. As part of this process, staff hosted two advisory group meetings in January and September 2020 to solicit input from the Clean Fuels Advisory Group, the Technology Advancement Advisory Group and other technical experts. During these advisory meetings, the participants reviewed current and proposed Technology Advancement projects as well as the proposed funding distribution for the Draft 2021 Plan Update and discussed near-term and long-term technologies as potential projects. While generally supportive of the proposed funding categories and allocations, the advisors further suggested inclusion of monetary benefits of the low carbon fuel standard program into demonstration projects and associated total cost of ownership calculations, consideration of criteria pollutant emission reductions with renewable aviation fuel, promoting use of renewable fuels for legacy fleets and support secondary use and recycling of batteries in a safe manner.

Discussions from the review process and advisory meetings, where appropriate, have been and will continue to be incorporated into project areas and included in this year's Plan Update as it is finalized. Additionally, staff regularly interacts with CARB, CEC, DOE, the California Fuel Cell Partnership, and other entities to solicit and incorporate technical areas for potential leveraged funding as well as attends key conferences and webinars. Overall, the Draft Plan attempts to maintain flexibility to address dynamically evolving technologies and incorporate new research and data.

The major areas of focus in the Draft 2021 Plan Update are proposed in the following areas:

- Large demonstrations of zero emissions drayage trucks
- Defining technology pathways via special projects - the Ultra-Low Emissions Engine Program with renewable fuels
- Near-zero emission (gaseous and liquid fuel) engine systems
- Local renewable fuel production and use
- Continued deployment of hybrid, plug-in, electric-drive technologies and infrastructure
- Onsite hydrogen production and dispensing and mobile refueling

There remains an urgent need, in light of 2023 ambient air quality standards for ozone, to develop and demonstrate near-zero and zero emissions heavy-duty technologies, especially for goods movement applications, including the infrastructure for such technologies. The top three funding categories are relatively unchanged from 2020. Major truck OEM rollout of Class 8 Heavy Duty Battery Electric Vehicles, as well as the need for large-scale charging infrastructure necessary to support medium- and heavy-duty fuel cell and battery electric vehicles anticipated to be in demonstration and commercial production over the next few years. Emphasis will continue on near-zero larger

displacement engine system development and demonstration, with a modest increase, and on natural gas infrastructure and deployment, including particular emphasis on renewables, to ensure a broad portfolio of technologies and leverage state and federal efforts. The increases in three other core technology areas is to take advantage of anticipated opportunities to partner with other agencies on projects and studies and to undertake follow-on projects. Under fuel/emissions studies, the increase is to participate in an anticipated follow-up study on in-use emissions with West Virginia University. Under stationary clean fuel technologies, the increase is for an anticipated project on microgrid for energy management; and under emissions control technologies, an aftertreatment systems project to demonstrate heating catalyst technology is planned.

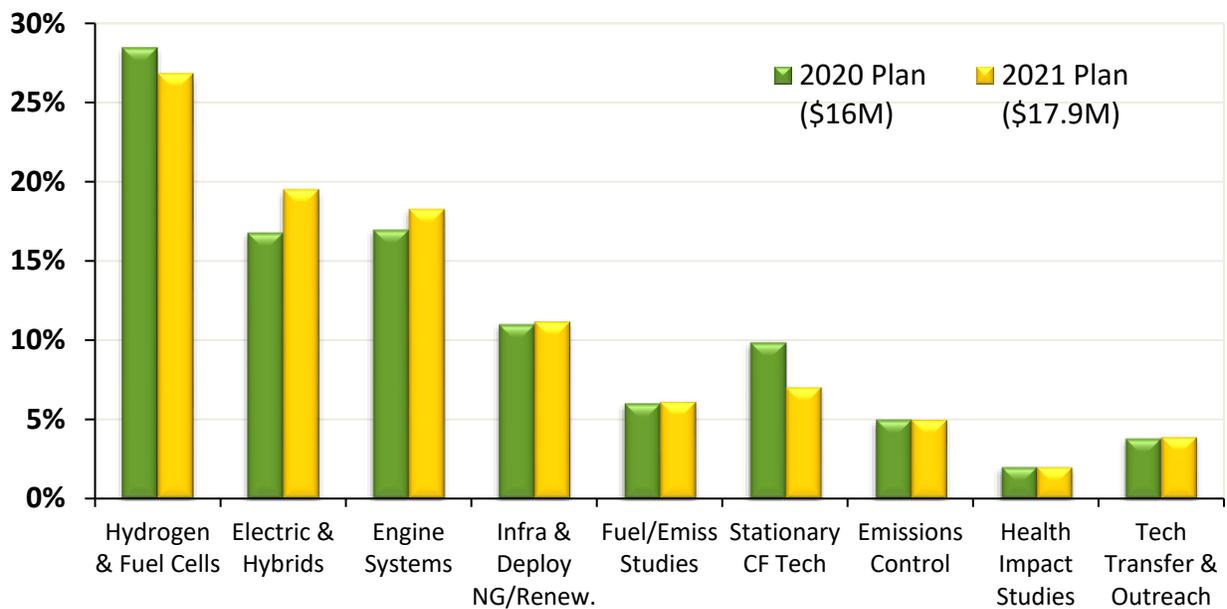


Figure 2: Plan Update Comparison

Based on communications with the organizations specified in H&SC Section 40448.5.1 and review of their programs, the projects proposed in this update do not appear to duplicate any past or present projects. As each individual project is recommended to the Board for funding, staff will continue to coordinate with these organizations to ensure that duplication is avoided and ensure optimal expenditure of Clean Fuels Program funds.

Attachment

Clean Fuels Program Draft 2021 Plan Update

**TECHNOLOGY ADVANCEMENT OFFICE
DRAFT 2021 PLAN UPDATE**

**South Coast Air Quality Management District
October 2020**

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EXECUTIVE SUMMARY

Introduction

The South Coast Air Quality Management District (South Coast AQMD) is the air pollution control agency for all of Orange County and the urban portions of Los Angeles, Riverside and San Bernardino counties. This region, which encompasses the South Coast Air Basin (Basin) as well as small portions of the Mojave Desert and Salton Sea Air Basins, historically experiences the worst air quality in the nation due to the natural geographic and atmospheric conditions of the region, coupled with the high population density and associated mobile and stationary source emissions.

In 1988, SB 2297 (Rosenthal) was signed into law (Chapter 1546). It initially established a “five-year program to increase the use of clean fuels,” but subsequent legislation extended and eventually removed the sunset clause for the Program. That legislation also reaffirmed existence of the Technology Advancement Office (TAO) to administer the Clean Fuels Program. The TAO Clean Fuels Program is an integral part of the South Coast AQMD’s effort to achieve the significant NO_x reductions called for in the 2016 Air Quality Management Plan (AQMP) because it affords South Coast AQMD the ability to fund research, development, demonstration and accelerated deployment of clean fuels and transformative transportation technologies.

Using funding received through a \$1 motor vehicle registration fee, the Clean Fuels Program encourages, fosters and supports clean fuels and transportation technologies, such as hydrogen and fuel cells, advanced natural gas technologies, alternative fuel engines, battery electric vehicles, plug-in hybrid electric vehicles and related fueling infrastructure including renewable fuels. A key strategy of the Program, which allows significant leveraging of Clean Fuels funding (historically \$4 to every \$1 of Clean Fuels funds), is its public-private partnerships with private industry, technology developers, academic institutions, research institutions and government agencies. Since 1988, the Clean Fuels Program leveraged nearly \$340 million into over \$1.5 billion in projects.

As technologies move towards commercialization, such as battery electric trucks, the Clean Fuels Program has been able to partner with large original equipment manufacturers (OEMs), such as Daimler and Volvo, in order to deploy these vehicles in larger numbers. These OEM partnerships allow the Program to leverage their research, product creation, customer relationships, and financial resources needed to move advanced technologies from the laboratories to the field and into customers’ hands. The OEMs have the resources and capabilities to design, engineer, test, manufacture, market, distribute and service quality products under brand names that are trusted. To obtain the emission reductions needed to meet federal and state ambient air quality standards, large numbers of advanced technology clean-fueled vehicles must be deployed across our region and state, including deployments of more than 50 clean-fueled vehicles at a single fleet location.

While South Coast AQMD aggressively seeks to leverage funds, it plays a leadership role in technology development and commercialization, along with its partners, to accelerate the reduction of criteria pollutants. As a result, the TAO Clean Fuels Program has traditionally supported a portfolio of technologies, at different technology readiness levels, to provide a continuum of emission reductions and health benefits over time. This approach provides the greatest flexibility and enhances the region’s chances toward achieving the National Ambient Air Quality Standards (NAAQS).

California Health and Safety Code (H&SC) 40448.5(e) calls for the Clean Fuels Program to consider, among other factors, the current and projected economic costs and availability of fuels, cost-effectiveness of emission reductions associated with clean fuels compared with other pollution control

alternatives, use of new pollution control technologies in conjunction with traditional fuels as an alternative means of reducing emissions, potential effects on public health, ambient air quality, visibility within the region, and other factors determined to be relevant by the South Coast AQMD. The Legislature recognized the need for flexibility, allowing focus on a broad range of technology areas, including cleaner fuels, vehicles and infrastructure, which helps the South Coast AQMD continue to make progress toward achieving its clean air goals.

H&SC 40448.5.1 requires the South Coast AQMD to prepare and submit to the Legislative Analyst each year by March 31, a Clean Fuels Annual Report and Plan Update. The Clean Fuels Annual Report looks at what the Program accomplished in the prior calendar year (CY) and the Clean Fuels Plan Update looks ahead at proposed projects for the next CY, re-calibrating the technical emphasis of the Program.

Setting the Stage

The overall strategy of TAO’s Clean Fuels Program is based, in large part, on emission reduction technology needs identified in the AQMP and the South Coast AQMD Board directives to protect the health of almost 18 million residents (nearly half the population of California) in the South Coast Air Basin (Basin). The AQMP, which is updated approximately every four years, is the long-term regional “blueprint” that relies on fair-share emission reductions from all jurisdictional levels (e.g., federal, state and local). The 2016 AQMP, which was adopted by the South Coast AQMD Board in March 2017, is composed of stationary and mobile source emission reductions from traditional regulatory control measures, incentive-based programs, projected co-benefits from climate change programs, mobile source strategies and other innovative approaches, including indirect source measures and incentive programs, to reduce emissions from federally regulated sources (e.g., aircraft, locomotives and ocean-going vessels).

Ground level ozone (a key component of smog) is created by a chemical reaction between NOx and volatile organic compound (VOC) emissions in sunlight. This is noteworthy because the primary driver for ozone formation in the Basin is NOx emissions, and mobile sources contribute approximately 88 percent of the NOx emissions in this region, as shown in Figure 1. Furthermore, NOx emissions, along with VOC emissions, also lead to the formation of PM2.5 [particulate matter measuring 2.5 microns or less in size, expressed as micrograms per cubic meter ($\mu\text{g}/\text{m}^3$)], including secondary organic aerosols.

The emission reductions and control measures in the 2016 AQMP rely on a mix of currently available technologies as well as the expedited development and commercialization of clean fuel mobile and stationary advanced technologies to achieve health-based air quality standards.

The 2016 AQMP identifies a 45 percent reduction in NOx required by 2023 and an additional 55 percent reduction by 2031 to achieve ozone standards of 80 ppb and 75 ppb, respectively. Figure 2 illustrates these needed NOx reductions in the Basin. The majority of these NOx reductions must come from mobile sources, both on-road and off-road. Notably, the South Coast AQMD is currently only one of

Sources of NOx:
Mobile and Stationary (2012)

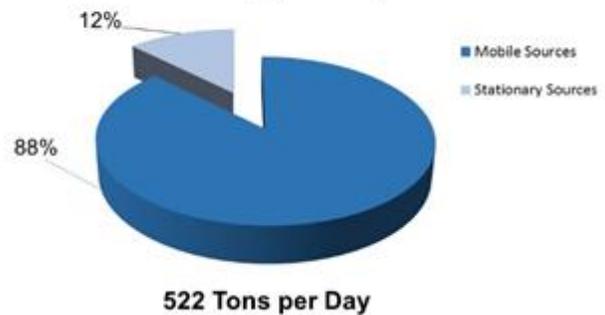
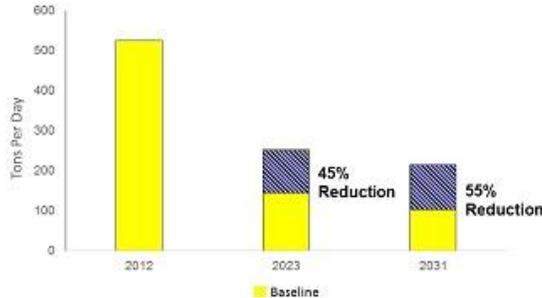


Figure 1: Sources of NOx 2012 Base Year

two regions in the nation designated as an extreme nonattainment area (the other region is San Joaquin Valley).

Basin Total NO_x Emissions



8-hour Ozone strategy targeting 2023 will ensure 1-hour attainment in 2022 as well as 24-hour and annual attainment in 2019 and 2025, respectively

Figure 2: Total NO_x Reductions Needed

For the first time, the 2016 AQMP identified a means to achieving the NAAQS through regulations and incentives for near-zero and zero emission technologies that are commercial or nearing commercialization. This strategy requires a significantly lower state and national heavy-duty truck engine emissions standard with the earliest feasible implementation date, significant additional financial resources, and accelerated fleet turnover on a massive scale.

Current state efforts in developing regulations for on- and off-road vehicles and equipment are expected to significantly reduce NO_x emissions, but are insufficient to meet South Coast AQMD needs, particularly in terms of timing.

Clean Fuels Program

The Clean Fuels Program is a very important mechanism to encourage and accelerate the advancement and commercialization of clean fuel and transportation technologies.

Figure 3 provides a conceptual design of the wide scope of the Clean Fuels Program and the relationship with incentive programs. Various stages of technology projects are funded not only to provide a portfolio of technology choices but to achieve near-term and long-term emission reduction benefits. South Coast AQMD’s Clean Fuels Program typically funds projects in the Technology Readiness Level (TRL) ranging between 3-8.



Figure 3: Stages of Clean Fuels Program Funding

Below is a summary of the 2020 Clean Fuels Annual Report and Draft 2021 Plan Update. Every Annual Report and Plan Update is reviewed by two advisory groups--the Clean Fuels Advisory Group, legislatively mandated by SB 98 (chaptered, 1999), and the Technology Advancement Advisory Group, created by the South Coast AQMD Board in 1990. These stakeholder groups review and assess the overall direction of the Program. The two groups meet approximately every six months to provide expert analysis and feedback on potential projects and areas of focus. Key technical experts working in the fields of the Program’s core technologies also typically attend and provide feedback. Preliminary review and comment are also provided by South Coast AQMD’s Board and other interested parties and stakeholders, as deemed appropriate.

2021 Plan Update

Staff's re-evaluation of the Clean Fuels Program to develop the annual Plan Update is based on a reassessment of the technology progress and direction for the agency. The Program continually seeks to support the development and deployment of cost effective clean fuel technologies with increased collaboration with OEMs to achieve large scale deployment. The design and implementation of the Clean Fuels Program Plan must balance the needs in the various technology sectors with technology readiness on the path to commercialization, emission reduction potential and cofunding opportunities. For several years, the state has focused a great deal of attention on climate change and petroleum reduction goals, but the South Coast AQMD has remained committed to developing, demonstrating and commercializing technologies that reduce criteria pollutants, specifically NO_x and toxic air contaminants (TACs). The majority of these technologies address the Basin's need for NO_x and TAC reductions and also garner reductions in greenhouse gases (GHG) and petroleum use. Due to these co-benefits, South Coast AQMD has been successful in partnering with the state and public/private partnerships to leverage its Clean Fuels funding extensively.

To identify technology and project opportunities where funding can make a significant difference in deploying cleaner technologies in the Basin, the South Coast AQMD engages in outreach and networking efforts. These activities range from close involvement with state and federal collaboratives, partnerships and industrial coalitions, to the issuance of Program Opportunity Notices (PONs) to solicit project ideas and concepts and Requests for Information (RFIs) to determine the current state of various technologies and their development and commercialization challenges. Additionally, unsolicited proposals from OEMs and other clean fuel technology developers are regularly received and reviewed. Potential development, demonstration and certification projects resulting from these outreach and networking efforts are included conceptually within the Draft 2021 Plan Update. Due to Assembly Bill (AB) 617¹, which requires reduced exposure to communities most impacted by air pollution, TAO conducted additional outreach to AB 617 communities regarding available zero and near-zero emission technologies and incentives to accelerate cleaner technologies. Cleaner technologies such as zero emission heavy-duty trucks are now included in the Community Emission Reduction Plans (CERPs) for these AB 617 communities. CARB adopted two critical milestone regulations for reducing emissions from heavy-duty mobile sources in 2020, the Advanced Clean Truck (ACT) regulation which mandates percent zero emission truck (ZET) sales starting in 2024 and the Omnibus Low NO_x regulation which requires lower NO_x standard heavy-duty engines starting in 2022. Despite these two major efforts, the expected NO_x reduction will still fall short of the 2023 and 2031 attainment target.

The Plan Update includes projects to develop, demonstrate and commercialize a variety of technologies, from near-term to long-term commercialization, that are intended to provide emission reductions identified in the 2016 AQMP. Given the need for significant reductions over the next five to ten years, near-zero and zero emission technologies are emphasized. Areas of focus include:

- reducing emissions from port-related activities, such as cargo handling and container movement, and other technologies, including demonstration and deployment of zero emission drayage trucks;
- developing and demonstrating ultra-low NO_x, gaseous and liquid renewable fueled, large displacement/high efficiency engines and zero emission heavy-duty vehicles;
- developing, demonstrating and deploying advanced natural gas and propane engines as well as near-zero and zero emission technologies for high horsepower applications;
- mitigating criteria pollutant emissions from renewable fuels, such as renewable natural gas, diesel and hydrogen as well as other renewable fuels and waste streams;

¹ <https://ww2.arb.ca.gov/our-work/programs/community-air-protection-program/about>

- producing transportation fuels and energy from renewable and waste stream sources;
- developing and demonstrating electric-drive (fuel cell, battery, plug-in hybrid and non-plug-in hybrid) technologies across light-, medium- and heavy-duty platforms;
- establishing large-scale hydrogen refueling and EV charging infrastructure to support light-, medium- and heavy-duty zero emission vehicles; and
- developing and demonstrating advanced zero emission microgrids for energy storage and demand to support transportation electrification, goods movement, and freight handling activities.

Table 1 (page 18) lists potential projects across nine core technologies by funding priority:

1. Hydrogen/Mobile Fuel Cell Technologies and Infrastructure (especially large-scale refueling and production facilities) and stations that support medium and heavy-duty vehicles;
2. Engine Systems/Technologies (emphasizing alternative and renewable fuels for truck and rail applications);
2. Electric/Hybrid Vehicle Technologies and Infrastructure (emphasizing electric and hybrid electric trucks and container transport technologies with zero emission operations);
4. Fueling Infrastructure and Deployment (predominantly renewable natural gas and renewable fuels);
5. Stationary Clean Fuel Technologies (including microgrids that support EV and Hydrogen infrastructure and renewables);
6. Fuel and Emission Studies;
7. Emission Control Technologies that support low emitting diesel engines;
8. Health Impact Studies within disadvantaged communities; and
9. Technology Transfer/Assessment and Outreach.

These potential projects for 2021 total \$17.9 million, with anticipated leveraging of more than \$4 for every \$1 of Clean Fuels funding for total project costs of \$120 million. Some of the proposed projects may also be funded by revenue sources other than the Clean Fuels Program, through state and federal grants for clean fuel technologies, incentive programs such as AB 617 Community Air Protection (CAP) funding, Volkswagen Mitigation and Carl Moyer, and VOC and NOx mitigation.

CLEAN FUELS PROGRAM

2021 Plan Update

In 1988, SB 2297 (Rosenthal) was signed into law (Chapter 1546) establishing South Coast AQMD's Clean Fuels Program and reaffirming the existence of the Technology Advancement Program (TAO) to administer the Clean Fuels Program. The funding source for the Clean Fuels Program is a \$1 motor vehicle registration surcharge that was originally approved for a limited five-year period, but legislation eventually extended both the Program and surcharge indefinitely. The Clean Fuels Program has evolved over the years but continues to fund a broad array of technologies spanning near- and long-term implementation. Similarly, planning will remain an ongoing activity for the Clean Fuels Program, which must remain flexible to address evolving technologies as well capitalize on the latest progress in technologies, research areas and data.

Every year, South Coast AQMD re-evaluates the Clean Fuels Program to develop a Plan Update based on reassessment of clean fuel technologies and direction of the South Coast AQMD Board. This Plan Update for CY 2021 targets several projects to achieve near-term emission reductions needed for the South Coast to meet health-based NAAQS.

Overall Strategy

The overall strategy of TAO's Clean Fuels Program is based on emission reduction technology needs identified through the AQMP process and South Coast AQMD Board directives to protect the health of the approximately 18 million residents (nearly half the population of California) in the South Coast Air Basin (Basin). The AQMP, which is updated approximately every four years, is the long-term regional "blueprint" that relies on fair-share emission reductions from all jurisdictional levels (e.g., federal, state and local). The 2016 AQMP is composed of stationary and mobile source emission reductions from traditional regulatory control measures, incentive-based programs, projected co-benefits from climate change programs, mobile source strategies and reductions from federally regulated sources (e.g., aircraft, locomotives and ocean-going vessels).

The emission reductions and control measures in the 2016 AQMP rely on commercial adoption of a mix of currently available technologies as well as the expedited development and commercialization of clean fuel mobile and stationary advanced technologies in the Basin to achieve air quality standards. The 2016 AQMP identifies a 45 percent reduction in NO_x required by 2023 and an additional 55 percent reduction by 2031 to achieve ozone standards of 80 ppb and 75 ppb, respectively. The majority of these NO_x reductions must come from mobile sources, both on- and off-road. Notably, South Coast AQMD is currently only one of two regions in the nation designated as an extreme nonattainment area (the other region is San Joaquin Valley). Furthermore, in April 2019, South Coast AQMD requested a voluntary re-classification from U.S. EPA of the 1997 8-hour federal standard ozone for Coachella Valley to "extreme" status. Hotter summer months and climate change in the region have presented challenges that require additional time to reach attainment.

While current state efforts in developing regulations for on- and off-road vehicles and equipment are expected to reduce NO_x emissions significantly, they will be insufficient to meet South Coast AQMD needs, particularly in terms of timing. The 2016 AQMP identified a means to achieving the NAAQS through regulations and incentives for near-zero and zero emission technologies that are commercial or nearing commercialization. This strategy requires a significantly lower state and national heavy-duty truck

engine emissions standard with the earliest feasible implementation date, significant additional financial resources, and accelerated fleet turnover on a massive scale.

On June 3, 2016, in light of the need for a more stringent national heavy-duty truck engine emissions standard to achieve mobile source emission reductions, South Coast AQMD petitioned the U.S. EPA to initiate rulemaking for a lower national NOx standard for heavy-duty engines. A national NOx standard (as opposed to a California standard) for on-road heavy-duty vehicles is estimated to result in NOx emission reductions from this source category from 70 to 90 percent in 14 to 25 years, respectively. While CARB has adopted more stringent in-use fleet rules which require older trucks and buses to upgrade to newer, cleaner engines meeting the 2010 standard of 0.2 g/bhp-hr by 2023, CARB estimates that 60 percent of total heavy-duty vehicle miles traveled in the South Coast Air Basin are from vehicles purchased outside of California. This points to the need for a more stringent federal as well as state standard for on-road heavy-duty vehicles.

Given that the Basin must attain the 75-ppb ozone NAAQS by 2031, a new on-road heavy-duty engine NOx emission standard is critical given the time needed for OEMs to develop and produce compliant vehicles, and for national fleet turnover to occur.

Error! Reference source not found. shows the difference in NOx reductions from on-road heavy-duty trucks under three scenarios: baseline (no change in the low NOx standard) in blue, a low NOx standard adopted only in California in yellow, and lastly, a federal low NOx standard in orange.

The U.S. EPA has since acknowledged a need for additional NOx reductions through a harmonized and comprehensive national NOx reduction program for heavy-duty on-highway engines and vehicles. On November 13, 2018, U.S. EPA announced the Cleaner Truck Initiative, and on January 6, 2020, they issued an Advance Notice of Proposed Rule to reduce NOx emissions from on-road heavy-duty trucks starting as early as model year 2026. However, CARB forged ahead, announcing its own Low NOx Omnibus rule, which was adopted by CARB Board in summer 2020. The new regulation will require lower NOx standard starting in model year 2024 a goal harmonize with U.S. EPA Cleaner Truck Initiative of a national NOx stand of 0.02 g/bhp-hr in 2027, 90% below today's NOx standard. Although both are welcome news, the timing is too late to help the South Coast AQMD meet its 2023 federal attainment deadline. So, despite the milestone progress, commercialization and deployment of cost-effective near-zero engines are still needed to meet near-term goals.

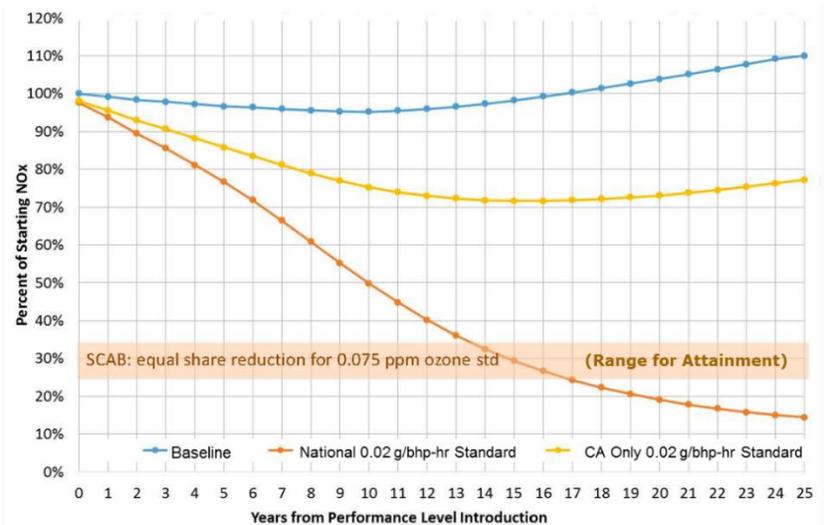


Figure 1: NOx Reduction Comparison: No New Regulations vs Low NOx Standard in California only vs National Standard

The findings from the MATES IV² study (May 2015), which included local scale studies near large sources such as ports and freeways, reinforced the importance of the need for transformative transportation technologies, especially near the goods movement corridor to reduce NO_x emissions. In mid-2017, South Coast AQMD initiated MATES V to update the emissions inventory of toxic air contaminants, as well as modeling to characterize risks, including measurements and analysis of ultrafine particle concentrations typically emitted or subsequently formed from vehicle exhaust. The MATES V report is expected to be finalized by early 2021. In the meantime, U.S. EPA approved the use of the CARB EMFAC 2017 model for on-road vehicles for use in the State Implementation Plan and transportation conformity analyses, which assesses emissions from on-road vehicles including cars, trucks and buses. The off-road model, which assesses emissions from off-road equipment such as yard tractors, top handlers, and rubber tire gantry cranes, is being replaced by category specific methods and inventory models being developed for specific regulatory support projects.

A key strategy of the Clean Fuels Program, which allows significant leveraging of Clean Fuels funding (historically \$4 to every \$1 of Clean Fuels funds), is its public-private partnerships with private industry, technology developers, academic institutions, research institutions and government agencies. Since 1988, the Clean Fuels Program provided more than \$340 million toward projects exceeding \$1.5 billion. In 1998, South Coast AQMD's Carl Moyer Program was launched. The two programs produce a unique synergy, with the Carl Moyer Program (and other subsequent incentive programs) providing the necessary funding to push market penetration of technologies developed and demonstrated by the Clean Fuels Program. This synergy enables South Coast AQMD to act as a leader in technology development and commercialization efforts targeting reduction of criteria pollutants. Since the Carl Moyer Program began in 1998, South Coast AQMD has implemented other incentive programs (i.e., Volkswagen Mitigation, Proposition 1B-Goods Movement, Community Air Protection Program and Voucher Incentive Program), currently with cumulative funding of \$250 million annually. The 2016 AQMP also included control measures to develop indirect source regulations and strengthen the fleet rules to take advantage of incentives to further accelerate emission reductions.

Despite several current California incentive programs to deploy cleaner technologies and offset the higher procurement costs of cleaner technologies, significant additional resources are still needed for the scale necessary to achieve the NAAQS for this region. Meanwhile, South Coast AQMD is seeking to commercialize alternative low-NO_x technologies that do not rely on incentives by providing customer fuel savings with low payback periods. There are several emerging key technology that will provide the NO_x and GHG co-benefit which might no longer require vehicle purchase incentives.

As technologies move towards commercialization, such as heavy-duty battery electric trucks, the Clean Fuels Program has been able to partner with large OEMs, such as Daimler and Volvo to deploy these vehicles in large numbers. These OEM partnerships allow the Program to leverage their research, design, engineering, manufacturing, sales and service, and financial resources that are needed to move advanced technologies from the laboratories to the field and into customers' hands. The OEMs have the resources to develop advanced technology vehicles such as battery electric and hydrogen fuel cells, manufacture in large quantities and distribution network to support sales across the state. To obtain the emission reductions needed to meet NAAQS, large numbers of advanced technology clean-fueled vehicles must be deployed across our region and state.

Figure 2 outlines a developmental progression for technology demonstration and deployment projects funded by the Clean Fuels Program and the relationship incentive programs administered by TAO play in that progression. The South Coast AQMD's Clean Fuels Program funds various stages of technology

² <http://www.aqmd.gov/docs/default-source/air-quality/air-toxic-studies/mates-iv/mates-iv-final-draft-report-4-1-15.pdf?sfvrsn=7>

projects, typically ranging from Technology Readiness Levels 3-8, to provide a portfolio of technology choices and to achieve near-term and long-term emission reduction benefits.



Figure 2: Technology Readiness Levels

While the state continues to focus their attention on climate change (GHG reductions), South Coast AQMD remains committed to achieving NOx reductions. Many of the technologies that address the Basin’s needed NOx reductions align with the state’s GHG reduction efforts. In 2016, U.S. EPA noted that the transportation sector contributed 28 percent of overall GHG emissions. Due to these co-benefits, South Coast AQMD has been successful in partnering with the state and public/private partnerships to leverage its Clean Fuels funding extensively.

Program and Funding Scope

This 2021 Plan Update includes projects to research, develop, demonstrate and advance deployment (RD³) a variety of technologies, from near-term to long-term, that are intended to address the following challenges:

- 1) implementation of new and changing federal requirements, such as the more stringent federal 8-hour ozone standard of 70 ppb promulgated by U.S. EPA in late 2015;
- 2) implementation of new technology measures by including accelerated development of technologies nearing commercialization and deploying commercially ready technologies; and
- 3) continued development of near-term cost-effective approaches and long-term technology development.

The overall scope of projects in the 2021 Plan Update needs to remain sufficiently flexible to address new technologies and control measures identified in the 2016 AQMP, dynamically evolving technologies, and new research and data. The latter might include findings from MATES V and revised emission inventories in EMFAC 2017.

Within the core technology areas defined later in this section, project objectives range from near term to long term. The South Coast AQMD Clean Fuels Program concentrates on supporting development, demonstration and technology commercialization and deployment efforts rather than fundamental research. The nature and typical time-to-product for Clean Fuels Program projects are described below, from near term to long term.

- *Deployment* or technology *commercialization* efforts focus on increasing utilization of clean technologies in conventional applications, promising immediate and growing emission reduction benefits. These are expected to result in commercially available products as early as 2020, including obtaining required certifications from CARB and U.S. EPA. It is often difficult to transition users to non-traditional technologies or fuels due to higher incremental costs or required changes to user behavior, even if these technologies or fuels offer significant benefits. In addition to government’s role to reduce risk by funding technology development and testing, it is also necessary to offset incremental costs through incentives to accelerate the use of cleaner technologies. The increased use

of these clean fuel technologies also depend on efforts to increase stakeholder confidence that these technologies are viable and cost-effective in the long term.

- Technologies ready to begin field *demonstration* in 2021 are expected to result in commercially available products in the 2023-2025 timeframe, and technologies being demonstrated generally are in the process of being certified by CARB and U.S. EPA. Field demonstrations provide a controlled environment for manufacturers to gain real-world experience and address end-user issues that arise prior to the commercial introduction of the technologies. Field demonstrations provide real-world evidence of performance to allay any concerns by early adopters.
- Finally, successful technology *development* projects are expected to begin during 2021 with duration of two or more years. Additionally, field demonstrations to gain long term verification of performance may also be needed prior to commercialization. Certification and commercialization would be expected to follow. Development projects identified in this plan may result in technologies ready for commercial introduction as soon as 2021-2025. Projects may involve the development of emerging technologies that are considered long-term and higher risk, but with significant emission reductions potential. Commercial introduction of such long-term technologies would not be expected until 2026 or later.

Core Technologies

The following technologies have been identified as having the greatest potential to enable the emission reductions needed to achieve NAAQS and thus form the core of the Clean Fuels Program.

The goal is to fund viable projects in all categories. However, not all project categories will be funded in 2021 due to funding limitations, and the focus will remain on control measures identified in the 2016 AQMP, with consideration for availability of suitable projects. The project categories identified below are appropriate within the context of the current air quality challenges and opportunities for technology advancement.

Within these areas, there is significant opportunity for South Coast AQMD to leverage its funds with other funding partners to expedite the demonstration and deployment of clean fuel technologies in the Basin. A concerted effort is continually made to form public private partnerships to maximize leveraging of Clean Fuels funds.

Several of the core technologies discussed below are synergistic. For example, a heavy-duty vehicle such as a transit bus or drayage truck, may utilize a hybrid electric drive train with a fuel cell operating on hydrogen fuel or an internal combustion engine operating on an alternative fuel as a range extender. Elements of the core hybrid electric system may overlap.

Priorities may shift during the year in keeping with the diverse and flexible “technology portfolio” approach or to leverage opportunities such as cost-sharing by the state or federal government or other entities. Priorities may also shift to address specific technology issues which affect residents within the South Coast AQMD’s jurisdiction. For example, AB 617, signed by the Governor in mid-2017, will implement actions designated in CERPs by five AB 617 communities within the South Coast region, and additional flexibility will be needed to develop new strategies and technologies for those disadvantaged communities.

The following nine core technology areas are listed by current South Coast AQMD priorities based on the goals for 2021.

Hydrogen/Mobile Fuel Cell Technologies and Infrastructure

The South Coast AQMD supports hydrogen infrastructure and fuel cell technologies as one option in the technology portfolio. It is dedicated to assisting federal and state government programs to deploy light-, medium-, and heavy-duty fuel cell vehicles (FCV) by supporting the required hydrogen fueling infrastructure.

Calendar Years 2015-2019 were a critical timeframe for the introduction of hydrogen fueling infrastructure. In 2014, Hyundai introduced the Tucson FCV for lease. In 2015, Toyota commercialized the Mirai, the first FCV available to consumers for purchase. In December 2016, Honda started delivering its 2017 Honda Clarity FCV. Other commercially available FCVs include the Audi H-Tron Quattro, Chevrolet Colorado ZH2, Hyundai Nexa, Mercedes-Benz GLC F-Cell and Nissan X-Trail. With lead times on retail level hydrogen fueling stations requiring 18-36 months for permitting, construction and commissioning, plans for future stations need to be implemented. While coordination with the California Division of Measurement Standards (DMS) to establish standardized measurements for hydrogen fueling started in 2014, additional efforts to offer hydrogen for sale in higher volumes for light-duty vehicles are still needed. Changes to CARB's Low Carbon Fuel Standard (LCFS) regulation to provide credit for low carbon fuel capacity in addition to throughput should enable station operators to remain solvent during the early years until vehicle numbers ramp up. Lastly, a deliberate and coordinated effort is necessary to ensure that light-duty retail hydrogen stations are developed with design flexibility to address specific location limitations, robust hydrogen supply, and refueling reliability matching those of existing gasoline and diesel fueling stations. The current network of hydrogen fueling stations to support the current number of light-duty FCVs on the road is insufficient, and supply of hydrogen and additional hydrogen production continue to be challenges that need to be addressed.

In 2018, Former Governor Brown issued Executive Order (EO) B-48-18. Among other provisions, the order sets an additional hydrogen station network development target of 200 stations by 2025. Meeting this new ambitious target clearly requires accelerated effort on the part of the State to ensure its achievement. The EO additionally sets a target for 5 million ZEVs by 2030; FCVs are expected to comprise a significant portion of this future ZEV fleet. In September 2019, Governor Newsom issued EO N-19-19 on Climate Change, which directs CARB to push OEMs to produce even more clean vehicles, and to find ways for more Californians, including residents in disadvantaged communities, to purchase these vehicles on the new and used markets. CARB is tasked with developing new grant criteria for clean vehicle programs to encourage OEMs to produce clean, affordable cars and propose new strategies to increase demand in the primary and secondary markets for ZEVs. Finally, CARB is taking steps to strengthen existing or adopt new regulations to achieve GHG reductions within the transportation sector.

Fuel cells can play a role in medium- and heavy-duty applications where battery recharge time, although improving, is insufficient to meet fleet operational requirements. The CaFCP's 2030 Vision³ released in July 2018 provides a broader framework for the earlier Medium- and Heavy-Duty Fuel Cell Electric Truck Action Plan completed in October 2016, which focused on Class 4 parcel delivery trucks and Class 8 drayage trucks with infrastructure development and established metrics for measuring progress.

As part of the \$83 million Shore-to-Store project, for which the Clean Fuels Program committed \$1 million, Toyota and Kenworth will deploy 10 Class 8 fuel cell trucks and Equilon (Shell) will build two large capacity hydrogen fueling stations in Wilmington and Ontario. Kenworth will leverage the development on the fuel cell truck demonstrated in South Coast AQMD's ZECT 2 project and integrate Toyota's fuel cells into the Kenworth trucks. These fuel cell trucks will be deployed at fleets including UPS, Total Transportation Services, Southern Counties Express, and Toyota Logistics Services at the Ports of Los Angeles and Port Hueneme, as well as other fleets in Riverside County. In 2019, Toyota displayed a second

³CaFCP's *The California Fuel Cell Revolution, A Vision For Advancing Economic, Social, and Environmental Priorities* ([Vision 2030](#)), September 4, 2018.

prototype Class 8 fuel cell truck at the Port of Long Beach, including plans for a new 1,000 kg/day heavy-duty hydrogen fueling station using hydrogen produced by a new tri-generation fuel cell.

Another player in the heavy-duty fuel cell truck space is Cummins who recently purchased Hydrogenics and EDI to develop fuel cell power trains. Cummins is currently working on the ZECT 2 and a CEC/South coast AQMD supported project that will develop and demonstrate fuel cell drayage trucks. Also, Volvo and Daimler this year announced a joint venture to develop fuel cell powered trucks. South Coast AQMD has created many alliances with the large OEM's and will continue to fund projects with these companies over the next year to develop heavy-duty fuel cell trucks.

The CaFCP *Fuel Cell Electric Bus Road Map* released in September 2019 supports implementation of CARB's Innovative Clean Transit and Zero Emission Airport Shuttle regulations. As part of the \$46 million Fuel Cell Electric Bus Commercialization Consortium project, for which the Clean Fuels fund contributed \$1 million, the Center for Transportation and Environment (CTE) partnered with New Flyer, Trillium, and Orange County Transportation Authority (OCTA) to deploy 10 40-foot New Flyer XHE40 fuel cell transit buses and install a liquid storage hydrogen station capable of fueling up to 50 fuel cell transit buses at OCTA. This project also deployed 10 fuel cell transit buses and a hydrogen station upgrade at Alameda-Contra Costa Transit District (AC Transit). The transit buses were delivered in December 2019 and liquid hydrogen station was completed in January 2020, and the demonstration and data collection period for the buses and station started in February 2020. SunLine Transit Agency was the recipient of a U.S. EPA Targeted Airshed grant in June 2020 to deploy five fuel cell transit buses, in addition to their existing fleet of 16 fuel cell and four battery electric transit buses and five buses that will be deployed by the end of 2020 as well as a recently upgraded 900 kg/day hydrogen station capable of supporting up to 30 fuel cell transit buses.

The 2021 Plan Update identifies key opportunities while clearly leading the way for pre-commercial demonstrations of OEM vehicles. Future projects may include the following:

- continued development and demonstration of distributed hydrogen production and fueling stations from multiple providers, including energy stations with electricity and hydrogen co-production and higher pressure (10,000 psi) hydrogen dispensing and scalable/higher throughput;
- development of additional sources of hydrogen production and local generation of hydrogen for fueling stations far from local production sources to better meet demand of FCVs;
- development and demonstration of cross-cutting fuel cell applications (e.g. plug-in hybrid fuel cell vehicles);
- development and demonstration of fuel cells in off-road, locomotive and commercial harbor craft applications such as port cargo handling equipment, switcher locomotives and tugs;
- demonstration of fuel cell vehicles in controlled fleet applications in the Basin;
- development and implementation of strategies with government and industry to build increasing scale and renewable content in the hydrogen market including certification and testing of hydrogen as a commercial fuel to create a business case for investing as well as critical assessments of market risks to guide and protect this investment;
- coordination with fuel cell vehicle OEMs to develop an understanding of their progress in overcoming barriers to economically competitive fuel cell vehicles and develop realistic scenarios for large scale introduction; and
- repurpose of fuel cells and hydrogen tanks for other, secondary energy production and storage uses, as well as reusing fuel cells and hydrogen tanks, and approaches to recycle catalysts and other metals.

Engine Systems/Technologies

To achieve the emissions reductions required for the Basin, internal combustion engines (ICEs) used in the heavy-duty sector will require emissions that are 90 percent lower than the 2010 standards as outlined in CARB's recently adopted Heavy-Duty On-Road "Omnibus" Low NOx regulation and EPA's Cleaner Trucks Initiative. In 2016, commercialization of the Cummins 8.9 liter (8.9L) natural gas engine achieving

90 percent below the existing federal standard was a game changer. The 8.9L engine works well in refuse and other vocational trucks as well as transit and school buses. In 2017, Cummins Westport Inc., with South Coast AQMD and other project partners, also achieved certification of the 12L natural gas engine. The 12L engine in Class 8 drayage trucks and 60-foot articulated transit buses is a further game changer. CARB and U.S. EPA certified both engines at 0.02 g/bhp-hr for NO_x. New for 2020, Cummins certified its 6.7L natural gas engine to 0.02 g/bhp-hr NO_x for the first time, further ensures viability of near-zero engine options for all market segments. For trucks that cannot utilize the Cummins near-zero emission engines, the 2021 Plan Update includes potential projects to develop, demonstrate and certify natural gas and propane engines in the 6-8L range. Although no near-zero emission diesel technology is commercially available today, South Coast AQMD has been working closely with CARB and others on defining technology pathways via several projects, including the Ultra-Low Emissions Diesel Engine Program at Southwest Research Institute (SwRI), opposed piston engine development with Achates Power Inc., and Thermal Management using Cycle Deactivation Project with West Virginia University. The 2021 Plan Update included on-road truck demonstrations for the SwRI as well as the Achates projects, these demonstration efforts are considered key milestones in driving up the TRL level toward full commercialization. CDA has proven to be a key engine enabling technology for controlling exhaust temperature and increasing efficiency. These demonstration projects, although not yet complete, show that near-zero emission diesel technologies are feasible via advanced engine and aftertreatment or optimized engine design and calibration. The Plan Update continues to incorporate pursuit of cleaner engines and hybrid powertrains for the heavy-duty sector. Future projects will support the development, demonstration and certification of engines and powertrains that can achieve these massive emission reductions using an optimized systems approach. In December 2018, South Coast AQMD participated in the Natural Gas Engine & Vehicle R&D Source Review Panel meeting in Sacramento to review, discuss and prioritize several natural gas engine and vehicle technology projects that increase efficiencies using advanced engines or hybrid drive trains.

The 2021 Plan includes potential projects that the South Coast AQMD might participate in with federal and state agencies towards these efforts. Specifically, these projects are expected to target the following:

- development of ultra-low emissions and improved higher efficiency natural gas engines for heavy-duty vehicles and high horsepower applications projects that move these technologies to a higher technology readiness level and eventual commercialization;
- continued development and demonstration of gaseous- and liquid-fueled, advanced fuels or alternative fuel medium-duty and heavy-duty engines and vehicles;
- development and demonstration of CNG hybrid vehicle technology;
- development and demonstration of diesel hybrid vehicle technology;
- development and demonstration of alternative fuel engines for off-road applications;
- evaluation of alternative engine systems such as hydraulic plug-in hybrid vehicles;
- development and demonstration of engine systems that employ advanced engine design features, cylinder deactivation, improved exhaust or recirculation systems, and aftertreatment devices; and
- development of low load and cold start technologies for hybrids and diesels where high-level emissions occur.

CARB and U.S. EPA's recent initiation to create national low NO_x standard for on-highway heavy-duty engines will further motivate manufacturers to develop lower-NO_x emitting technologies expected to result in greater NO_x emission reductions than a California only low NO_x standard for on-road heavy-duty engines.

Electric/Hybrid Technologies and Infrastructure

In an effort to meet federal standards for PM_{2.5} and ozone, a primary focus must be on zero and near-zero emission technologies. A key strategy to achieve these goals is the wide-scale electrification of transportation technologies. South Coast AQMD supports projects to address concerns regarding cost,

battery lifetime, electric range, charging infrastructure and OEM commitment. Integrated transportation systems can encourage further emission reductions by matching EVs to typical consumer and fleet duty cycles and demands. Additionally, the challenges of installing infrastructure both in terms of costs and construction impacts needs to be better understood.

There are separate challenges associated with light-duty electric vehicles (EVs) vs. medium- and heavy-duty EVs, which are on opposite ends of the commercialization spectrum. Light-duty EVs and charging infrastructure have long been commercially available and availability of public charging and costs to deploy infrastructure are the main challenges. Medium- and heavy-duty vehicles are becoming more commercially available, with Daimler and Volvo obtaining CARB certification of their Class 6 and/or 8 battery electric trucks in 2020. Standards for charging infrastructure to support medium- and heavy-duty vehicles has generally been with the CCS1 connector in North America, with Volvo and ABB obtaining UL certification of the CCS2 connector in 2020, which is a connector standard predominantly used in Europe and other parts of the world. There is also an agreed upon SAE J3068 connector standard for single-phase and three-phase AC charging. The challenges and costs of installing medium- and heavy-duty charging infrastructure are exponentially increased compared to light-duty infrastructure. Each year there are more commercially available options for medium- and heavy-duty on-road vehicles and off-road equipment, charging infrastructure to support these vehicles and equipment, and an ability to fund larger scale deployment projects for medium- and heavy-duty vehicles, equipment, and infrastructure.

This is especially important when the number of light-duty EVs continues to increase annually. As of Q2 2020, 723,045 and 1,556,058⁴ new plug-in and battery electric vehicles were sold or leased in California and the U.S respectively. Greater adoption of EVs will increase significantly with the introduction of more vehicles with 200-plus mile range, such as the Tesla Model 3/S/X/Y, Jaguar i-PACE, Kia e-Niro, Hyundai Kona Electric, Mercedes Benz EQC, Audi e-tron, Nissan Leaf e Plus, Chevrolet Bolt, BMW i3, and Porsche Taycan Turbo.

The development and deployment of zero emission goods movement and freight handling technologies remains one of the top priorities for the South Coast AQMD to support a balanced and sustainable growth at the San Pedro Bay Ports as well as freight/logistics facilities throughout the South Coast Air Basin. The South Coast AQMD continues to work with our regional partners, including the San Pedro Bay Ports, Southern California Association of Governments (SCAG) and Los Angeles County Metropolitan Transportation Authority (Metro) to demonstrate and deploy technologies that are technically feasible, cost effective with the assistance of incentives and/or grant funding, and beneficial to all stakeholders. Specific technologies include zero emission trucks/freight handling equipment/infrastructure (battery and/or fuel cell), or plug-in hybrid powertrains, near-zero emission locomotives (e.g., 90% below Tier 4), electric locomotives using battery electric tender cars and catenary systems, and linear synchronous motors for locomotives and trucks. Additionally, the California Sustainable Freight Action Plan outlines a blueprint to transition the state's freight system to an environmentally cleaner, more efficient and economical system, including a call for a zero and near-zero emission vehicle pilot project in Southern California. The City of Los Angeles Zero Emission 2028 Roadmap 2.0 in preparation for the 2028 Olympics corroborates this effort, calling for an additional 25% GHG and criteria pollutant reductions. The San Pedro Bay Ports Clean Air Action Plan calls for zero emissions cargo handling equipment by 2030 and zero emission drayage trucks by 2035, respectively.

New zero emission battery electric technology projects include: 1) deployment of 70 Volvo Class 8 battery electric drayage/freight trucks for the Switch-On project at up to five fleets in the Inland Empire and San Fernando Valley in Los Angeles funded by a \$20 million U.S. EPA Targeted Airshed grant, 2) demonstration of two additional Class 8 battery electric drayage trucks as part of the Volvo LIGHTS project

⁴Veloz is a non-profit advocacy organization promoting light-duty electric vehicles. <https://www.veloz.org/sales-dashboard/>

funded by a \$500,000 U.S. EPA Clean Air Technology Initiative grant, 3) retrofit of six RTG cranes with hybrid electric engines at SSA Marine Terminal in the Port of Long Beach funded by a \$2.5 million South Coast AQMD grant, and 4) Daimler Commercial Experience project to demonstrate eight Class 6 and 8 battery electric trucks and fast charging infrastructure funded by a \$1 million South Coast AQMD grant.

Continued technology advancements in light-duty infrastructure have facilitated the development of corresponding codes and standards for medium- and heavy-duty infrastructure including the UL certification of the CCS2 connector for the Volvo LIGHTS battery electric truck demonstration project. Additionally, SCE's Charge Ready Transport Program and LADWP include funding for medium- and heavy-duty vehicles and infrastructure, and there is an upcoming joint CARB-CEC heavy-duty drayage truck deployment and infrastructure solicitation for \$40 million towards a 50-truck deployment at a single drayage fleet.

Heavy-duty hybrid vehicles have historically been optimized for fuel economy, new generation hybrid powertrains that use a systems approach for co-optimizing both criteria emissions and fuel economy could provide another technology pathway to meet the air quality goals of the Basin. These hybrid systems in both plug-in and non-plug-in configurations, will focus on electrifying key engine subsystems and energy recovery to provide engine assistance during transient operations. Furthermore, the availability of additional electrical power such as 48-volt systems could allow for electric aftertreatment heaters for better transient control through thermo-management and therefore better NO_x control. CARB adopted new test procedure for medium-duty and heavy-duty hybrid powertrains to certify to engine standards in CARB's proposed Heavy-Duty On-Road "Omnibus" Low NO_x regulation. The new hybrid powertrain test procedures will properly credit for the fuel and emission benefits of hybrid vehicles via vehicle simulation on vehicle-based cycles and allow the entire powertrain system to certify to potentially lower emissions standards than traditional engine only tests. South Coast AQMD views these next generation hybrid powertrains can be deployed without the need for incentives by providing fuel economy benefits which could provide another potential cost-effective pathway for reducing NO_x emissions in the near term.

Opportunities to develop and demonstrate technologies that could enable expedited widespread use of pre-commercial and commercial battery electric and hybrid-electric vehicles in the Basin include the following:

- demonstration of battery electric and fuel cell electric technologies for cargo handling and container transport operations, e.g., heavy-duty battery electric or plug-in electric drayage trucks with all electric range;
- demonstration of medium-duty battery electric and fuel cell electric vehicles in package delivery operations, e.g., battery electric walk-in vans with fuel cell or CNG range extender;
- development and demonstration of battery and fuel cell electric off-road equipment; e.g. battery electric off-road construction equipment or yard tractors;
- development and demonstration of CNG hybrid vehicle technology;
- development and demonstration of diesel hybrid vehicle technology;
- development of hybrid vehicles and technologies for off-road equipment;
- demonstration of niche application battery and fuel cell electric medium- and heavy-duty vehicles, including school and transit buses and refuse trucks with short-distance fixed service routes;
- demonstration of integrated programs that make best use of electric drive vehicles through interconnectivity between fleets of shared electric vehicles and mass transit, and rideshare services that cater to multiple users and residents in disadvantaged communities;
- development of eco-friendly intelligent transportation system (ITS), geofencing, and Eco-Drive strategies to maximize emission reductions and energy consumption by operating in zero emission mode when driving in disadvantaged communities, demonstrations that encourage electric drive vehicle deployment in autonomous applications, optimized load-balancing strategies and improved characterization of in-duty drayage cycles and modeling/simulations for cargo freight and market analysis for zero emission heavy-duty trucks;

- demonstration and installation of infrastructure to support battery electric and fuel cell electric vehicle light-, medium- and heavy-duty fleets, and ways to reduce cost and incentivize incremental costs over conventionally fueled vehicles, meet fleet operational needs, improve reliability, and integrate with battery energy storage, renewable energy and energy management strategies (e.g., vehicle-to-grid or vehicle-to-building functionality, demand response, load management);
- development of higher density battery technologies for use in heavy-duty vehicles;
- repurpose EV batteries for other or second life energy storage uses, as well as reusing battery packs and approaches to recycle lithium, cobalt and other metals;
- development of a methodology to increase capability to accept fast-charging and resultant life cycle and demonstration of effects of fast-charging on battery life and vehicle performance; and
- deployment of infrastructure corresponding to codes and standards specific to light-, medium- and heavy-duty vehicles, including standardized connectors, fuel quality, communication protocols, and open standards and demand response protocols for EV chargers to communicate across charging networks.

Fueling Infrastructure and Deployment (Natural Gas/Renewable Fuels)

Significant demonstration and commercialization efforts funded by the Clean Fuels Program as well as other local, state and federal agencies are underway to: 1) support the upgrade and buildup of public and private infrastructure projects, 2) expand the network of public-access and fleet fueling stations based on the population of existing and anticipated vehicles, and 3) put in place infrastructure that will ultimately be needed to accommodate transportation fuels with very low gaseous emissions.

Compressed and liquefied natural gas (CNG and LNG) refueling stations are being positioned to support both public and private fleet applications. Upgrades and expansions are also needed to refurbish or increase capacity for some of the stations installed five or more years ago as well as standardize fueling station design, especially to ensure growth of alternative fuels throughout the Basin and beyond. There is also growing interest for partial or complete transition to renewable natural gas delivered through existing natural gas pipelines. Funding has been provided at key refueling points for light-, medium- and heavy-duty natural gas vehicle users traveling from the local ports, along I-15 and The Greater Interstate Clean Transportation Corridor (ICTC) Network. SB 350 (De León) further established a target to double the energy efficiency in electricity and natural gas end uses by 2030.

Some of the projects expected to be developed and cofunded for infrastructure development are:

- development and demonstration of renewable natural gas as a vehicle fuel from renewable feedstocks and biowaste;
- development and demonstration of advanced, cost effective methods for manufacturing synthesis gas for conversion to renewable natural gas;
- enhancement of safety and emissions reductions from natural gas refueling equipment;
- expansion of fuel infrastructure, fueling stations, and equipment; and
- expansion of infrastructure connected with existing fleets, public transit, and transportation corridors, including demonstration and deployment of closed loop systems for dispensing and storage.

Stationary Clean Fuel Technologies

Although stationary source NO_x emissions are small compared to mobile sources in the Basin, there are applications where cleaner fuel technologies or processes can be applied to reduce NO_x, VOC and PM emissions. For example, a recent demonstration project funded in part by the South Coast AQMD at a local sanitation district consisted of retrofitting an existing biogas engine with a digester gas cleanup system and catalytic exhaust emission control. The retrofit system resulted in significant reductions in NO_x, VOC and CO emissions. This project demonstrated that cleaner, more robust renewable distributed generation

technologies exist that not only improve air quality but enhance power quality and reduce electricity distribution congestion.

SCR has been used as aftertreatment for combustion equipment for NO_x reduction. SCR requires the injection of ammonia or urea that is reacted over a catalyst bed to reduce the NO_x formed during the combustion process. Challenges arise if ammonia distribution within the flue gas or operating temperature is not optimal resulting in ammonia emissions leaving the SCR in a process referred to as “ammonia slip”. The ammonia slip may also lead to the formation of particulate matter in the form of ammonium sulfates. An ongoing demonstration project funded in part by the South Coast AQMD consists of retrofitting a Low NO_x ceramic burner on an oil heater without the use of reagents such as ammonia nor urea which is anticipated to achieve SCR NO_x emissions or lower. Based on the successful deployment of this project, further emission reductions may be achieved by other combustion sources such as boilers by the continued development of specialized low NO_x burners without the use of reagents.

Additionally, alternative energy storage could be achieved through vehicle-to-grid or vehicle-to-building technologies, as well as power-to-gas that could allow potentially stranded renewable electricity stored as hydrogen fuel. UCR’s Sustainable Integrated Grid Initiative and UCI’s Advanced Energy and Power Program, funded in part by the South Coast AQMD, for example, could assist in the evaluation of these technologies.

Projects conducted under this category may include:

- development and demonstration of reliable, low emission stationary technologies (e.g., new innovative low NO_x burners and fuel cells);
- exploration of renewables, waste gas and produced gas sources for cleaner stationary technologies;
- evaluation, development and demonstration of advanced control technologies for stationary sources;
- vehicle-to-grid, vehicle-to-building, or other stationary energy demonstration projects to develop sustainable, low emission energy storage alternatives; and
- development and demonstration of microgrids with photovoltaic/fuel cell/battery storage/EV chargers and energy management.

The development, demonstration, deployment and commercialization of advanced stationary clean fuel technologies will support control measures in the 2016 AQMP in that they reduce emissions of NO_x and VOCs from traditional combustion sources by replacement or retrofits with zero and near-zero emission technologies.

Health Impacts, Fuel and Emissions Studies

The monitoring of pollutants in the Basin is extremely important, especially when linked to (1) a particular sector of the emissions inventory (to identify the responsible source or technology) and/or (2) exposure to pollution (to assess potential health risks). In fact, studies indicate that ultrafine particulate matter (PM) can produce irreversible damage to children’s lungs. This information highlights the need for further emission and health studies to identify emissions from high polluting sectors as well as the health effects resulting from these technologies.

Over the past few years, the South Coast AQMD has funded emission studies to evaluate the impact of tailpipe emissions of biodiesel and ethanol fueled vehicles mainly focusing on criteria pollutants and GHG emissions. These studies showed that biofuels, especially biodiesel in some applications and duty cycles, can contribute to higher NO_x emissions while reducing other criteria pollutant emissions. In 2020, South Coast approved comprehensive ethanol fuel study along with CARB and others to assess the emissions and secondary organic aerosol impacts on model year 2002 and up light duty vehicles. Furthermore, despite recent advancements in toxicological research related to air pollution, the relationship between particle chemical composition and health effects is still not completely understood, especially for biofuels. In 2015, South Coast AQMD funded studies to further investigate the toxicological potential of emissions, such as

ultrafine particles and vapor phase substances, and to determine whether substances such as volatile or semi-volatile organic compounds are being emitted in lower mass emissions that could pose harmful health effects. In addition, as the market share for gasoline direct injection (GDI) vehicles has rapidly increased from 4 percent of all vehicle sales in the U.S. to an estimated 60 percent between 2009 and 2016, it is important to understand the air quality impacts from these vehicles. South Coast AQMD has funded studies to investigate both physical and chemical composition of tailpipe emissions, focusing on PM from GDI vehicles as well as secondary organic aerosol formation formed by the reaction of gaseous and particulate emissions from natural gas and diesel heavy-duty vehicles. In 2017, South Coast AQMD initiated a basin wide in-use real-world emissions study, including fuel usage profile characterization and an assessment of the impacts of current technology and alternative fuels. Preliminary results suggest real-world emissions vary greatly between applications and fuel types. In 2020, CARB adopted Omnibus regulation to the next lower level NOx standard, particularly highlighting the need to address the gap between certification values and in-use emissions. The new regulation included a new low-load cycle, new in-use emissions testing metric based on 3-Bin Moving Average Windows (3B-MAW), and new concept to assess NOx across the entire vehicle population via onboard emission sensors. The new lower level emissions trigger the need to perform a new in-use study focus on assessing the variability in-use, multiple proposals from CARB, EPA and other are under discussion to fulfill that need. The current and future real-world emissions study could help stakeholders better understand the impacts of emissions in real time to a specific geographic area.

One a large scale, Senate Bill 210 was signed in the law in 2019 which directs CARB to development and implement a new comprehensive heavy-duty inspection and maintenance (HD I/M) program to support higher emitter and issues with mal-maintenance to ensure trucks maintain their emissions for their intended useful life. The HD I/M program includes a measurement emission from large population of trucks which is critical for success of this program. Remote sensing technology, which can be setup near road side and over passes has gain the spot light for enabling a new suite of technology for assess emissions in-use. South Coast AQMD staff is closing monitoring the CARB progress and see how it can help us better understand emissions inventory.

Previous studies of ambient levels of toxic air contaminants, such as the MATES studies, have found that diesel exhaust is the major contributor to health risk from air toxics. MATES V was launched in 2017 to update the emissions inventory of toxic air contaminants and modeling to characterize risks, including measurements and analysis of ultrafine particle concentrations typically emitted or converted from vehicle exhaust. In addition, staff are also performing additional advanced monitoring activities as an extension of the MATES V study.

In recent years, there has also been an increased interest at the state and federal level on the use of alternative fuels to reduce petroleum oil dependency, GHG emissions and air pollution. In order to sustain and increase biofuel utilization, it is essential to identify feedstocks that can be processed in a more efficient, cost-effective and sustainable manner. More recently, the power-to-gas concept has renewed interest in hydrogen-fossil fuel blends where the emissions impact on latest ICE technologies needs to be reassessed. In 2019, South Coast AQMD, along with SoCalGas, UCR/CE-CERT launched a study to assess emissions of hydrogen-natural gas blends on near-zero emission natural gas engines. Moreover, based on higher average summer temperatures noted over the past few years, there is interest on how the higher temperatures impact ozone formation. In line with this, a project launched in 2019 to evaluate meteorological factors and trends contributing to recent poor air quality in the Basin. These types of studies may be beneficial to support the CERPs developed under AB 617, as well as other programs targeting benefits to residents in disadvantaged communities.

Some areas of focus include:

- demonstration of remote sensing technologies to target different high emission applications and sources;
- studies to identify health risks associated with ultrafine and ambient particulate matter to characterize toxicity and determine specific combustion sources;
- in-use emission studies using biofuels, including renewable diesel, to evaluate in-use emission composition;
- in-use emission studies to determine impact of new technologies, in particular EVs on local air quality as well as benefit of telematics on emission reduction strategies;
- lifecycle energy and emissions analyses to evaluate conventional and alternative fuels;
- analysis of fleet composition and its associated impacts on criteria pollutants;
- evaluation of emissions impact of hydrogen-fossil fuel blends on latest technology engines; and
- evaluation of impact of higher ambient temperatures on emissions of primary and secondary air pollutants.

Emissions Control Technologies

Although engine technology and engine systems research are required to reduce the emissions at the combustion source, dual fuel technologies and post-combustion cleanup methods are also needed to address currently installed on-road and off-road technologies. Existing diesel emissions can be greatly reduced with introduction of natural gas into the engine or via aftertreatment controls such as PM traps and advanced SCR and DPF catalysts coupled with electrically heated diesel exhaust fluid (DEF) dosers and electrical heaters that increase the aftertreatment temperature utilizing the 48V battery system from diesel-hybrid powertrain, as well as lowering the sulfur content or using additives with diesel fuel. Gas-to-Liquid (GTL) fuels, formed from natural gas or other hydrocarbons rather than petroleum feedstock and emulsified diesel, provide low emission fuels for use in diesel engines. As emissions from engines become lower and lower, the lubricant contributions to VOC and PM emissions become increasingly important.

Recently, onboard emissions sensors have been identified by CARB and other agencies as a new method for assessing in-use emissions compliance. At the same time, researchers have proposed to use sensors, coupled with GPS, cellular connection, weather, traffic, and other online air quality models, to enable advanced concepts like Geofencing, Eco-routing, and more. The most promising of these technologies will be considered for funding, specifically:

- evaluation and demonstration of new emerging liquid fuels, including alternative and renewable diesel and GTL fuels;
- development and demonstration of renewable-diesel engines and advanced aftertreatment technologies for mobile applications (including heated dosing technologies, close coupled catalysts, electronically heated catalysts and other advanced selective catalytic reduction systems) as well as non-thermal regen technology;
- development and demonstration of low-VOC and PM lubricants for diesel and natural gas engines;
- develop, evaluate, and demonstrate onboard sensor-based emissions monitoring methodology; and
- develop, evaluate, and demonstrate cloud-based emissions and energy management system

Technology Assessment and Transfer/Outreach

Since the value of the Clean Fuels Program depends on the deployment and adoption of the demonstrated technologies, outreach and technology transfer efforts are essential to its success. This core area encompasses assessment of advanced technologies, including retaining outside technical assistance to expedite the implementation of low emission and clean fuel technologies, coordinating activities with other organizations and educating the end users of these technologies. Technology transfer efforts include supporting various incentive programs that encourage the purchase of cleaner technologies, cosponsoring

technology-related conferences, workshops and other events, and disseminating information on advanced technologies to various audiences (i.e., residents in disadvantaged communities, local governments, funding agencies, technical audiences). As part of Assembly Bill (AB) 617⁵, which requires reduced exposure to communities most impacted by air pollution, TAO conducted additional outreach to AB 617 communities regarding available zero and near-zero emission technologies and incentives to accelerate the adoption of cleaner technologies. Cleaner technologies such as zero emission heavy-duty trucks are now included in the Community Emission Reduction Plans (CERPs) for these AB 617 communities.

Target Allocations to Core Technology Areas

The figure below presents the potential allocation of available funding, based on South Coast AQMD projected program costs of \$17.9 million for all potential projects. The actual project expenditures for 2021 will be less than the total South Coast AQMD projected program costs since not all projects will materialize. Target allocations are based on balancing technology priorities, technical challenges and opportunities discussed previously and near term versus long term benefits with the constraints on available South Coast AQMD funding. Specific contract awards throughout 2021 will be based on this proposed allocation, quality of proposals received and evaluation of projects against standardized criteria and ultimately South Coast AQMD Board approval.

⁵ <https://ww2.arb.ca.gov/our-work/programs/community-air-protection-program/about>

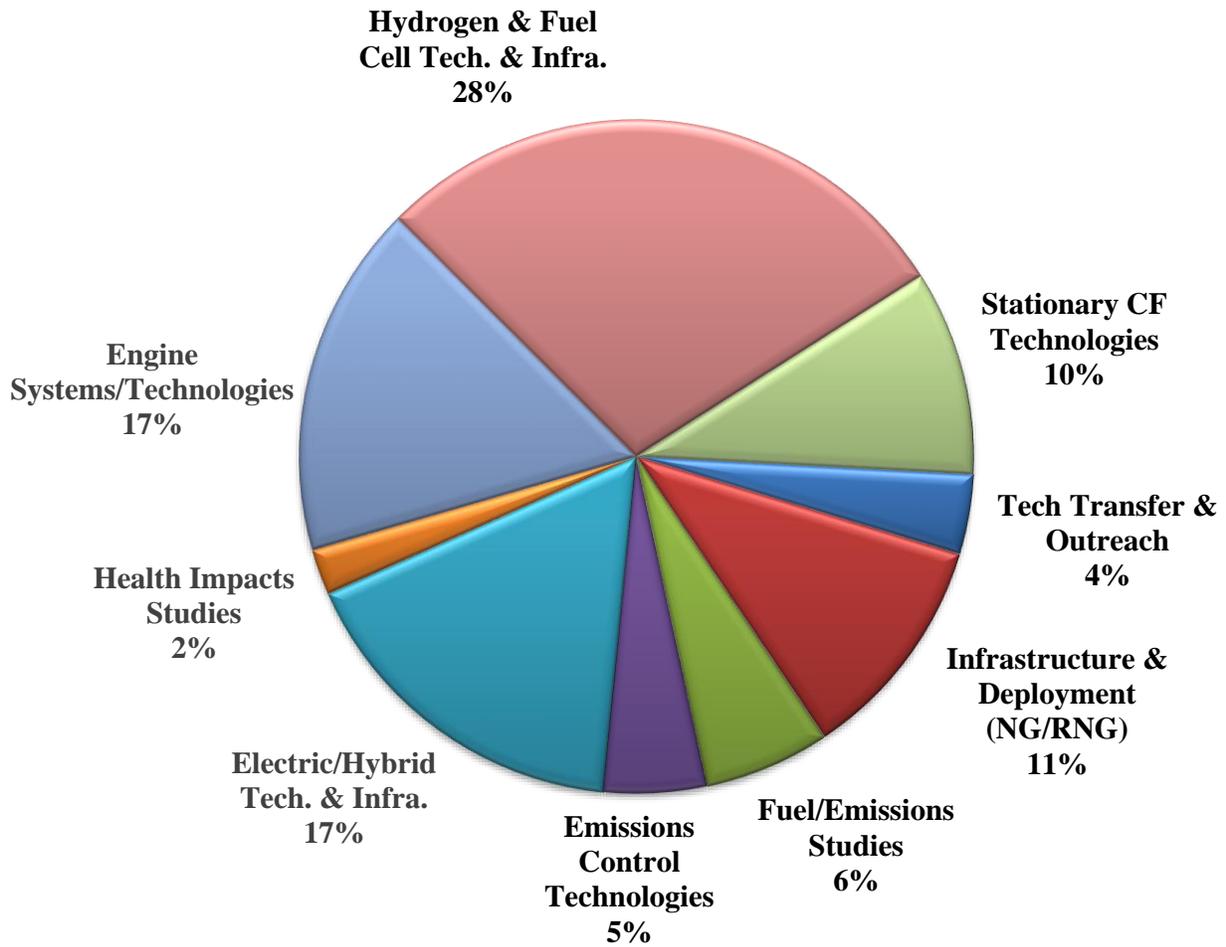


Figure 3: Projected Cost Distribution for Potential South Coast AQMD Projects in 2021 (\$17.9M)

CLEAN FUELS PROGRAM

Program Plan Update for 2021

This section presents the Clean Fuels Program Plan Update for 2021. The proposed projects are organized by program areas and described in further detail, consistent with the South Coast AQMD budget, priorities and the best available information on the state-of-the-technology. Although not required, this Plan also includes proposed projects that may also be funded by revenue sources other than the Clean Fuels Program, through state and federal grants for clean fuel technologies, incentive programs such as AB 617 Community Air Protection (CAP) funding, Volkswagen Mitigation and Carl Moyer, and VOC and NO_x mitigation.

Table 1 (page 18) summarizes potential projects for 2021 as well as the distribution of South Coast AQMD costs in some areas as compared to 2020. The funding allocation continues the focus on development and demonstration of zero and near-zero emission technologies including infrastructure to support these vehicles and off-road equipment. For the 2021 Draft Plan, the same four funding categories remain at the top but with reduced funding for electric/hybrid technologies in light of large electric/hybrid projects recently funded and with additional funding to Stationary Clean Fuel Technologies and Emissions Control Technologies for planned projects in 2021, including:

- Heavy-duty zero emission battery electric and fuel cell trucks and infrastructure;
- Onboard sensor development for emissions monitoring and improved efficiency;
- Microgrid demonstrations to support zero emission infrastructure;
- Battery and fuel cell electric transit and school buses and fleet charging/fueling infrastructure;
- Heavy-duty diesel truck replacements with near-zero emissions natural gas trucks; and
- Fuel and emissions studies, such as conducting airborne measurements and analysis of NO_x emissions and assessing emissions impacts of hydrogen-natural gas fuel blends on near-zero emissions heavy-duty natural gas engines.

As in prior years, the funding allocations again align well with the South Coast AQMD's FY 2020-21 Goals and Priority Objectives, which includes supporting development of cleaner advanced technologies. Overall, the Clean Fuels Program is designed to ensure a broad portfolio of technologies, complement state and federal efforts, and maximize opportunities to leverage technologies in a synergistic manner.

Each of the proposed projects described in this Plan, once fully developed, will be presented to the South Coast AQMD Governing Board for approval prior to contract initiation. This Plan Update reflects the maturity of the proposed technology and identifies contractors to implement the projects, participating host sites and fleets, and securing sufficient cost-sharing to complete the project, and other necessary factors. Recommendations to the South Coast AQMD Governing Board will include descriptions of the technologies to be demonstrated or deployed, their applications, proposed scope of work, and capabilities of the selected contractor(s) and project team, in addition to the expected costs and benefits of the projects as required by H&SC 40448.5.1.(a)(1). Based on communications with all of the organizations specified in H&SC 40448.5.1.(a)(2) and review of their programs, the projects proposed in this Plan do not appear to duplicate any past or present projects.

Funding Summary of Potential Projects

The remainder of this section contains the following information for each of the potential projects summarized in Table 1 (page 18).

Table 1 Proposed Project: A descriptive title and a designation for future reference.

Expected South Coast AQMD Cost: The estimated proposed South Coast AQMD cost-share as required by H&SC 40448.5.1.(a)(1).

Expected Total Cost: The estimated total project cost including the South Coast AQMD cost-share and the cost-share of outside organizations expected to be required to complete the proposed project. This is an indication of how much South Coast AQMD public funds are leveraged through its cooperative efforts.

Description of Technology and Application: A brief summary of the proposed technology to be developed and demonstrated, including the expected vehicles, equipment, fuels, or processes that could benefit.

Potential Air Quality Benefits: A brief discussion of the expected benefits of the proposed project, including the expected contribution towards meeting the goals of the AQMP, as required by H&SC 40448.5.1.(a)(1). In general, the most important benefits of any technology research, development and demonstration program are not necessarily realized in the near-term. Demonstration projects are generally intended to be proof-of-concept for an advanced technology in a real-world application. While emission benefits, for example, will be achieved from the demonstration, the true benefits will be seen over a longer term, as a successfully demonstrated technology is eventually commercialized and implemented on a wide scale.

Table 1: Summary of Potential Projects for 2021

Proposed Project	Expected SCAQMD Cost \$	Expected Total Cost \$
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Hydrogen/Mobile Fuel Cell Technologies and Infrastructure

Develop and Demonstrate Hydrogen Research to Support Innovative Technology Solutions for Fueling Fuel Cell Vehicles	90,000	1,800,000
Develop and Demonstrate Hydrogen Production and Fueling Stations	2,000,000	6,500,000
Develop and Demonstrate Medium- and Heavy-Duty Fuel Cell Vehicles	2,644,500	12,000,000
Demonstrate Light-Duty Fuel Cell Vehicles	75,000	75,000
Subtotal	\$4,809,500	\$20,375,000

Engine Systems/Technologies

Develop and Demonstrate Advanced Gaseous- and Liquid-Fueled Medium- and Heavy-Duty Engines & Vehicle Technologies to Achieve Ultra-Low Emissions	2,750,000	10,000,000
Develop and Demonstrate Alternative Fuel and Clean Conventional Fueled Light-Duty Vehicles	176,300	1,000,000
Develop and Demonstrate Low Load and Cold-Start Technologies	176,300	1,000,000
Develop and Demonstrate Low Emissions Locomotive Technologies	176,300	1,000,000
Subtotal	\$3,278,900	\$13,000,000

Electric/Hybrid Technologies and Infrastructure

Develop and Demonstrate Medium- and Heavy-Duty On-Road and Off-Road Battery Electric and Hybrid Vehicles and Equipment	2,400,000	22,800,000
Develop and Demonstrate Electric Charging Infrastructure	600,000	30,790,000
Demonstrate Alternative Energy Storage	300,000	2,000,000
Demonstrate Light-Duty Battery Electric Vehicles	200,000	200,000
Subtotal	\$3,500,000	\$55,790,000

Fueling Infrastructure and Deployment (Natural Gas/Renewable Fuels)

Demonstrate Near-Zero Emission Natural Gas Vehicles in Various Applications	500,000	2,100,000
Develop, Maintain and Expand Natural Gas Infrastructure	500,000	2,100,000
Demonstrate Renewable Transportation Fuel Manufacturing and Distribution Technologies	\$1,000,000	\$10,000,000
Subtotal	\$2,000,000	\$14,200,000

Stationary Clean Fuel Technologies

Develop and Demonstrate Microgrids with Photovoltaic/Fuel Cell/Battery Storage/EV Chargers and Energy Management	1,000,000	4,500,000
Develop and Demonstrate Zero or Near-Zero Emission Energy Generation Alternatives	264,450	1,000,000
Subtotal	\$1,264,450	\$5,500,000

Table 1: Summary of Potential Projects for 2021 (cont'd)

Proposed Project	Expected SCAQMD Cost \$	Expected Total Cost \$
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Fuel/Emissions Studies

Conduct In-Use Emissions Studies for Advanced Technology Vehicle Demonstrations	500,000	2,000,000
Conduct Emissions Studies on Biofuels, Alternative Fuels and Other Related Environmental Impacts	400,000	1,500,000
Identify and Demonstrate In-Use Fleet Emissions Reduction Technologies and Opportunities	200,000	1,000,000
Subtotal	\$1,100,000	\$4,500,000

Emissions Control Technologies

Develop and Demonstrate Advanced Aftertreatment Technologies	250,000	1,000,000
Develop and Demonstrate Advanced Aftertreatment Catalyst Heating Technologies	250,000	1,000,000
Develop Methodology and Evaluate and Demonstrate Onboard Sensors for On-Road Heavy-Duty Vehicles	250,000	1,000,000
Demonstrate On-Road Technologies in Off-Road and Retrofit Applications	176,300	800,000
Subtotal	\$926,300	\$3,800,000

Health Impacts Studies

Evaluate Ultrafine Particle Health Effects	88,150	1,000,000
Conduct Monitoring to Assess Environmental Impacts	132,225	500,000
Assess Sources and Health Impacts of Particulate Matter	132,225	300,000
Subtotal	\$352,600	\$1,800,000

Technology Assessment/Transfer and Outreach

Assess and Support Advanced Technologies and Disseminate Information	350,000	800,000
Support Implementation of Various Clean Fuels Vehicle Incentive Programs	350,000	400,000
Subtotal	\$700,000	\$1,200,000
TOTALS FOR POTENTIAL PROJECTS	\$17,931,750	\$120,165,000

Technical Summaries of Potential Projects

Hydrogen/Mobile Fuel Cell Technologies and Infrastructure

Proposed Project: Develop and Demonstrate Hydrogen Research to Support Innovative Technology Solutions for Fueling Fuel Cell Vehicles

Expected South Coast AQMD Cost: \$90,000

Expected Total Cost: \$1,800,000

Description of Technology and Application:

California regulations require automakers to place increasing numbers of ZEVs into service every year. By 2050, CARB projects that 87% of light-duty vehicles on the road will be zero emission battery and FCVs.

Many stakeholders are working on hydrogen and fuel cell products, markets, requirements, mandates and policies. California has been leading the way for hydrogen infrastructure and FCV deployment. This leadership has advanced a hydrogen network that is not duplicated anywhere in the U.S. and is unique in the world for its focus on providing a retail fueling experience. In addition, the advancements have identified many lessons learned for hydrogen infrastructure development, deployment and operation. Other interested states and countries are using California's experience as a model case, making success in California paramount to enabling market acceleration and uptake in the U.S. U.S. leadership for hydrogen technologies is rooted in California, a location for implementing many DOE H2@Scale pathways, such as reducing curtailment and stranded resources, reducing petroleum use and emissions, and developing and creating jobs. The technical research capability of the national laboratories can be used to assist California in decisions and evaluations, as well as to verify solutions to problems impacting the industry. Because these challenges cannot be addressed by one agency or one laboratory, in 2018, a hydrogen research consortium was organized to combine and collaborate.

The California Hydrogen Infrastructure Research Consortium focuses on top research needs and priorities to address near-term problems in order to support California's continued leadership in innovative hydrogen technology solutions needed for fueling FCVs. These tasks also provide significant contributions to the DOE H2@Scale Initiative. For instance, advances in fueling methods and components can support the development of supply chains and deployments. Currently, funded tasks include data collection from operational stations, component failure fix verification (i.e., nozzle freeze lock), reporting about new fueling methods for medium- and heavy-duty applications and ensuring hydrogen quality is maintained. The tasks are supported by leading researchers at NREL and coordinating national labs and managed in detail (e.g., schedule, budget, roles, milestones, tasks, reporting requirements) in a hydrogen research consortium project management plan.

These efforts are complemented by projects undertaken and supported by the CaFCP and its members over the last few years such as the Vision 2030 document released in July 2018 establishing a roadmap for future FCV and hydrogen refueling stations, including barriers that need to be overcome and CARB's Advanced Clean Truck Regulation adopted in June 2020.

This project area would enable cofunding support for additional or follow on mutually agreed technical tasks with the California Hydrogen Infrastructure Research Consortium members, the CaFCP as well as other collaborative efforts that may be undertaken to advance hydrogen infrastructure technologies.

Potential Air Quality Benefits:

The 2016 AQMP identifies the use of alternative fuels and zero emission transportation technologies as necessary to lower NOx and VOC emissions, in an effort to meet federal air quality standards. One of the major advantages of FCVs is the fact that they use hydrogen, a fuel that can be domestically produced

from a variety of resources such as natural gas (including biogas), electricity (stationary turbine technology, solar or wind) and biomass. The technology and means to produce hydrogen fuel to support FCVs are available but require optimization to achieve broad market scale. The deployment of large numbers of FCVs, which is one strategy to attain air quality goals, requires a well-planned and robust hydrogen fueling infrastructure network. This South Coast AQMD project, with significant additional funding from other governmental and private entities, will work towards providing the necessary hydrogen fueling infrastructure network.

Proposed Project: Develop and Demonstrate Hydrogen Production and Fueling Stations**Expected South Coast AQMD Cost:** \$2,000,000**Expected Total Cost:** \$6,500,000**Description of Technology and Application:**

Alternative fuels, such as hydrogen and the use of advanced technologies, such as FCVs, are necessary to meet future clean air standards. A key element in the widespread acceptance and resulting increased use of alternative fuel vehicles is the development of a reliable and robust infrastructure to support the refueling of vehicles, cost-effective production and distribution and clean utilization of these new fuels.

A challenge to the entry and acceptance of direct-hydrogen FCVs is the limited number and scale of hydrogen refueling and production sites. This project would support the development and demonstration of hydrogen refueling technologies. Proposed projects would address:

Fleet and Commercial Refueling Stations: Further expansion of the hydrogen fueling network based on retail models, providing renewable generation, adoption of standardized measurements for hydrogen refueling, other strategic refueling locations, dispensing pressures that support zero emission vehicle deployment and compatibility with existing CNG stations may be considered.

Energy Stations: Multiple-use energy stations that can produce hydrogen for FCVs or for stationary power generation are considered an enabling technology with the potential for costs competitive with large-scale reforming. System efficiency, emissions, hydrogen throughput, hydrogen purity and system economics will be monitored to optimize strategies for hydrogen fueling infrastructure deployment and as a means to produce power and hydrogen from renewable feedstocks (e.g., biomass, digester gas) and store hydrogen in larger scales to support electric systems.

Innovative Refueling Appliances: Home or small scale refueling/recharging is an attractive advancement for alternative clean fuels for some potential applications. This project would evaluate a hydrogen innovative refueler for cost, compactness, performance, durability, emission characteristics, ease of assembly and disassembly, maintenance and operations. Other issues such as setbacks, building permits, building code compliance and UL ratings for safety would also be evaluated.

Projections for on-the-road FCVs counts are now 27,000 in 2023 and 48,900 in 2026 in California and the majority of these do not include medium- and heavy-duty vehicles that may be deployed in the Basin. To provide fuel for these vehicles, the hydrogen fueling infrastructure needs to be significantly increased and become more reliable in terms of availability. South Coast AQMD will seek additional funding from CEC and CARB to construct and operate hydrogen fueling stations and take advantage of funding opportunities that may be realized by any momentum created by the Governor's 2018 Executive Order to establish 200 stations by 2025 and adoption of CARB's Advanced Clean Truck Regulation.

Potential Air Quality Benefits:

The 2016 AQMP identifies the use of alternative clean fuels in mobile sources as a key attainment strategy. Pursuant to AQMP goals, the South Coast AQMD has in effect several fleet rules that require public and certain private fleets to purchase clean-burning alternative-fueled vehicles when adding or replacing vehicles to their vehicle fleets. FCVs constitute some of the cleanest alternative-fuel vehicles today. Since hydrogen is a key fuel for FCVs, this project would address some of the barriers faced by hydrogen as a fuel and thus assist in accelerating its acceptance and ultimate commercialization. In addition to supporting the immediate deployment of the demonstration fleet, expanding the hydrogen fuel infrastructure should contribute to the market acceptance of fuel cell technologies in the long run, leading to substantial reductions in NO_x, VOC, CO, PM and toxic compound emissions from vehicles.

Proposed Project: Develop and Demonstrate Medium- and Heavy-Duty Fuel Cell Vehicles

Expected South Coast AQMD Cost: \$2,644,500

Expected Total Cost: \$12,000,000

Description of Technology and Application:

This proposed project would support evaluation including demonstration of promising fuel cell technologies for applications using direct hydrogen with proton exchange membrane (PEM) fuel cell technology. Battery dominant fuel cell hybrids are another potential technology as a way of reducing costs and potentially enhancing performance of FCVs.

The California ZEV Action Plan specifies actions to help deploy an increasing number of ZEVs, including medium- and heavy-duty ZEVs. CARB recently adopted Advanced Clean Truck and Fleet Regulations in addition to Innovative Clean Transit Bus Regulation as other drivers. Fleets are useful demonstration sites because economies of scale exist in central refueling, in training skilled personnel to operate and maintain the vehicles, in the ability to monitor and collect data on vehicle performance and for manufacturer technical and customer support. In some cases, medium- and heavy-duty FCVs could leverage the growing network of hydrogen stations, providing an early base load of fuel consumption until the number of passenger vehicles grows. These vehicles could include hybrid-electric vehicles powered by fuel cells and equipped with batteries capable of being charged from the grid and even supplying power to the grid.

In 2012, the DOE awarded South Coast AQMD funds to demonstrate Zero Emission Container Transport (ZECT) technologies. In 2015, the DOE awarded South Coast AQMD additional funds to develop and demonstrate additional fuel cell truck platforms and vehicles under ZECT II. More recently, the Clean Fuels Program cost-shared the development of transit buses at OCTA and will cost-share the demonstration of trucks and hydrogen stations to support the Port of Los Angeles project. More projects like these are anticipated as the OEMs come on board.

This category may include projects in the following applications:

On-Road: <ul style="list-style-type: none">• Transit Buses• Shuttle Buses• Medium- & Heavy-Duty Trucks	Off-Road: <ul style="list-style-type: none">• Vehicle Auxiliary Power Units• Construction Equipment• Lawn and Garden Equipment• Cargo Handling Equipment
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Potential Air Quality Benefits:

The 2016 AQMP identifies the need to implement ZEVs. South Coast AQMD adopted fleet regulations require public and some private fleets within the Basin to acquire alternatively fueled vehicles when making new purchases. In the future, such vehicles could be powered by zero emission fuel cells operating on hydrogen fuel. The proposed projects have the potential to accelerate the commercial viability of FCVs. Expected immediate benefits include the establishment of zero and near-zero emission proof-of-concept vehicles in numerous applications. Over the longer term, the proposed projects could help foster wide-scale implementation of FCVs in the Basin. The proposed projects could also lead to significant fuel economy improvements, manufacturing innovations and the creation of high-tech jobs in Southern California, besides realizing the air quality benefits projected in the AQMP as well as GHG emission reductions. Currently, the range of the trucks in the ZECT II project have a targeted range of 150 miles. Future projects would include extending the range of the FCVs up to 400 miles and to demonstrate improvements to the reliability and durability of the powertrain systems and hydrogen storage system. For fuel cell transit buses, projects are being proposed that reduce the cost of the fuel cell bus to less than \$1 million through advanced technologies for the fuel cell stack and higher density and lower cost batteries.

Proposed Project: Demonstrate Light-Duty Fuel Cell Vehicles

Expected South Coast AQMD Cost: \$75,000

Expected Total Cost: \$75,000

Description of Technology and Application:

This proposed project would support the demonstration of limited production and early commercial light-duty FCVs using gaseous hydrogen with proton exchange membrane (PEM) fuel cell technology, mainly through showcasing this technology. Recent designs of light-duty FCVs include hybrid batteries to recapture regenerative braking and improve overall system efficiency.

With the implementation of the California ZEV Action Plan, supplemented by the existing and planned hydrogen refueling stations in the Southern California area, light-duty limited-production FCVs are planned for retail deployment in early commercial markets near hydrogen stations by several OEMs. Fleets are useful demonstration sites because economies of scale exist in central refueling, in training skilled personnel to operate and maintain the vehicles, in the ability to monitor and collect data on vehicle performance and for OEM technical and customer support. South Coast AQMD has included FCVs as part of its demonstration fleet since it started the Five Cities Program in 2005 with the Cities of Burbank, Ontario, Riverside, Santa Ana, and Santa Monica to deploy 30 hydrogen ICE vehicles and five hydrogen stations. As part of this effort, South Coast AQMD has provided support, education, and outreach regarding FCV technology on an ongoing basis. In addition, demonstration vehicles could include hybrid-electric vehicles powered by fuel cells and equipped with larger batteries capable of being charged from the grid and even supplying power to the grid.

Hyundai, Toyota and Honda have commercialized FCVs in California, and Toyota is redesigning the 2020 Mirai as a five-passenger sedan. The first commercial FCV leases are ending, and solo carpool lane access extends only for MY 2017 and later, encouraging new replacements. Innovative strategies and demonstration of dual fuel, ZEVs could expand the acceptance of BEVs and accelerate the introduction of fuel cells in vehicle propulsion. As hydrogen production dedicated to transportation increases from multiple providers in the next few years, and station throughput increases, dispensed hydrogen cost should start to decrease, which would encourage more model development and enable more demonstration and deployment.

Potential Air Quality Benefits:

The 2016 AQMP identifies the need to implement ZEVs. South Coast AQMD adopted fleet regulations require public and some private fleets within the Basin to acquire alternatively fueled vehicles when making new purchases. In the future, such vehicles could be powered by zero emission fuel cells operating on hydrogen fuel. The proposed projects have the potential to accelerate the commercial viability of FCVs. Expected immediate benefits include the deployment of zero emission vehicles in South Coast AQMD's demonstration fleet. Over the longer term, the proposed projects could help foster wide-scale implementation of ZEVs in the Basin. The proposed projects could also lead to significant fuel economy improvements, manufacturing innovations and the creation of high-tech jobs in Southern California, besides realizing the air quality benefits projected in the AQMP.

Engine Systems/Technologies

Proposed Project: Develop and Demonstrate Advanced Gaseous- and Liquid-Fueled Medium- and Heavy-Duty Engines and Vehicles Technologies to Achieve Ultra-Low Emissions

Expected South Coast AQMD Cost: \$2,750,000

Expected Total Cost: \$12,500,000

Description of Technology and Application:

The objective of this proposed project would be to support development and certification of near-commercial prototype low emission medium- and heavy-duty gaseous- and liquid-fueled engine technologies, as well as integration and demonstration of these technologies in on-road vehicles. The NOx emissions target for this project area is 0.02 g/bhp-hr or lower and the PM emissions target is below 0.01 g/bhp-hr. Recent development of low-NOx hybrid powertrain also shown potential for achieving lower NOx as a combined system. To achieve these targets, an effective emissions control strategy must employ advanced fuel system and engine design features such as cylinder deactivation (CDA), aggressive engine calibration and improved thermal management, improved exhaust gas recirculation (EGR) systems, and aftertreatment devices that are optimized using a system approach. This effort is expected to result in several projects, including:

- development and demonstration of advanced engines in medium- and heavy-duty vehicles and high horsepower (HP) applications;
- development of durable and reliable retrofit technologies to partially or fully convert engines and vehicles from petroleum fuels to alternative fuels; and
- field demonstrations of advanced technologies in various fleets operating with different classes of vehicles.
- development and demonstration of CNG, propane and diesel hybrid powertrain technology

Anticipated fuels for these projects include but are not limited to alternative fuels (fossil fuel-based and renewable natural gas, propane, hydrogen blends, electric and hybrid), conventional and alternative diesel fuels, ultra-low sulfur diesel, renewable diesel, dimethyl ether and gas-to-liquid fuels. There has been significantly more interest as well as a mandate requiring the use of renewable fuels across all sectors due to CARB's Low Carbon Fuel Standard (LCFS). Projects listed under Fuel/Emissions Studies will assess the emissions impact of renewable fuels on past and future combustion technologies. Several key diesel engine development projects that have demonstrated the ability to achieve 0.02 g/bhp-hr NOx under laboratory conditions has reach on-road truck demonstrate stage. The truck integration and packaging is another critical step towards commercialization. The prototype trucks are typically placed in revenue service to collect real-world performance data and well as end user feedback for production engines.

The use of alternative fuel in heavy-duty trucking applications has been demonstrated in certain local fleets within the Basin. These vehicles typically require 200-400 HP engines. Higher HP alternative fuel engines are beginning to be introduced. However, vehicle range, lack or limited accessible public infrastructure, lack of experience with alternative fuel engine technologies and limited selection of appropriate alternative fuel engine products as well as high initial cost have made it difficult for more firms to consider significant use of alternative fuel vehicles. For example, in recent years, several large trucking fleets have expressed interest in using alternative fuels. However, at this time the choice of engines over 400 HP or more is limited. Continued development of cleaner dedicated alternative gaseous- or diesel-fueled engines over 400 HP with lower NOx emissions, would increase availability to end-users and provide additional emission reductions. Moreover, a developing trend of less incentive funding is occurring as certain alternative fuel engine technologies continue to reach full commercial readiness. Thus, continued development of cost-effective technologies that do not rely on incentives are key to drive additional market penetration and emissions reduction.

The South Coast AQMD has investigated the emergence of cost-effective mild hybrid powertrain technologies to achieve targeted lower-NO_x emission standard and improved fuel economy. In 2020, CARB and EPA introduced new hybrid powertrain certification test procedures aiming to help hybrid powertrain certify to engine-based emission standards. The new test procedures utilize the equivalent vehicle based test cycles and real-time vehicle simulation to account for the fuel and emission benefits of hybrid vehicles under the traditional engine based test cycles. Cost effective hybrid technologies that offers reasonable payback period could potentially offer a faster commercialization pathway for reducing both NO_x and GHG in the near term by strategically utilizing the existing internal combustion engines and electric components that assists engine operation and maintain aftertreatment temperature and efficiency. Simulation results shown that these newly integrated hybrid powertrains could be achieve the CARB 2024-2026 NO_x standard of 0.05 g/bhp-hr while maintain reasonable cost and feasible pathway to 0.02 g/bhp-hr. These low-NO_x hybrid powertrains could be another pathway for near term emissions reduction strategy until the full commercialization of zero emission technologies. Furthermore, low-cost mild hybrid system that do not rely on incentive could drive up sales outside of California and gain additional emissions reduction from interstate commerce trucks. Due to limited time to attainment and the fast approach to the CARB 2024 NO_x limit, continued development and demonstration efforts are needed in the medium- and heavy-duty sector in order to accelerate the commercialization of next generation hybrid technologies to market.

Potential Air Quality Benefits:

This project is intended to expedite the commercialization of near-zero emission gaseous- and liquid-fueled medium- and heavy-duty engine technology both in the Basin and in intrastate operation. The emissions reduction benefits of replacing one 4.0 g/bhp-hr heavy-duty engine with a 0.2 g/bhp-hr engine in a vehicle that consumes 10,000 gallons of fuel per year is about 1,400 lb/yr of NO_x. A heavy-duty 8.9L and 11.9L engines using natural gas achieving NO_x emissions of 0.02 g/bhp-hr have been certified and commercialized, with larger displacement and advanced technology (e.g., opposed piston) engines undergoing development. Further, neat or blended alternative fuels can also reduce heavy-duty engine particulate emissions by over 90 percent compared to current diesel technology. The key to future engine system project success is cost-effectiveness and availability of future incentives. This project is expected to lead to increased availability of low emission alternative fuel heavy-duty engines. Fleets can use the engines and vehicles emerging from this project to comply with South Coast AQMD fleet regulations and towards compliance of the 2016 AQMP control measures as well as future CARB and EPA low NO_x regulations.

Proposed Project: Develop and Demonstrate Alternative Fuel and Clean Conventional Fueled Light-Duty Vehicles

Expected South Coast AQMD Cost: \$176,300

Expected Total Cost: \$1,000,000

Description of Technology and Application:

Although new conventionally fueled vehicles are much cleaner than their predecessors, not all match the lowest emissions standards often achieved by alternative fuel vehicles. This project would assist in the development, demonstration and certification of both alternative-fueled and conventional-fueled vehicles to meet the strictest emissions requirements by the state, e.g., SULEV for light-duty vehicles. The candidate fuels include CNG, LPG, ethanol, GTL, clean diesel, modified biodiesel and ultra-low sulfur diesel, and other novel technologies. The potential vehicle projects may include:

- certification of CNG light-duty sedans and pickup trucks used in fleet services;
- assessment of “clean diesel” vehicles, including hybrids and their ability to attain SULEV standards; and
- assessment of other clean technologies.

Other fuel and technology combinations may also be considered under this category.

Potential Air Quality Benefits:

The 2016 AQMP identifies the use of alternative clean fuels in mobile sources as a key attainment strategy. Pursuant to AQMP goals, the South Coast AQMD has in effect several fleet rules that require public and certain private fleets to purchase clean-burning alternative-fueled vehicles when adding or replacing vehicles to their vehicle fleets. This project is expected to lead to increased availability of low emission alternative-and conventional-fueled vehicles for fleets as well as consumer purchase.

Proposed Project: Develop and Demonstrate Low Load and Cold-Start Technologies

Expected South Coast AQMD Cost: \$176,300

Expected Total Cost: \$1,000,000

Description of Technology and Application:

Cold starts and low loads of internal combustion engines have a negative impact on the environment especially in urban areas like much of the South Coast Air Basin. The thermal efficiency of the internal combustion engine is significantly lower at cold-starts and lower loads. Diesel exhaust aftertreatment systems require a temperature of 250 degrees Celsius or higher to operate at the highest level of emissions reduction efficiency, furthermore diesel engines at cold start increase emissions as much as 10% compared to spark-ignited CNG engines. At low loads, an aftertreatment system often may operate at 150 degrees Celsius. It is also now known that the smaller and poorly integrated hybrid powertrain engines are experiencing similar warm-up issues due to the on-off drive cycles. In fact, the CARB and EPA low-NOx regulation all included a new low-load cycle as well as new in-use low-load operation “bins” that sets emissions limits (different than traditional limits) on low-load operations. The need for thermal efficiency at start-up has led to a variety of suggestions and trials. The primary goal is to reduce energy losses so that systems and components such as the catalytic converter system reach and maintain their intended operating temperature range as soon as possible after engine start. In most cases, adaptation of algorithms associated with fuel injection timing, cylinder deactivation, EGR fraction, turbo control, heated dosing, SCR pre-heaters and close coupled catalysts can be used to keep the catalyst at the correct operating temperature. This project is to investigate technology to improve catalyst temperature at start-up and low loads with minimal economic impact and time. This technology could be applied to a range of vehicles from hybrid-electric light-duty vehicles to heavy-duty trucks. Emphasis should be on steady temperature control at optimal degrees already proven and established through significant research. The following items are the most recently developed best practices with respect to cost and functionality. These engine-based technologies should be integrated closely with aftertreatment technologies to maximize the intended emissions benefit.

- Develop and demonstrate engine-based low-load and cold start technologies such as cylinder activation technology on heavy-duty applications; and
- develop control algorithms to ensure the engine exhaust maintains catalyst temperature throughout the duty cycle.

The project would be implemented, and fleet tested, and recorded over a minimum 12-month period. Further projects can develop from this technology and should be tested in regard to other liquid fuel burning engines.

Potential Air Quality Benefits:

The technology to reduce emissions at cold starts and low loads is beneficial to a broad spectrum of vehicles from hybrid electric, light-duty and heavy-duty engines in drayage long haul trucks. The advancement in this technology will directly contribute toward low NOx required as a result of U.S. EPA and CARB’s heavy-duty engine standard and the current attainment policies in effect. Eliminating cold starting engine issues also directly creates a co- benefit of reducing fuel consumption.

Proposed Project: Develop and Demonstrate Low Emissions Locomotive Technologies

Expected South Coast AQMD Cost: \$176,300

Expected Total Cost: \$1,000,000

Description of Technology and Application:

The objective of this project is to support the development and demonstration of gaseous and liquid fueled locomotive engines. The requirements of locomotive engines as primary generators of electricity to power the locomotive poses serious challenges. Locomotives operate at a specific duty cycle different than conventional on-road engines. The engines often run at low speed and have extended periods of idle time. The durability requirements also surpass other forms of transportation.

Large displacement gaseous fueled engines do not currently exist to power locomotives. The early stages of development of engines and systems to fill this need is currently on-going. Engines are expected to be below the current 0.2g/bhp-hr low NO_x standard. The adaptation of alternative fueled locomotives in coordination with required infrastructure improvement by leading manufacturers in the industry shows great potential for further research and cost savings with less maintenance costs and better reliability.

Potential Air Quality Benefits:

This project is expected to reduce emissions around 97 tons per year of NO_x for each locomotive. The reduction of PM and CO₂ also shows great potential mitigation in environmental justice communities.

Electric/Hybrid Technologies and Infrastructure

Proposed Project: Develop and Demonstrate Medium- and Heavy-Duty On-Road and Off-Road Electric and Hybrid Vehicles and Equipment

Expected South Coast AQMD Cost: \$2,203,750

Expected Total Cost: \$12,500,000

Description of Technology and Application:

The significance of transportation in overall carbon emissions is increasing as energy utilities move toward cleaner and more sustainable ways to generate electricity. In 2018, the U.S. EPA⁶ estimated that transportation was responsible for about 28 percent of the nation's carbon emissions, while the electricity sector emissions accounted for 27 percent.

The South Coast AQMD has long been a leader in promoting early demonstrations of next generation light-duty vehicle propulsion technologies (and fuels). However, given the commercial availability of light-duty EVs, priorities have shifted. South Coast AQMD will continue to evaluate market offerings and proposed technologies in light-duty vehicles to determine if any future support is required.

Meanwhile, medium- and heavy-duty vehicles make up 4.8⁷ percent of vehicles in the U.S. and drive 9.4⁸ percent of all vehicle miles traveled each year yet are responsible for more than 38⁹ percent of all the fuel burned annually. Moreover, the 2016 AQMP identified medium- and heavy-duty vehicles as the largest source of NOx emissions in the South Coast Air Basin. Electric and hybrid technologies have gained momentum in the light-duty sector with commercial offerings by most of the automobile manufacturers. Unfortunately, there are significant emission reductions needed for medium- and heavy-duty vehicles and off-road equipment, exacerbated by low turnover of these vehicles by fleets and high incremental costs for battery electric vehicles and equipment compared to conventional-fueled vehicles and equipment.

The South Coast AQMD has investigated the use of electric and hybrid technologies to achieve similar performance as conventional-fueled counterparts while achieving emission reductions and improved fuel economy. Multiple natural gas and diesel hybrid vehicles have been development and demonstrated under the DOE funded Zero Emissions Cargo Transport (ZECT), CARB Greenhouse Gas Reduction Fund (GGRF) and NREL's Natural Gas Vehicle Consortium. These hybrid trucks all share plug-in capability and capable of zero emission operation and some leveraging advance concepts such as Geofencing to maximize emissions reduction in certain areas. Vehicle based hybrid system continue to progress for additional emissions reduction and efficiency improvements. Engine powertrain based hybrid system began to emerge since the introduction of the optional hybrid powertrain test procedures, The hybrid powertrain based projects are further described under engine systems.

Vehicle categories to be considered for potential or future demonstration and deployment projects include drayage/freight/regional haul trucks, utility trucks, delivery vans, shuttle buses, transit buses, waste haulers, construction equipment, cranes and other off-road equipment such as yard tractors, forklifts, top handlers, and RTG cranes. Innovations that may be considered for demonstration and deployment include advancements in the auxiliary power unit, either ICE or other heat engine; and battery-dominant hybrid systems utilizing off-peak charging, with advanced battery technologies including alternative chemistries, design, and management systems. Alternative fuels are preferred in these projects, e.g., natural gas, especially from renewable sources, LPG, hydrogen, GTL and hydrogen-natural gas blends, but conventional fuels such as gasoline, renewable diesel, or even modified biodiesel may be considered if the

⁶ <https://www.epa.gov/greenvehicles/fast-facts-transportation-greenhouse-gas-emissions>

⁷ <https://www.bts.gov/content/number-us-aircraft-vehicles-vessels-and-other-conveyances>

⁸ <https://www.bts.gov/content/us-vehicle-miles>

⁹ <https://www.bts.gov/content/fuel-consumption-mode-transportation-1>

emission benefits can be demonstrated as equivalent or superior to alternative fuels. Both new designs and retrofit technologies and related charging infrastructure will be considered.

Both on-road vehicles and off-road equipment are transitioning increasingly towards zero emission technologies. Off-road equipment include cargo handling and construction equipment. Several manufacturers have released battery electric and hybrid equipment, and more are becoming commercially available. Since the applications are more diverse in this sector, continued development and incentives are needed to accelerate progress in this sector.

This project category will develop and demonstrate:

- various electric vehicles and equipment;
- anticipated costs for electric vehicles and equipment;
- customer interest and preferences for these alternatives;
- integration of technologies into prototype vehicles and fleets;
- battery electric and hybrid-electric medium- and heavy-duty vehicles (e.g., drayage/freight/regional haul trucks, utility trucks, delivery vans, shuttle buses, transit buses, waste haulers);
- development and demonstration of battery electric off-road equipment, (e.g., battery electric off-road cargo handling and construction equipment);
- development and demonstration of CNG hybrid vehicle technology; and
- development and demonstration of diesel hybrid vehicle technology.

Potential Air Quality Benefits:

The 2016 AQMP identifies zero or near-zero emission vehicles as a key attainment strategy. Plug-in hybrid electric technologies have the potential to achieve near-zero emission while retaining the range capabilities of conventional-fueled vehicles, a key factor expected to enhance broad consumer acceptance. Given the variety of EV systems under development, it is critical to determine actual emission reductions and performance metrics compared to conventional-fueled vehicles. Successful demonstration of optimized prototypes would promise to enhance the deployment of zero and near-zero emission technologies.

Expected benefits include the establishment of criteria for emission evaluations, performance requirements, and customer acceptability of the technology. This will help both regulatory agencies and OEMs to expedite introduction of zero and near-zero emission vehicles in the Basin, which is a high priority of the 2016 AQMP.

Proposed Project: Develop and Demonstrate Electric Charging Infrastructure

Expected South Coast AQMD Cost: \$220,375

Expected Total Cost: \$1,250,000

Description of Technology and Application:

There is a critical need to address gaps in EV charging infrastructure availability. Almost half (47 percent) of the 1,556,058¹⁰ EVs sold in the U.S. since 2010 were in California, and of those sales in California, almost half (44¹¹ percent) of CVRP rebates issued as of February 2020 were for vehicles in the South Coast AQMD. In addition, the California ZEV Action Plan, which was updated in 2018, calls for 5 million ZEVs and supporting infrastructure by 2030.

There are separate challenges associated with infrastructure for light-duty EVs vs. medium- and heavy-duty EVs, which are on opposite ends of the commercialization spectrum. Light-duty EVs and charging infrastructure have long been commercially available with an agreed upon SAE J1772 connector standard for Level 1 and Level 2 charging. Availability of public fast charging and workplace charging continues to increase and is needed particularly for residents in multi-unit dwellings without easy access to home charging. Availability and costs to deploy infrastructure are the main challenges for light-duty EVs.

Medium- and heavy-duty vehicles are becoming more commercially available, with Daimler and Volvo obtaining CARB certification of their Class 6 and/or 8 battery electric trucks in 2020. Standards for charging infrastructure to support medium- and heavy-duty vehicles has generally been with the CCS1 connector in North America, with Volvo and ABB obtaining UL certification of the CCS2 connector in 2020, which is a connector standard predominantly used in Europe and other parts of the world. There is also an agreed upon SAE J3068 connector standard for single-phase and three-phase AC charging. The challenges and costs of installing medium- and heavy-duty charging infrastructure are exponentially increased compared to light-duty infrastructure. Each year there are more commercially available options for medium- and heavy-duty on-road vehicles and off-road equipment, charging infrastructure to support these vehicles and equipment, and an ability to fund larger scale deployment projects for medium- and heavy-duty vehicles, equipment, and infrastructure. As the deployment of medium- and heavy-duty vehicles and off-road equipment has increased, there is an increasing reliance on the use of standardized charging connectors and UL or Nationally Recognized Testing Laboratory (NRTL) charging infrastructure, as opposed to proprietary charging infrastructure and connectors which can only be used with vehicles and equipment manufactured by that OEM or equipment manufacturer.

The South Coast AQMD is actively pursuing development of intelligent transportation systems, such as Volvo's EcoDrive 2.0 software platform being utilized for the GGRF Zero Emission Drayage Truck (ZEDT) and Volvo LIGHTS projects, to improve traffic efficiency of battery electric and fuel cell electric drayage/freight trucks. This system provides truck drivers real-time vehicle operation feedback based on changing traffic and road conditions where trucks can dynamically change their speed to better flow through intersections. EcoDrive also uses geofencing capabilities to operate in zero emissions mode while traveling through disadvantaged communities. A truck eco-routing system can provide the eco-friendliest travel route based on truck engine/emission control characteristics, loaded weight, road grade and real-time traffic conditions. Integrated programs can interconnect fleets of electric drive vehicles with mass transit via web-based reservation systems that allow multiple users. These integrated programs can match the features of EVs (zero emissions, zero start-up emissions, short range) to typical consumer demands for mobility in a way that significantly reduces emissions of pollutants and greenhouse gases. As part of the demonstration of the Volvo diesel plug-in hybrid electric truck for the ZEDT project, this truck will be demonstrated in California for six months starting in November 2020 and data will be collected on the performance of

¹⁰ Veloz is a non-profit advocacy organization promoting light-duty electric vehicles. <https://www.veloz.org/sales-dashboard/>

¹¹ <https://cleanvehiclerebate.org/eng/rebate-statistics>

EcoDrive 2.0 through the connector vehicle corridor in Carson that was set up as part of the CEC funded Eco FRATIS¹² freight transportation connected truck project.

This project category is one of South Coast AQMD's continued efforts to:

- deploy a network of DC fast charging infrastructure (350kW or more) and rapidly expand the existing network of public EV charging stations including energy storage systems;
- charging infrastructure and innovative systems to support medium- and heavy-duty vehicle and off-road equipment demonstration and deployment projects;
- support investigation of fast charging impact on battery life;
- develop intelligent transportation system strategies for cargo containers; and
- develop freight load-balancing strategies as well as to conduct market analysis for zero emission heavy-duty trucks in goods movement.

Potential Air Quality Benefits:

The 2016 AQMP identifies zero emission vehicles as a key attainment strategy. This proposed project category will reduce PM pollution along major roadways through the expansion of the public EV charging infrastructure network by allowing drivers to shift away from conventional-fueled vehicles to battery and fuel cell EVs. In addition, this project will assist in achieving improved fuel economy and lower tailpipe emissions, further helping the region to achieve NAAQS and protect public health. Expected benefits include the establishment of criteria for emission evaluations, performance requirements and customer acceptability of the technology. This will help both regulatory agencies and OEMs to expedite introduction of ZEVs in the South Coast Basin, which is a high priority of the 2016 AQMP.

¹² <https://www.aapa-ports.org/files/PDFs/ITS%20POLA%204.24.2019.pdf>

Proposed Project: Demonstrate Alternative Energy Storage

Expected South Coast AQMD Cost: \$176,300

Expected Total Cost: \$1,500,000

Description of Technology and Application:

The South Coast AQMD has been involved in the development and demonstration of energy storage systems for electric and hybrid-electric vehicles, mainly lithium ion chemistry battery packs. Over the past few years, new technologies, especially lithium-ion batteries have shown robust performance. Other technology manufacturers have also developed energy storage devices including beyond lithium-ion batteries, flywheels, hydraulic systems and ultracapacitors. Energy storage systems optimized to combine the advantages of ultracapacitors and high-energy but low-power advanced batteries could yield benefits. Beyond lithium-ion batteries (e.g., lithium-sulfur, lithium-oxygen, sodium-ion, flow, and solid-state batteries) also have opportunities to achieve higher energy density, longer cycle life, and lower cost.

This project category is to apply these advanced storage technologies in vehicle platforms to identify best fit applications, demonstrate their viability (reliability, maintainability and durability), gauge market preparedness, evaluate costs relative to current lithium-ion batteries and provide a pathway to commercialization.

The long-term objective of this project is to decrease fuel consumption and resulting emissions without any changes in performance compared to conventional-fueled vehicles. This effort will support several projects for development and demonstration of battery electric and hybrid electric vehicles using advanced energy storage strategies and conventional or alternative fuels. The overall net emissions and fuel consumption of these types of vehicles are expected to be much lower than traditional engine systems. Both new and retrofit technologies will be considered.

Additionally, this project will also assess potential for second life uses of electric vehicle batteries for storage as well as the longer term more cost-effective recycling approaches currently in a nascent “pilot” stage, especially for metals such as lithium and cobalt.

Potential Air Quality Benefits:

Certification of battery electric and hybrid electric vehicles and engines and their integration into the Basin’s transportation sector is a high priority under the 2016 AQMP. This project is expected to further efforts to develop alternative energy storage technologies that could be implemented in medium- and heavy-duty trucks, buses, off-road equipment, and other applications. Benefits will include proof of concept for new technologies, diversification of transportation fuels and lower emissions of criteria, toxic pollutants and greenhouse gases.

Proposed Project: Demonstrate Light-Duty Battery Electric and Plug-In Hybrid Vehicles

Expected South Coast AQMD Cost: \$100,000

Expected Total Cost: \$100,000

Description of Technology and Application:

This proposed project would support the demonstration of limited production and early commercial light-duty BEVs and PHEVs using advanced technology, mainly through showcasing this technology. Recent designs of light-duty BEVs and PHEVs provide increased electric range, improved efficiency and recharge times, and other advanced safety, energy, autonomous and performance features in new platforms and applications that can accelerate EV adoption.

South Coast AQMD has included BEVs and PHEVs as part of its demonstration fleet since the development of early conversion vehicles. South Coast AQMD also installed 92 Level 2 EV charging ports in 2017 and a DC fast charger with CHAdeMO and CCS1 connectors in 2018 to support public and workplace charging as a means of supporting education and outreach regarding BEV and PHEV technology.

Light-duty BEVs and PHEVs are available from most established OEMs and several new OEMs. Current legislation extends solo carpool lane access only for three years until September 2025.

Potential Air Quality Benefits:

The 2016 AQMP identifies the need to implement light-duty EVs. South Coast AQMD adopted fleet regulations require public and some private fleets within the Basin to acquire alternatively fueled vehicles when making new purchases. In the future, such vehicles could be powered by BEVs. The proposed projects have the potential to accelerate commercial viability of BEVs and PHEVs. Expected immediate benefits include the deployment of ZEVs in South Coast AQMD's demonstration fleet. Over the longer term, the proposed projects could help foster wide-scale implementation of ZEVs in the Basin. The proposed projects could also lead to significant fuel economy improvements, manufacturing innovations and the creation of high-tech jobs in Southern California, besides realizing the air quality benefits projected in the 2016 AQMP.

Fueling Infrastructure and Deployment (Natural Gas/Renewable Fuels)

Proposed Project: Demonstrate Near-Zero emission Natural Gas Vehicles in Various Applications

Expected South Coast AQMD Cost: \$440,750

Expected Total Cost: \$2,000,000

Description of Technology and Application:

Natural gas vehicles (NGVs) have been very successful in reducing emissions in the Basin due to the deployment by fleets and owners and operators of heavy-duty vehicles utilizing this clean fuel. Currently, on-road heavy-duty natural gas engines are increasingly being certified to CARB's optional low-NOx standards which are significantly lower in NOx than the current on-road heavy-duty standard. This technology category seeks to support the expansion of OEMs producing engines or systems certified to the lowest optional NOx standard or near-zero emissions and useable in a wide variety of medium- and heavy-duty applications, such as Class 6 vehicles used in school buses and in passenger and goods delivery vans, Class 7 vehicles such as transit buses, waste haulers, street sweepers, sewer-vector trucks, dump trucks, concrete mixers, commercial box trucks, and Class 8 tractors used in goods movement and drayage operations and off-road equipment such as construction vehicles and yard hostlers. This category can also include advancing engine technologies to improve engine efficiencies that will help attract heavy-duty vehicle consumers to NGVs.

Potential Air Quality Benefits:

Natural gas-powered vehicles have inherently lower engine criteria pollutant emissions relative to conventionally fueled vehicles, especially older diesel-powered vehicles. Recently, on-road heavy-duty engines have been certified to near-zero emission levels that are 90% lower in NOx than the current on-road HDV standard. California's On-Road Truck and Bus Regulation requires all on-road HDVs to meet the current standard by January 1, 2023. The deployment of near-zero emission vehicles would significantly further emission reductions relative to the state's current regulatory requirements. Incentivizing the development and demonstration of near-zero emission NGVs in private and public fleets, goods movement applications, transit buses will help reduce local emissions and emissions exposure to nearby residents. Natural gas vehicles can also have lower greenhouse gas emissions and can increase energy diversity, help address national energy security objectives, and can reduce biomass waste when produced from such feedstocks. Deployment of additional NGVs is consistent with South Coast AQMD's AQMP to reduce criteria pollutants, and when fueled by RNG supports California's objectives of reducing GHGs and the carbon intensity of the state's transportation fuel supply, as well as the federal government's objective of increasing domestically produced alternative transportation fuels.

Proposed Project: Develop, Maintain & Expand Natural Gas Infrastructure

Expected South Coast AQMD Cost: \$440,750

Expected Total Cost: \$2,000,000

Description of Technology and Application:

This project supports the development, maintenance and expansion of natural gas fueling stations in strategic locations throughout the Basin, including the Ports, and advancing technologies and station design to improve fueling and refueling efficiencies of heavy-duty NGVs. This category supports the broader deployment of near-zero emission heavy-duty vehicles and the implementation of South Coast AQMD's fleet rules. In addition, as natural gas fueling equipment begins to age or has been placed in demanding usage, components will deteriorate. This project offers facilities to replace worn-out equipment or to upgrade existing fueling and/or garage and maintenance equipment to offer increased fueling capacity to public agencies, private fleets and school districts.

Potential Air Quality Benefits:

The AQMP identifies the use of alternative clean fuels in mobile sources as a key attainment strategy. Heavy-duty NGVs have significantly lower emissions than their diesel counterparts and represent the cleanest internal combustion engine-powered vehicles available today. The project has the potential to significantly reduce the installation and operating costs of NGV refueling stations, and improving vehicle refueling times through improved refueling systems designs and high-flow nozzles. While new or improved NGV stations have an indirect emissions reduction benefit, they help facilitate the introduction of near-zero emission NGVs in private and public fleets in the area, which have a direct emissions reduction benefit. It is expected that natural gas' lower fuel cost relative to diesel and the added financial incentives of renewable natural gas (RNG) under the state's Low Carbon Fuel Standard program and the federal Renewable Fuel Standard program will significantly reduce operating costs of high fuel volume heavy-duty NGVs and attract consumers to this technology. The increased exposure and fleet and consumer acceptance of NGVs would lead to significant and direct reductions in NO_x, VOC, CO, PM and toxic compound emissions from mobile sources. Such increased penetration of NGVs will provide direct emissions reductions of NO_x, VOC, CO, PM and air toxic compounds throughout the Basin.

Proposed Project: Demonstrate Renewable Transportation Fuel Manufacturing and Distribution Technologies

Expected South Coast AQMD Cost: \$881,500

Expected Total Cost: \$10,000,000

Description of Technology and Application:

The transportation sector represents a significant source of criteria pollution in the Basin. Clean, alternative fuel-powered transportation is a necessary component for this region to meet federal clean air standards. Alternative fuels produced from renewable sources such as waste biomass help to further efforts associated with landfill and waste diversion, greenhouse gas reduction, energy diversity and petroleum dependency. Locally produced renewable fuels further reduces concerns associated with out-of-state production and transmission of fuel as well as helps support the local economy. Renewable fuels recognized as a transportation fuel under the state's Low Carbon Fuel Standard program and the federal government's Renewable Fuel Standard program can provide financial incentives that can significantly reduce the price of fuel and hence the cost of operation of clean, alternative fuel vehicles and providing additional incentive for consumers to purchase and deploy clean, alternative renewable fueled powered vehicles.

The project category will consider the development and demonstration of technologies for the production and use of renewable transportation fuels such as renewable natural gas (RNG), renewable diesel (RD), and renewable hydrogen (RH) from various waste biomass feed stocks including municipal solid wastes, green waste, and biosolids from waste water treatment facilities, from technologies such as anaerobic digestion, gasification, and pyrolysis.

The main objectives of this project are to investigate, develop and demonstrate:

- commercially viable methods for converting renewable feed stocks into CNG, LNG, Hydrogen or diesel (e.g., production from biomass);
- economic small-scale natural gas liquefaction technologies;
- utilization of various gaseous feed stocks locally available;
- commercialize incentives for fleets to site, install and use RNG refueling facilities; and
- pipeline interconnection in the local gas grid to provide supply to users.

Potential Air Quality Benefits:

The South Coast AQMD relies on a significant increase in the penetration of zero and near-zero emission vehicles in the South Coast Basin to attain federal clean air standards by 2023 and 2032. This project would help develop a number of renewable transportation fuel production and distribution facilities to improve local production and use of renewable fuels to help reduce transportation costs and losses that can reduce total operating costs of zero and near-zero emission vehicles to be competitive with comparable diesel fueled vehicles. Such advances in production and use are expected to lead to greater infrastructure development. Additionally, this project could support the state's goal of redirecting biomass waste for local fuel production and reduce greenhouse gases associated with these waste biomass feedstocks.

Stationary Clean Fuel Technologies

Proposed Project: Develop and Demonstrate Microgrids with Photovoltaic/Fuel Cell/Battery Storage/EV Chargers and Energy Management

Expected South Coast AQMD Cost: \$1,322,250

Expected Total Cost: \$6,000,000

Description of Technology and Application:

CARB has proposed the Advanced Clean Truck Regulation which is part of a holistic approach to accelerate a large-scale transition of zero emission medium-and heavy-duty vehicles from Class 2B to Class 8. Manufacturers who certify Class 2B-8 chassis or complete vehicles with combustion engines would be required to sell zero emission trucks as an increasing percentage of their annual California sales from 2024 to 2030. By 2030, zero emission truck/chassis sales would need to be 50% of Class 4-8 straight trucks sales and 15% of all other truck sales.

The commercialization of zero emission heavy-duty trucks is currently under way with two of the largest manufacturers announcing plans for commercial products in the 2021-2022 timeframe to be introduced in Southern California. Both Daimler and Volvo, which are currently developing battery electric drayage trucks with the South Coast AQMD, are planning commercial products soon. Several fleet operators are planning large deployments of 50 to 100 trucks, some at single site locations. Also, CARB is expected to announce in spring 2020 release of a solicitation that seeks projects to deploy 50 or more heavy-duty trucks at a single location. Ever larger deployments of zero emission trucks will be needed for the technology to have an impact on air quality.

Large deployments of zero emission Class 8 battery electric trucks (BET) each carrying 300+ kW hours of battery-stored energy or fuel cell trucks (FCT) carrying 30-50 kg of hydrogen will require costly infrastructure that creates a barrier for some fleets to adopt zero emission platforms. Many fleet operators do not own but lease their facilities making the capital expenditure of EV or hydrogen infrastructure impossible to recoup in a short period of time. Like the diesel vehicles they presently operate, fleets purchase fuel for their trucks, not the fueling station. Microgrids can be instrumental in meeting the challenge of providing large amounts of energy cost effectively for EV charging or hydrogen generation to support zero emission vehicle refueling. Additionally, if the microgrid equipment is owned by a third party and the energy sold to the fleet through a power purchase agreement, the financial challenge of a large capital investment can be avoided by the fleet operator.

A microgrid is a group of interconnected loads and distributed energy resources within clearly defined electrical boundaries that acts as a single controllable entity with respect to the grid. A microgrid can connect and disconnect from the grid to enable it to operate in both grid-connected and island-mode. Microgrids can work synergistically with the utility grid to provide power for zero emission vehicle refueling by managing when energy from the grid is used—during off-peak hours when it is the least expensive. Then during peak demand periods, the microgrid would use energy from battery storage or onsite generation. Most all the technologies that make up microgrids already exist including photovoltaic, fuel cells, battery storage, along with hardware and software for the energy management system (EMS). When grid service is interrupted, the microgrid can disconnect from it and continue to operate as an energy island independent from the grid. Having assurance of an uninterrupted fueling source is an important consideration for a fleet operator. Also, if the microgrid is connected to the fleet operator's logistics system, additional benefits in terms of infrastructure cost and battery life for BETs can be realized. If the EMS is fed information on the route a truck is going to travel, it can charge the vehicle with enough energy for the trip so the truck will operate within 20-80% state of charge (SOC) of the battery having the least amount of impact to battery life. Additionally, if the EMS is connected to the logistics system, it can plan the charging schedules with 150 kW or less powerful chargers which again

will have less impact to battery life than the planned higher powered 300+ kW chargers and lower the costs for the charging infrastructure.

The energy demand of electric and fuel cell heavy-duty trucks is substantial; for a 100-vehicle fleet of BETs with 300 kW hours, batteries would require 30 MW hours/day of energy and for a 100-vehicle fleet of FCTs, 2000 kgs/day of hydrogen. Microgrids can provide energy for hydrogen and EV infrastructure and can serve to enable large zero emission vehicle deployments and make refueling economical and reliable. Staff has demonstrated several microgrid projects with the University of California Irvine and has toured the microgrid at University of California San Diego. Currently, several pilot projects are being discussed with microgrid developers and fleet operators that involve various configurations of microgrid technologies and different business models. Proposed projects would include development and demonstration of microgrids utilizing various types of renewable and zero emitting onsite generation (fuel cell tri-generation, power to gas, photovoltaic, wind), energy storage, connectivity to logistics systems, vehicle-to-grid and vehicle-to-building technologies. Also, projects that demonstrate different business models will be considered, such as projects involving a separate entity owning some or all the microgrid equipment and engaging in a power purchase agreement to provide energy to fleets that are transitioning to zero emission trucks. Proposed projects would partner with truck OEMs and their major customers, such as large- and medium-sized fleets looking at microgrid solutions for their operations here in the South Coast Air Basin.

Potential Air Quality Benefits:

Microgrids can support large deployments of zero emission medium- and heavy-duty trucks that are necessary to meet the AQMP target of a 45 percent reduction in NOx required by 2023 and an additional 55 percent reduction by 2031. Both renewable and zero emitting power generation technologies that make up a microgrid can provide a well-to-wheel zero emission pathway for transporting goods. Projects could potentially reduce a significant class of NOx and CO emissions that are in excess of the assumptions in the AQMP and further enhance South Coast AQMD's ability to enforce full-time compliance.

Proposed Project: Develop and Demonstrate Renewables-Based Energy Generation Alternatives

Expected South Coast AQMD Cost: \$264,450

Expected Total Cost: \$1,000,000

Description of Technology and Application:

The objective of this proposed project is to support the development and demonstration of clean energy, renewable alternatives in stationary applications. The technologies to be considered include thermal, photovoltaic and other solar energy technologies; wind energy systems; energy storage potentially including vehicle to grid or vehicle to building functionalities for alternative energy storage; biomass conversion; and other renewable energy and recycling technologies. Innovative solar technologies, such as solar thermal air conditioning and photovoltaic-integrated roof shingles, are of particular interest. Also, in the agricultural sections of the Basin, wind technologies could potentially be applied to drive large electric motor-driven pumps to replace highly polluting diesel-fired pumps. Besides renewable technologies, electrolyzer technology could be used to generate hydrogen, a clean fuel. Hydrogen, when used in regular engines, can potentially reduce tail-pipe emissions, while in fuel cells the emissions are reduced to zero.

The project is expected to result in pilot-scale production demonstrations, scale-up process design and cost analysis, overall environmental impact analysis and projections for ultimate clean fuel costs and availability. This project is expected to result in several projects addressing technological advancements in these technologies that may improve performance and efficiency, potentially reduce capital and operating costs, enhance the quality of natural gas generated from renewable sources for injection into natural gas pipelines, improve reliability and user friendliness and identify markets that could expedite the implementation of successful technologies.

Potential Air Quality Benefits:

The 2016 AQMP identifies the development and ultimately the implementation of non-polluting power generation. To gain the maximum air quality benefit, polluting fossil fuel-fired electric power generation needs to be replaced with clean renewable energy resources or other advanced zero emission technologies, such as hydrogen fuel cells, particularly in a distributed generation context.

The proposed project is expected to accelerate the implementation of advanced zero emission energy sources. Expected benefits include directly reducing the emissions by the displacement of fossil generation; proof-of-concept and potential viability for such zero emission power generation systems; increased exposure and user acceptance of the new technology; reduced fossil fuel usage; and the potential for increased use, once successfully demonstrated, with resulting emission benefits, through expedited implementation. These technologies would also have a substantial influence in reducing global warming emissions.

Fuel/Emissions Studies

Proposed Project: Conduct In-Use Emissions Studies for Advanced Technology Vehicle Demonstrations

Expected South Coast AQMD Cost: \$500000

Expected Total Cost: \$850,000

Description of Technology and Application:

Hybrid electric, hybrid hydraulic, plug-in electric hybrid and pure EVs will all play role in the future of transportation. Each of these transportation technologies has attributes that could provide unique benefits to different transportation sectors. Identifying the optimal placement of each transportation technology will provide the co-benefits of maximizing the environmental benefit and return on investment for the operator.

In addition, South Coast AQMD has been supporting rapid deployment of near-zero emission natural gas technologies ever since the first heavy-duty engine is commercially available in 2015. As more near-zero emission natural gas (now propane) technology penetrate the different segments, in-use assessment of real-world benefit is needed.

The CARB EMFAC model that the 2016 AQMP is based on uses emissions data from in-use emissions studies for calculating emission factors for heavy-duty trucks rather than the certification data. For the upcoming EMFAC 202x, a natural gas engine module is included for the first time with emissions data gathered from the 2017 South Coast AQMD funded in-use emissions characterization effort. The upcoming CARB and EPA low-NOx regulation focused on addressing the gap of in-use and certification values by introducing a new methodology that includes emissions from all operations. While staff do expect the in-use emissions from new engines perform closer to certification values, there are still significant population of the 2010+ legacy fleet expected to remain in service well over 2031. There is always a need to better assess real world truck emissions and fuel economy benefit from both engines, hybrid powertrain and zero emission technologies for continued technology improvements.

The environmental benefit for each technology class is duty-cycle and application specific. Identifying the attributes of a specific application or drive cycle that would take best advantage of a specific transportation technology would speed the adoption and make optimal use of financial resources in the demonstration and deployment of a technology. The adoption rates would be accelerated since the intelligent deployment of a certain technology would ensure that a high percentage of the demonstration vehicles showed positive results, which would spur the adoption of this technology in similar applications, as opposed to negative results derailing the further development or deployment of a certain technology.

The proposed project would review and potentially coordinate application specific drive cycles to for specific applications. The potential emissions reductions and fossil fuel displacement for each technology in a specific application would be quantified on a full-cycle basis. This information could be used to develop a theoretical database of potential environmental benefits of different transportation technologies when deployed in specific applications.

Another proposed project would be the characterization of intermediate volatility organic compound (IVOC) emissions which is critical in assessing ozone and SOA precursor production rates. Diesel vehicle exhaust and unburned diesel fuel are major sources of and contribute to the formation of urban ozone and secondary organic aerosol (SOA), which is an important component of PM2.5.

Finally, while early developments in autonomous and vehicle-to-vehicle controls are focused on light-duty passenger vehicles, the early application of this technology to heavy-duty, drayage and container transport technologies is more likely. The impact on efficiency and emissions could be substantial. A project to examine this technology to assess its effect on goods movement and emissions associated with goods movement could be beneficial at this time.

Potential Air Quality Benefits:

The development of an emissions reduction database, for various application specific transportation technologies, would assist in the targeted deployment of new transportation technologies. This database coupled with application specific vehicle miles traveled and population data would assist in intelligently deploying advanced technology vehicles to attain the maximum environmental benefit. These two data streams would allow vehicle technologies to be matched to an application that is best suited to the specific technology, as well as selecting applications that are substantial enough to provide a significant environmental benefit. The demonstration of a quantifiable reduction in operating cost through the intelligent deployment of vehicles will also accelerate the commercial adoption of the various technologies. The accelerated adoption of lower emitting vehicles will further assist in attaining South Coast AQMD's air quality goals.

Proposed Project: Conduct Emissions Studies on Biofuels, Alternative Fuels and Other Environmental Impacts

Expected South Coast AQMD Cost: \$400,000

Expected Total Cost: \$1,500,000

Description of Technology and Application:

The use of biofuels can be an important strategy to reduce petroleum dependency, air pollution and greenhouse gas emissions and help with California's aggressive GHG reduction goal. Biofuels are in fact receiving increased attention due to national support and state activities resulting from SB 32, AB 1007 and the Low-Carbon Fuel Standard. With an anticipated increase in biofuel use, it is the objective of this project to further analyze these fuels to better understand their benefits and impacts not only on greenhouse gases but also air pollution and associated health effects.

In various diesel engine studies, replacement of petroleum diesel fuel with biodiesel fuel has demonstrated reduced PM, CO and air toxics emissions. Biodiesel also has the potential to reduce greenhouse gas emissions because it can be made from renewable feedstocks, such as soy and canola. However, certain blends of biodiesel have a tendency to increase NOx emissions for certain engines and duty cycles, which exacerbates the ozone and PM2.5 challenges faced in the Basin. In addition, despite recent advancements in toxicological research in the air pollution field, the relationship between biodiesel particle composition and associated health effects is still not completely understood.

Ethanol is another biofuel that is gaining increased national media and state regulatory attention. CARB's reformulated gasoline regulation to further increase the ethanol content to 10% as a means to increase the amount of renewable fuels in the state. It is projected that the state's ethanol use will increase from 900 million gallons in 2007 to 1.5 billion gallons by 2012 as a result. As in the case of biodiesel, ethanol has demonstrated in various emission studies to reduce PM, CO and toxic emissions; however, the relationship between particle composition and associated health effects from the combustion of ethanol is not well understood either. In 2019, the U.S. EPA approved 15% ethanol (E15) blends for year-round use and CARB, along with South Coast AQMD and other launched an emissions study of E15 to assess the emissions impact of the current fleet of California light duty vehicles.

CARB recently proposed a regulation on the commercialization of alternative diesel fuels, including biodiesel and renewable diesel, while noting that biodiesel in older heavy-duty vehicles can increase NOx and the need for emerging alternative diesel fuels to have clear ground rules for commercialization. The impact of natural gas fuel composition on emissions from heavy-duty trucks and transit buses is also being studied. Researchers has proposed to evaluate the emissions impact of renewable natural gas and other natural gas blends such as renewable hydrogen.

In order to address these concerns on potential health effects associated with biofuels, namely biodiesel and ethanol blends, this project will investigate the physical and chemical composition and associated health effects of tailpipe PM emissions from light- to heavy-duty vehicles burning biofuels in order to ensure public health is not adversely impacted by broader use of these fuels. This project also supports future studies to identify mitigation measures to reduce NOx emissions for biofuels. Additionally, a study of emissions from well-to-wheel for the extraction and use of shale gas might be considered.

More recently, the Power-to-Gas concept has renewed interest in hydrogen-fossil fuel blends which the emissions impact on latest ICE technologies needs to be reassessed. Hydrogen fueled ICE was studied heavily in the early 2000's and results has shown significant criteria emissions reduction possible with optimized engine calibration. Since then, ICE technologies have been fitted with advanced aftertreatment to allow the engines to be certified to today's NOx and low NOx standards. Therefore, emissions impact assessment is much needed on the latest engines.

Lastly, in an effort to evaluate the contribution of meteorological factors to high ozone and PM2.5 episodes

occurring in the Basin, mainly as a result of higher summer time temperatures and increased air stagnation following the drought years, a comprehensive study is necessary to evaluate the trends of meteorological factors that may adversely impact air quality in the Basin. The study will assist staff to better understand the potential impact of recent weather trends on criteria pollutant emissions and potentially develop more effective strategies for improving air quality in the future.

Potential Air Quality Benefits:

If renewable diesel, biodiesel and biodiesel blends can be demonstrated to reduce air pollutant emissions with the ability to mitigate any NOx impact, this technology will become a viable strategy to assist in meeting air pollutant standards as well as the goals of SB 32 and the Low-Carbon Fuel Standard. The use of biodiesel is an important effort for a sustainable energy future. Emission studies are critical to understanding the emission benefits and any tradeoffs (NOx impact) that may result from using this alternative fuel. With reliable information on the emissions from using biodiesel and biodiesel blends, the South Coast AQMD can take actions to ensure the use of biodiesel will obtain air pollutant reductions without creating additional NOx emissions that may exacerbate the Basin's ozone problem. Additionally, understanding meteorological factors on criteria pollutant emissions may help identify ways to mitigate them, possibly through targeted advanced transportation deployment.

Proposed Project: Identify and Demonstrate In-Use Fleet Emissions Reduction Technologies and Opportunities

Expected South Coast AQMD Cost: \$220,375

Expected Total Cost: \$1,000,000

Description of Technology and Application:

New technologies, such as alternative fueled heavy-duty engines, are extremely effective at reducing emissions because they are designed to meet the most stringent emissions standards while maintaining vehicle performance. In addition, many new vehicles are now equipped with telematics enabling motorists to obtain transportation information such as road conditions to avoid excessive idling and track information about the vehicle maintenance needs, repair history, tire pressure and fuel economy. Telematics have been shown to reduce emissions from new vehicles. Unfortunately, the in-use fleet lacks telematic systems--particularly heavy-duty engines in trucks, buses, construction equipment, locomotives, commercial harbor craft and cargo handling equipment--have fairly long working lifetimes (up to 20 years due to remanufacturing in some cases). Even light-duty vehicles routinely have lifetimes exceeding 200,000 miles and 10 years. And it is the in-use fleet, especially the oldest vehicles, which are responsible for the majority of emissions. In the last a few years, real-time emissions and fuel economy data reporting along with telematics has been demonstrated with large fleets to as fleet management tools to identify high emitters and increase operational efficiency.

This project category is to investigate near-term emissions control technologies that can be cost-effectively applied to reduce emissions from the in-use fleet. The first part of the project is to identify and conduct proof-of-concept demonstrations of feasible candidate technologies, such as:

- remote sensing for heavy-duty vehicles;
- annual testing for high mileage vehicles (>100,000 miles);
- replace or upgrade emissions control systems at 100,000-mile intervals;
- on-board emission diagnostics with remote notification;
- low-cost test equipment for monitoring and identifying high emitters;
- test cycle development for different class vehicles (e.g. four-wheel drive SUVs);
- electrical auxiliary power unit replacements;
- development, deployment and demonstration of smart vehicle telematic systems; and
- low NOx sensor development

Potential Air Quality Benefits:

Many of the technologies identified can be applied to light- and heavy-duty vehicles to identify and subsequently remedy high-emitting vehicles in the current fleet inventory. Estimates suggest that 5 percent of existing fleets account for up to 80 percent of the emissions. Identification of higher emitting vehicles would assist with demand-side strategies, where higher emitting vehicles have correspondingly higher registration charges. The identification and replacement of high-emitting vehicles has been identified in CERPs from the Year 1 AB 617 communities as a high priority for residents living in these communities, particularly as heavy-duty trucks frequently travel on residential streets to bypass traffic on freeways surrounding these disadvantaged communities.

Emissions Control Technologies

Proposed Project: Develop and Demonstrate Advanced Aftertreatment Technologies

Expected South Coast AQMD Cost: \$500,000

Expected Total Cost: \$2,000,000

Description of Technology and Application:

There are a number of aftertreatment technologies which have shown substantial emissions reductions in diesel engines. These technologies include zoned catalyst soot filters, early light -off catalysts, dual SCR systems, pre-NOx absorbers, and ammonia slip catalysts. Additional heating technologies enabled by availability of 48 volt battery system can be used to keep desired catalyst temperatures such as heated dosing and heated catalysts are also part of the complete aftertreatment system design towards near-zero emission NOx. This project category is to develop and demonstrate these aftertreatment technologies alone or in tandem with an alternative fuel to produce the lowest possible PM, ultrafine particles, nanoparticles, NOx, CO, carbonyl and hydrocarbon emissions in retrofit and new applications. With the increasing focus on zero and near-zero emissions goods movement technologies, this category should examine idle reduction concepts and technologies that can be employed at ports and airports.

Possible projects include advancing the technologies for on-road truck demonstrations beyond the lab based testing, retrofit applications, such as heavy-duty line-haul and other large displacement diesel engines, street sweepers, waste haulers and transit buses. Applications for non-road may include construction equipment, yard hostlers, gantry cranes, locomotives, commercial harbor craft, ground support equipment and other similar industrial applications. Potential fuels to be considered in tandem are low-sulfur diesel, emulsified diesel, biodiesel, gas-to-liquids, hydrogen and natural gas. This project category will also explore the performance, economic feasibility, viability (reliability, maintainability and durability) and ease-of-use to ensure a pathway to commercialization.

Potential Air Quality Benefits:

The transfer of mature emission control technologies, such as DPFs and oxidation catalysts, to the off-road sector is a potentially low-risk endeavor that can have immediate emissions reductions. Further development and demonstration of other technologies, such early light -off SCR and heated dosing, could also have NOx reductions of up to 90%.

Proposed Project: Develop and Demonstrate Advanced Aftertreatment Catalyst Heating Technologies

Expected South Coast AQMD Cost: \$220,375

Expected Total Cost: \$1,000,000

Description of Technology and Application:

The objective of this project is to support the demonstration and integration of aftertreatment systems incorporating technologies such as heated dosing and electrically heated catalysts used for on-road heavy duty vehicles. Current aftertreatment systems are required to maintain an operating temperature of 200 °C or higher for optimal performance. Diesel engines for heavy duty commercial vehicles have been discovered to operate at temperatures below 200 °C during specific parts of the driving cycle, such as low loads and cold starts. Emissions during the low-load and cold starts have been shown to increase up to 30% and PM up to 20%. Previous technologies, such as the mini burner, were successful mitigating the cold catalyst issue. There were draw backs in this technology due to increased CO2 emissions. The mini burner was not favorable as a successful approach because it increased fuel consumption. New aftertreatment technologies, coupled with advanced engine and hybrid technologies, have shown potential to reduce emissions up to 99% without a fuel penalty. Technologies such as:

- Close-coupled catalysts
- Dual-heated diesel-exhaust fluid dosing
- Electronically heated catalysts

Current aftertreatment design incorporates a close-coupled catalyst, Diesel particulate filter, dual SCR, and an ammonia–slip catalyst. Included in this design is a required heat source at low loads, cold starts and motoring conditions. The use of an electric heat source has become feasible due to advancements in electrical-powered applications and integration with the vehicle. These heating technologies has been demonstrated under lab based testing but issues reside with further commercialization effort as the new CARB and EPA regulation significantly lengthening the warranty and durability requirements which could increase the cost and ultimate limit adoption of new and unproven technologies. Thus, large scale, OEM and supplier sponsored demonstration effort is needed to move these technologies forward.

Potential Air Quality Benefits:

This project is expected to contribute to the total emission reductions in heavy-duty on road engines. Emission reductions of 80-90% in heavy-duty diesel long-haul trucks has already been proven when an advanced aftertreatment system, incorporating an additional heat source, along with advanced engine technology such as cylinder deactivation is used. The fuel savings benefit is especially attractive to long-haul fleet operations. In order to meet the ultra-low NOx air quality standards and promote a national low NOx standard for heavy-duty diesel engines, an advanced aftertreatment system incorporating heated catalyst technology is required.

Proposed Project: Develop Methodology and Evaluate Onboard Emission Sensors for On-Road Heavy-Duty Vehicles

Expected South Coast AQMD Cost: \$250,000

Expected Total Cost: \$1,000,000

Description of Technology and Application:

New heavy-duty on-road vehicles represent one of the largest categories in the NOx emissions inventory in the Basin. In order to meet the 2023 and 2031 ozone standards, NOx emissions need to be reduced by 45% and an additional 55% from 2012 levels, respectively, mainly from mobile sources. Previous in-use emission studies, including studies funded by the South Coast AQMD, have shown significantly higher NOx emissions from on-road heavy-duty vehicles than the certification limit under certain in-use operations, such as low power duty cycles. In CARB's adopted Heavy-Duty On-Road "Omnibus" Low NOx regulation, in addition to the lower certification values, a low load test cycle and revisions to the not-to-exceed compliance tests. A NOx sensor data reporting are also introduced where the vehicle computer are required to store a past period of emissions data to ensure real-world emission reductions are realized over various duty cycles, especially those low power duty cycles in urban areas. An alternative proposed new methodology is to continuously measure real-time emissions from trucks with onboard sensors. Both industry, government and regulators are looking to use the sensors to better monitor emissions compliance and leverage the real-time data from sensors to enable advances concepts such as geofencing.

This project category is to investigate near term and long-term benefits from onboard sensors to understand in-use emissions better and reduce emissions from the advanced management concept. The first part of the project is to identify and conduct proof-of-concept demonstrations of feasible candidate technologies, such as:

- laboratory evaluation of existing sensors;
- development and evaluation of next generation sensors;
- development of algorithms to extract sensor information into mass-based metric;
- demonstrate feasibility to monitor emissions compliance using sensors;
- identify low cost option for cost and benefit analysis;
- demonstrate sensors on natural gas and other mobile sources such as light-duty, off-highway and commercial harbor craft; and
- development, deployment and demonstration of smart energy/emissions management systems

Potential Air Quality Benefits:

The proposed research projects will assist the trucking industry to monitor emissions, using sensors as one of the design platform options. Reduction of NOx and PM emissions from mobile sources is imperative for the Basin to achieve NAAQS and protect public health.

Proposed Project: Demonstrate On-Road Technologies in Off-Road and Retrofit Applications

Expected South Coast AQMD Cost: \$176,300

Expected Total Cost: \$800,000

Description of Technology and Application:

On-road heavy-duty engines have demonstrated progress in meeting increasingly stringent federal and state requirements. New heavy-duty engines have progressed from 2 g/bhp-hr NO_x in 2004 to 0.2 g/bhp-hr NO_x in 2010, which is an order of magnitude decrease in just six years. Off-road engines, however, have considerably higher emissions limits depending on the engine size. For example, Tier 3 standards for heavy-duty engines require only 3 g/bhp-hr NO_x. There are apparent opportunities to implement cleaner on-road technologies in off-road applications. There is also an opportunity to replace existing engines in both on-road and off-road applications with the cleanest available technology. Current regulations require a repower (engine exchange) to only meet the same emissions standards as the engine being retired. Unfortunately, this does not take advantage of recently developed clean technologies.

Exhaust gas cleanup strategies, such as SCR, electrostatic precipitators, baghouses and scrubbers, have been used successfully for many years on stationary sources. The exhaust from the combustion source is routed to the cleaning technology, which typically requires a large footprint for implementation. This large footprint has made installation of such technologies on some mobile sources prohibitive. However, in cases where the mobile source is required to idle for long periods of time, it may be more effective to route the emissions from the mobile source to a stationary device to clean the exhaust stream.

Projects in this category will include utilizing proven clean technologies in novel applications, such as:

- demonstrating certified LNG and CNG on-road engines in off-road applications including yard hostlers, switcher locomotives, gantry cranes, waste haulers and construction equipment;
- implementing lower emission engines in repower applications for both on-road and off-road applications; and
- applying stationary best available control technologies, such as SCR, scrubbers, baghouses and electrostatic precipitators, to appropriate on- and off-road applications, such as idling locomotives, commercial harbor craft at dock and heavy-duty line-haul trucks at weigh stations.

Potential Air Quality Benefits:

The transfer of mature emission control technologies, such as certified engines and SCR, to the off-road and retrofit sectors offers high potential for immediate emissions reductions. Further development and demonstration of these technologies will assist in the regulatory efforts which could require such technologies and retrofits.

Health Impacts Studies

Proposed Project: Evaluate Ultrafine Particle Health Effects

Expected South Coast AQMD Cost: \$88,150

Expected Total Cost: \$1,000,000

Description of Technology and Application:

Reducing diesel exhaust from vehicles has become a high priority in the Basin since CARB identified the particulate phase of diesel exhaust as a surrogate for all of the toxic air contaminants emitted from diesel exhaust. Additionally, health studies indicate that the ultrafine particulate matter (UPM) may be more toxic on a per-mass basis than other fractions. Several technologies have been introduced and others are under development to reduce diesel emissions. These include among others low-sulfur diesel fuel, particulate matter traps and heavy-duty engines operating on alternative fuel such as CNG and LNG. Recent studies have shown that control technologies applied to mobile sources have been effective in reducing the mass of particulates emitted. However, there is also evidence that the number of UPM on and near roadways has increased, even while the mass of particulates has decreased. To have a better understanding of changes in ultrafine particulate emissions from the application of new technologies and health effects of these emissions, an evaluation and comparison of UPM and the potential impacts on community exposure, particularly in disadvantaged communities, is needed.

In this project, measurements and chemical composition of UPM will be done, as well as studies conducted to characterize their toxicity. The composition of PM can further be used to determine the contribution from specific combustion sources. Additionally, engine or chassis dynamometer testing may be conducted on heavy-duty vehicles to measure, evaluate and compare UPM, PAH and other relevant toxic emissions from different types of fuels such as CNG, low-sulfur diesel, biofuels and others. This project needs to be closely coordinated with the development of technologies for alternative fuels, aftertreatment technologies, and new engine development in order to determine the health benefits of such technologies.

Furthermore, gasoline direct injection (GDI) vehicles are known for higher efficiency and power output but the PM emissions profile is not well understood especially on secondary organic aerosol (SOA) formation potential. As manufacturers introduce more GDI models in the market to meet new fuel economy standards, it is important to understand the SOA potential from these vehicles as it could lead to further impact on the ambient PM concentration in our region. Consequently, in 2015 a project was initiated with UCR/CE-CERT to investigate the physical and chemical composition of aerosols from GDI vehicles using a mobile environmental chamber that has been designed and constructed to characterize secondary emissions. Based on initial results indicating an increase in particle numbers, follow-up in-use studies to assess PM emissions including with and without particle filters will be beneficial.

Potential Air Quality Benefits:

The AQMP for the South Coast Basin relies on significant penetration of low emission vehicles to attain federal clean air standards. Reduction of PM emissions from the combustion of diesel and other fuels is a major priority in achieving these standards. This project would help to better understand the nature and number of UPM generated by different types of fuels and advanced control technologies as well as provide information on potential health effects of UPM. Such an understanding is important to assess the emission reduction potentials and health benefits of these technologies. In turn, this will have a direct effect on the policy and regulatory actions for commercial implementation of alternative fuel vehicles in the Basin.

Proposed Project: Conduct Monitoring to Assess Environmental Impacts

Expected South Coast AQMD Cost: \$132,225

Expected Total Cost: \$500,000

Description of Technology and Application:

Facilities, buildings, structures, or highways which attract mobile sources of pollution are considered “indirect” sources. Ambient and saturation air monitoring near sources such as ports, airports, rail yards, freight/logistics distribution centers and freeways is important to identify emissions exposure to surrounding communities and provide data to assess health impacts. This project category would identify areas of interest and conduct ambient air monitoring, emissions monitoring, analyze data and assess potential health impacts from mobile sources. These projects would need to be at least one year in duration in order to properly assess air quality impacts in surrounding communities.

Potential Air Quality Benefits:

The proposed project will assist in evaluation of adverse public health impacts associated with mobile sources. The information will be useful in (a) determining whether indirect sources have a relatively higher impact on residents living in close proximity, particularly in disadvantaged communities; and (b) providing guidance to develop some area-specific control strategies in the future should it be necessary.

Proposed Project: Assess Sources and Health Impacts of Toxic Air Contaminants

Expected South Coast AQMD Cost: \$132,225

Expected Total Cost: \$300,000

Description of Technology and Application:

Previous studies of ambient levels of toxic air contaminants, such as the MATES studies, have found that diesel exhaust is the major contributor to health risk from air toxics. Analyses of diesel particulate matter (DPM) in ambient samples have been based on measurements of elemental carbon. While the bulk of particulate elemental carbon in the Basin is thought to be from combustion of diesel fuels, it is not a unique tracer for diesel exhaust.

The MATES III study collected particulate samples at ten locations in the Basin. Analysis of particulate bound organic compounds was utilized as tracers to estimate levels of ambient DPM as well as estimate levels of PM from other major sources. Other major sources that were taken into consideration include automobile exhaust, meat charbroiling, road dust, wood smoke and fuel oil combustion. Analyzing for organic compounds and metals in conjunction with elemental carbon upon collected particulate samples was used to determine contributing sources.

MATES IV, completed in 2015, included an air monitoring program and updated emissions inventory of toxic air contaminants. MATES IV also measured UPM concentrations and black carbon at monitoring sites as well as near sources such as airports, freeways, rail yards, busy intersections and freight/logistics warehouse operations.

MATES V was launched in 2017 to update the emissions inventory of toxic air contaminants and modeling to characterize risks, including measurements and analysis of UPM concentrations typically emitted or converted from vehicle exhaust. In addition, staff are also performing additional advanced monitoring activities as an extension of the MATES V study.

This project category would include other related factors, such as toxicity assessment based on age, source (heavy-duty, light-duty engines) and composition (semi-volatile or non-volatile fractions) to better understand health effects and potential community exposure, particularly in disadvantaged communities. Additionally, early identification of new health issues could be of considerable value and could be undertaken in this project category.

Potential Air Quality Benefits:

Results of this work will provide a more robust, scientifically sound estimate of ambient levels of DPM as well as levels of PM from other significant combustion sources, including gasoline and diesel generated VOCs. This will allow a better estimation of potential exposure and health effects from toxic air contaminants from diesel exhaust in the Basin. This information in turn can be used to determine health benefits of promoting clean fuel technologies.

Technology Assessment/Transfer and Outreach

Proposed Project: Assess and Support Advanced Technologies and Disseminate Information

Expected South Coast AQMD Cost: \$352,600

Expected Total Cost: \$800,000

Description of Project:

This project supports the assessment of clean fuels and advanced technologies, their progress towards commercialization and the dissemination of information on demonstrated technologies. The objective of this project is to expedite the transfer of technology developed as a result of Technology Advancement Office projects to the public domain, industry, regulatory agencies and the scientific community. This project is a fundamental element in the South Coast AQMD's outreach efforts by coordinating activities with other organizations to expedite the implementation of advanced engines and clean fuels technologies.

This project may include the following:

- technical review and assessment of technologies, projects and proposals;
- support for alternative fuel refueling and infrastructure;
- advanced technology curriculum development, mentoring and outreach to local schools;
- emission studies and assessments of near-zero and zero-emission alternatives;
- preparation of reports, presentations at conferences, improving public relations and public communications of successful clean technology demonstrations;
- participation in and coordination of workshops and various meetings;
- support for training programs related to fleet operation, maintenance and refueling of alternative fuel vehicles and equipment;
- publication of technical papers as well as reports and bulletins; and
- dissemination of information, including websites development and updates.

These objectives will be achieved by consulting with industry, scientific, health, medical and regulatory experts and co-sponsoring related conferences and organizations, resulting in multiple contracts. In addition, an ongoing outreach campaign will be conducted to encourage decision-makers to voluntarily switch to alternatively fueled vehicles and train operators to purchase, operate and maintain these vehicles/equipment and associated infrastructure.

Potential Air Quality Benefits:

South Coast AQMD adopted fleet regulations requiring public and private fleets within the Basin to acquire alternatively fueled vehicles when making new purchases. The benefits of highlighting success stories in the use of advanced alternatively fueled vehicles could expedite the acceptance and commercialization of advanced technologies. Especially, by the operators seeking to comply with the provisions of the South Coast AQMD fleet rules. The emission reduction benefits will contribute to the goals of the AQMP.

Proposed Project: Support Implementation of Various Clean Fuels Vehicle Incentive Programs

Expected South Coast AQMD Cost: \$264,450

Expected Total Cost: \$400,000

Description of Project:

This project supports the implementation of incentive programs, including the state and federal grant programs, the Carl Moyer, lower emission school bus, Replace Your Ride Programs and the South Coast AQMD residential EV charger rebate program. Implementation support includes application review, funds allocation, equipment owner reports collection, documentation to the CARB, verification of vehicle operation, and other support as needed. Information dissemination is critical to successfully implementing the coordinated and comprehensive incentive programs. Outreach will be directed to vehicle dealers, individuals and fleets. To date, the South Coast AQMD residential EV charger rebate program has provided over 1,500 rebates, totaling \$416,087. The total available funds of \$1 million is consisted with \$500,000 from South Coast AQMD Clean Fuels Fund and \$500,000 from the Mobile Source Air Pollution Reduction Review Committee (MSRC).

Potential Air Quality Benefits:

As described earlier, the South Coast AQMD will provide matching funds to implement several key incentives programs to reduce diesel emissions in the Basin. Furthermore, the South Coast AQMD adopted fleet regulations requiring public and private fleets within the Basin to acquire alternatively fueled vehicles when making new purchases. The benefits of highlighting zero emission vehicle incentives could potentially expedite the acceptance and commercialization of advanced technologies by operators seeking to comply with the South Coast AQMD fleet rules provisions. The result of future emission reduction benefits will contribute to the goals of the AQMP. The lower emission school bus, AB 617 Community Air Protection, Volkswagen Environmental Mitigation Trust and Carl Moyer incentives programs could reduce large amounts of NOx and PM emissions, and toxic air contaminants in the Basin.



South Coast
Air Quality
Management District

March 2020

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Clean Fuels Program 2021 Proposed Plan Update



Clean Fuels Program

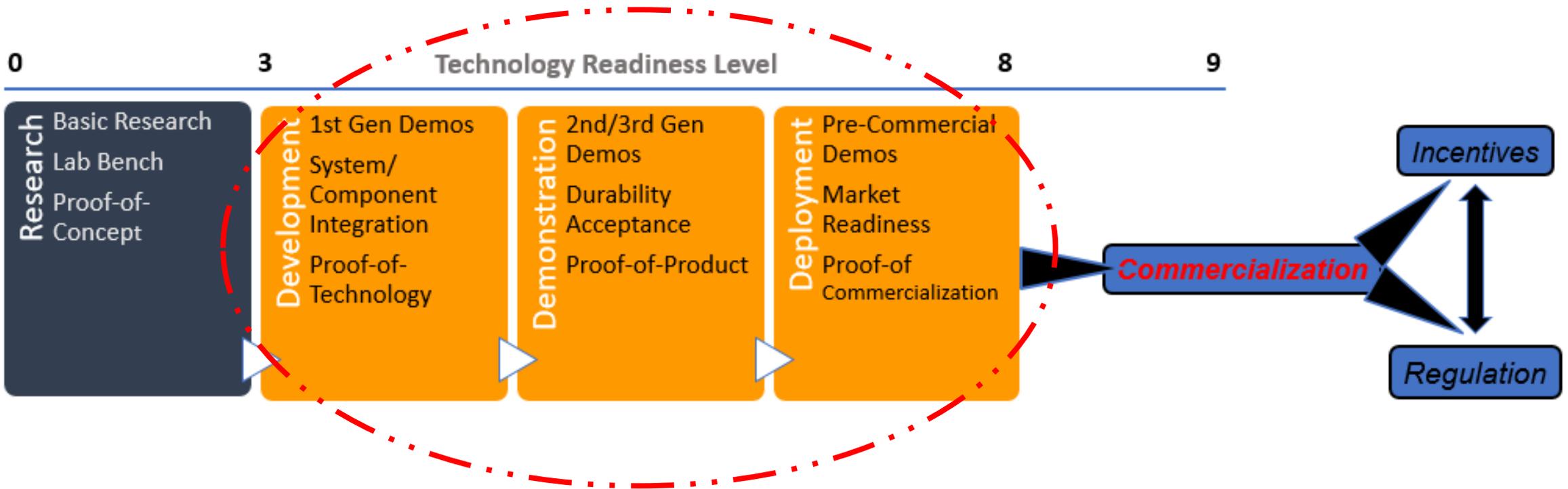
2020 Annual Report
& 2021 Plan Update

Technology Advancement Office

Driving toward cleaner air

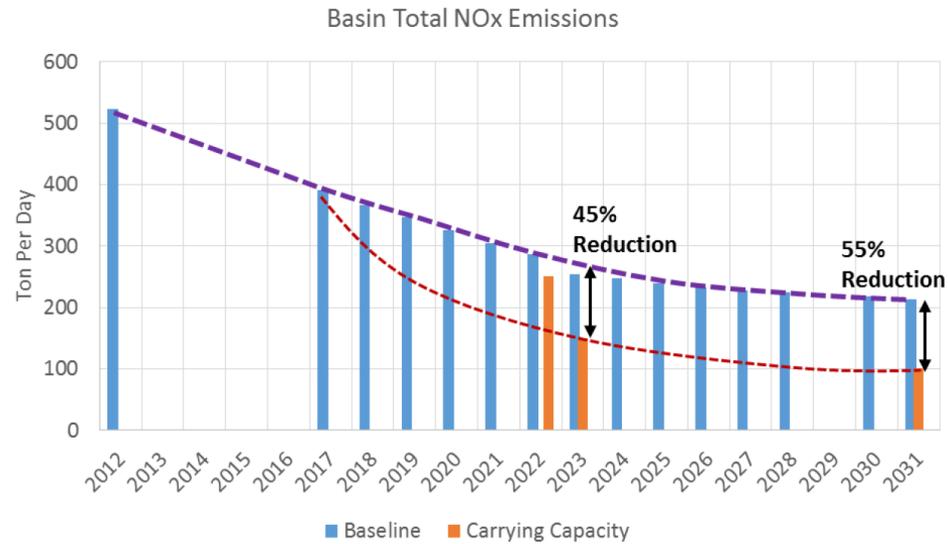
**Technology Committee
October 16, 2020**

Clean Fuels Fund Program



South Coast AQMD Plans & Policies

- 2016 AQMP – NAAQS



Sector	Board Direction
Commercial Marine Ports	Develop MOU with ports to implement Clean Air Action Plan (CAAP)
Railyard and Intermodal Yards	Pursue Indirect Source Regulation (ISR)
Warehouse Distribution Centers	Pursue ISR
Commercial Airports	Develop MOU with airports to create and implement Air Quality Improvement Plans (AQIPs)
New/Redevelopment Projects	Further study on potential ISR or other approaches

Federal/State Actions

- Federal – FY 2021 Interior, Environment and Related Agencies funding bill
- State - Governors Executive Order requiring sales of all new passenger vehicles to be zero-emission by 2035
- USEPA – Cleaner Trucks Initiative
- CEC – Low Carbon Fuel Production Program (LCFPP)
- CARB Regulations
 - Heavy-Duty On-Road “Omnibus” Low NOx Regulation
 - Advanced Clean Truck Regulation (ACT)
 - Truck and Bus Regulation (Compliance begins 2020)
 - Innovative Clean Transit (ICT) Regulation



Draft 2021 Plan Update (Key Technical Areas)

- Focus priorities on large demonstrations of zero emissions drayage trucks to test and validate OEM readiness and infrastructure viability
- Defining technology pathways via special projects - the Ultra-Low Emissions Engine Program
- Near-zero emission (gaseous and liquid fuel) engine systems, especially high HP uses

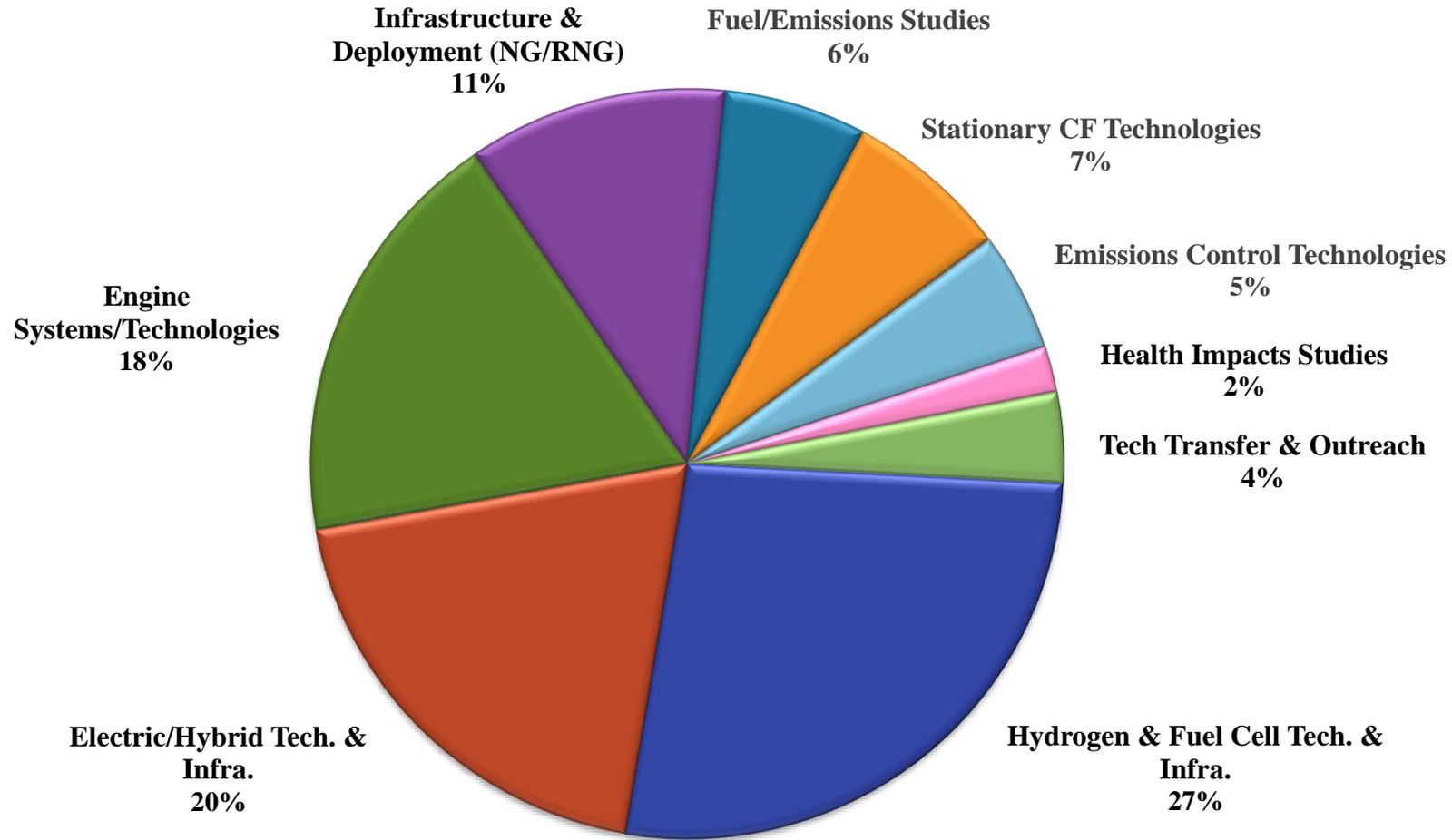


Draft 2021 Plan Update (Continued) (Key Technical Areas)

- Expand focus on local biogas production and use
- Leverage OEM partnerships to focus on continued deployment of hybrid, plug-in, electric-drive technologies and infrastructure
- Onsite hydrogen production and dispensing and mobile refueling
- Maintain other areas of emphasis

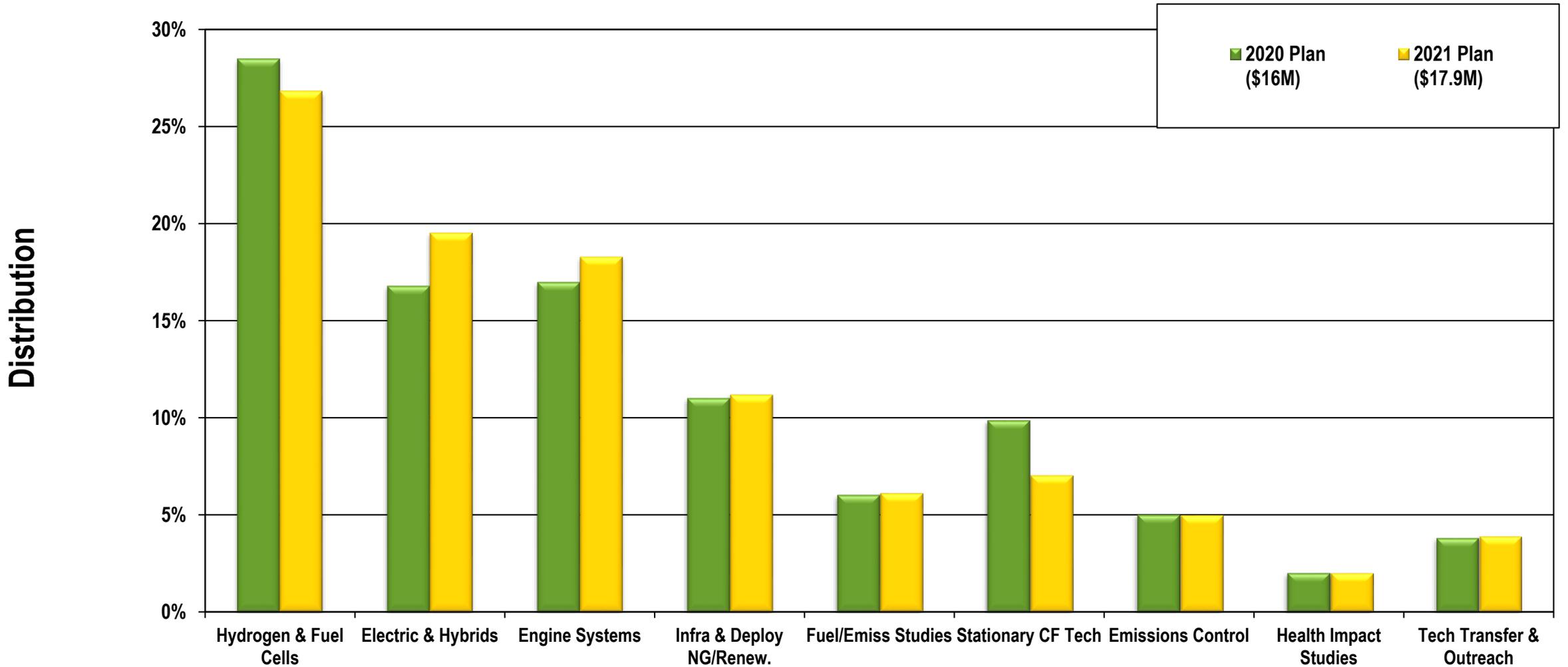


Proposed 2021 Plan Distribution



\$17.9M

Plan Update Comparison



Feedback

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